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BULGARIAN COMMISSION OF MILITARY HISTORY

TECHNOLOGY AND WARFARE

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ФОНД
НАУЧНИ
ИЗСЛЕДВАНИЯ
Министерство на образованието, младежта и науката

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Редакционна бележка

За пръв път в 75-годишната история на Международната комисия по военна история България бе домакин на неин конгрес. 38-ият конгрес по военна история премина под егидата на министъра на отбраната на Република България, а официален домакин бе Военна академия „Г. С. Раковски“. Българската национална комисия по военна история направи всичко възможно за доброто организиране на това важно международно научно събитие.

В работата на 38-ия международен конгрес по военна история (25–31 август 2012 г., хотел Кемпински Зографски, София) взеха участие близо 250 участници и гости от 35 държави от Европа, Азия, Близкия изток, Африка, Северна и Южна Америка. Конгресната програма включваше общо около 90 научни и информативни доклада, които бяха изнесени в 14 пленарни сесии, 10 паралелни кръгли маси, 2 специални панела, 2 докторантски семинара, 3 работни заседания на специализираните подкомитети (Образователен, Библиографски и Архивен) и 5 заседания на ръководните органи на Международната комисия (Изпълнителен съвет, Генерална асамблея и Съвет на президентите на национални комисии).

Научната програма на конгреса бе посветена на общата тема „*Технологии и войни*“. В пленарните сесии и кръгли маси бяха обсъдени широк кръг тематични проблеми за развитието и ролята на военните технологии от средните векове и индустриалната епоха до студената война и информационно-технологичната ера в началото на XXI век. Един от специалните акценти бе върху използването на военни технологии по време на Балканските и Първата световна война предвид предстоящите стогодишнини от тяхното провеждане. Отделни заседания разгледаха еволюцията на военните технологии във военноморските и военновъздушните сили, ролята им в изграждане на фортификации и комуникации, разузнаване и технологии, технологии и операции и др. Един от основните дискусионни проблеми бе за съотношението между човешкия фактор и новите военни технологии. За пръв път със специален панел в конгрес по военна история се представи Международният комитет на военните музеи и оръжейни колекции (ICOMAM) към ЮНЕСКО. По инициатива на ръководството на Образователния комитет в работата на конгреса взеха участие с доклади в двата докторантски семинара осем млади учени от седем държави. Библиографският комитет също бе инициатор на съпътстващи дискусии за излезли нови книги по военна история в рамките на научната програма на конгреса. Допълнително за чуждестранните гости бе предвидена богата културна програма, която ги запозна с историческото и духовно наследство на България. В дните и непосредствено след приключване на международния форум неговата работа бе отразена в над 30 информации и коментари в българските печатни и електронни медии.

В настоящия том с материалите на конгреса са включени получените в установения срок окончателни варианти на 57 доклади на делегати от 33 държави. По препоръка на ръководството на Международната комисия по военна история в края на изданието сме добавили още един доклад, изнесен по време на 36-ия конгрес по военна история в Амстердам през септември 2010 г. Публикуването на този сборник в Издателството на Софийския университет стана възможно в резултат на съвместните усилия на Университетския комплекс по хуманитаристика „Алма Матер" и Военна академия „Г. С. Раковски", довели до създаването на Междууниверситетския академичен консорциум „Граждански измерения на сигурността и отбраната".

Editorial note

For the first time in the 75-years' history of the International Commission of Military History Bulgaria was the host of its congress. The 38^{th} Congress of Military History was held under the auspices of the Minister of Defense of the Republic of Bulgaria, the official host was the «G. S. Rakovski» National Defense Academy, Sofia. Bulgaria. The Bulgarian National Commission of Military History did everything possible to better organize this important international scientific event.

The 38^{th} International Congress of Military History (August 25 – 31. 2012, Kempinski Hotel Zografski, Sofia) was attended by nearly 250 participants and guests from 35 countries in Europe, Asia, Middle East, Africa, North and South America. The program of the Congress included a total of about 90 scientific and informative reports which were presented in 14 plenary sessions, 10 parallel roundtables, 2 special panels, 2 doctoral seminars, 3 workshops of the specialized subcommittees (Education, Bibliography and Archives) and 5 meetings of the governing bodies of the International Commission (Executive Council, General Assembly and the Council of the Presidents of the National Commissions).

The scientific program of the congress was devoted to the general topic «*Technology and Warfare*». During the plenary sessions and roundtables were discussed a wide range of topical issues related to the development and the role of the military technology ranging from the Middle Ages and the Industrial Era to the Cold War and the information-technological era at the beginning of the 21st century. A special focus was put on the use of the military technology during the Balkan Wars and the First World War given the upcoming centennial of their conduct. Separate sessions reviewed the evolution of the military technology in the Navy and Air Force, its role in the construction of fortifications and communications, reconnaissance and technology, technology and operations and other. One of the main issues for discussion was related to the correlation between the human factor and the new military technology. For the first time the International Committee of Museums and Collections of Arms and Military History (ICOMAM) at UNESCO presented a special panel during a congress on military history. On the initiative of the management of the Education Committee in the congress work participated with reports submitted within the two doctoral seminars eight young scientists from seven countries. The Bibliographic Committee was also the initiator, within the scientific program of the congress, of accompanying discussions about newly issued books on military history. A rich cultural program was additionally provided for the foreign guests that introduced them to the historical and spiritual heritage of

Bulgaria. During the days of holding the international forum and immediately after its closure the activities of the congress were covered by more than 30 information and comments in the Bulgarian print and electronic media.

In this volume containing the materials of the congress are included the final versions submitted within the stipulated period of 57 reports of delegates from 33 countries. On the recommendation of the leadership of the International Commission of Military History at the end of the issue we have added one more report presented at the 36th Congress of Military History held in Amsterdam in September 2010.

The publication of this collection in the Publishing house of the Sofia University «St. Kliment Ohridski» was made possible thanks to the joint efforts of the University Research Complex in the Humanities «Alma Mater» and «G. S. Rakovski» National Defense Academy for the creation of the Inter-university Academic Consortium «Civil Dimensions of Security and Defense».

Note de la redaction

Pour la première fois de l'histoire de 75 ans de la Commission Internationale d'Histoire Militaire la Bulgarie a accueilli son congrès. Le 38ème Congrès d'Histoire Militaire s'est déroulé sous les auspices du Ministre de la Défense de la République de Bulgarie, l'hôte officiel de cette manifestation était l'Académie Nationale Militaire «G. S. Rakovski», Sofia, Bulgarie. La Commission Nationale Bulgare d'Histoire Militaire a fait tout son possible pour organiser au mieux cet important événement scientifique international.

Aux travaux du 38ème Congrès International d'Histoire Militaire (les 25–31 Août 2012, Kempinski Hôtel Zografski, Sofia) ont pris part près de 250 participants et invités de 35 pays d'Europe, d'Asie, de Proche Orient, d'Afrique et d'Amérique du Nord et du Sud. Le programme du Congrès comprenait un total d'environ 90 rapports scientifiques et informatifs qui ont été présentés dans le cadre des 14 sessions plénières, 10 tables rondes parallèles, 2 groupes de travail spéciaux, 2 séminaires de doctorat, 3 séances de travail des sous-comités spécialisés (d'Education, Bibliographique et d'Archives) et 5 réunions de organes directeurs de la Commission Internationale (Conseil Exécutif, Assemblée générale et le Conseil des Présidents des comités nationaux).

Le programme scientifique du congrès a été consacré au thème général «*Technologies et Art Militaire*». Lors des séances plénières et des tables rondes ont été discutées un large éventail de questions thématiques portant sur le développement et le rôle des technologies militaires depuis le Moyen-âge et l'époque industrielle jusqu'à la guerre froide et l'ère des informations et technologique au début du XXIème siècle. Un des accents particuliers a été mis sur l'utilisation des technologies militaires pendant les Guerres des Balkans et la Première Guerre Mondiale en vue du prochain centenaire de leur conduite. Certaines séances ont examiné l'évolution des technologies militaires dans la Marine et les Forces aériennes, leur rôle dans la construction des fortifications et des communications, la reconnaissance et les technologies, les technologies et les opérations et autres. L'un des principaux sujets de discussion portait sur la corrélation entre le facteur humain et les nouvelles technologies militaires. C'était pour la première fois que le Comité International des musées et des collections d'armes et d'histoire militaire (ICOMAM) auprès de l'UNESCO s'est présenté avec un panel spécial dans le cadre d'un congrès sur l'histoire militaire. A l'initiative de la direction du Comité d'Education aux travaux du congrès ont pris part avec des rapports présentés au cours des deux séminaires doctoraux huit jeunes scientifiques de sept pays. Le Comité bibliographique a également été l'initiateur, dans le cadre du programme scientifique du congrès, de discussions accompagnantes portant sur des livres nouvellement publiés sur l'histoire militaire. Pour les invités étrangers il a été prévu en outre un riche programme culturel qui les a introduits à l'héritage historique et spirituel de la Bulgarie. Au cours des journées de la tenue du forum international et immédiatement après sa clôture ses activités ont fait l'objet de plus de 30 informations et commentaires et ont été rapportées dans la presse écrite et les médias électroniques bulgares.

Dans ce volume contenant les papiers du congrès sont incluses les versions finales, présentées dans le délai prescrit, des 57 rapports des délégués de 33 pays. Sur la recommandation de la direction de la Commission Internationale d'Histoire Militaire à la fin de l'édition nous avons rajouté encore un rapport, présenté au cours du 36ème Congrès d'Histoire Militaire tenu à Amsterdam en Septembre 2010. La publication de ce recueil aux Editions de l'Université de Sofia «St. Kliment Ohridski» est devenue possible grâce aux efforts conjoints du Complexe Universitaire des Sciences Humaines «Alma Mater» et de l'Académie Nationale Militaire «G. S. Rakovski», pour la création du Consortium académique interuniversitaire «Dimensions civiles de la sécurité et de la défense».

38TH CONGRESS OF THE ICMH
SOFIA, BULGARIA, 25–31 AUGUST 2012

TECHNOLOGY AND WARFARE

UNDER THE AEGIS OF THE MINISTER OF DEFENSE OF REPUBLIC OF BULGARIA

SCIENTIFIC PROGRAM

Monday, 27 August

09:00–10:30 Opening Session (Sofia 2 Hall)

09:00–09:10 Welcome by the President of the Bulgarian Commission of Military History, Professor Dr. Dimitar **Minchev**.

09:10–09:30 Address by the Bulgarian Minister of Defense, H. E. Mr. Anu **Anguelov**.

09:30–09:45 Address by the President of the International Commission of Military History, Drs. Piet **Kamphuis**.

09:50–10:20 Keynote speech: Colonel (r), Professor Dr. Reiner **Pommerin** (Germany): *"From Stone Axe to Nukes – Technology and Warfare".*

11:00–12:30 Working Session 1: Technology, Arms Production, and Operations (Sofia 2 Hall). Moderator: Colonel Dr. Hans Hubertus-**Mack** (Germany).

1. Professeur Dr. Jean-Nicolas **Corvisier** (France): *Armements, tactiques et stratégies: Le cercle sans fin de la guerre?*
2. Capitaine Julien **Grand** (Switzerland): *Production autonome d'avions de combats: quels défis pour un petit pays neutre?*
3. Lt. General. **Ren** Haiquan (China): *Military Technology and Strategy and Tactics in the Light of War History of the Chinese People's Liberation Army.*

14:00–15:45 Working Session 2: From the Middle Ages to the Age of Enlightenment (Sofia 2 Hall). Moderator: Dr. Claudia **Reichl-Ham** (Austria).

1. Professor Dr. John **Hosler** (USA): *Military Technology in the Writings of John of Salisbury (12th Century).*
2. Professor D. Sc. Vladimir **Artamonov** (Russia): *La guerre Turco-russe, 1710–1713.*
3. Dr. Sandrine **Picaud-Monnerat** (Switzerland): *La place de l'artillerie légère dans la bataille et dans la 'petite guerre' au XVIIIe siècle.*

14:00–15:45 Round Table I: Technology and Naval Power before and during the First World War (Kyoto Hall). Moderator: Capitaine de Corvette Blaise **Mbue Ngappe** (Cameroun).

1. Professor Dr. Michael **Epkenhans** (Germany): *The Imperial German Navy and "Spin-Off".*
2. Captain (Navy) Francesco **Loriga** (Italy): *The Italian Navy and the Technological Development. The Guglielmo Marconi Experiment.*
3. Dr. Zisis **Fotakis** (Greece): *Technological Progress and National Defence: the Case of the Greek Navy, 1821–1914.*
4. Brigadier General (r) Michael Hesselholt **Clemmesen** (Denmark): *The Fate of the Royal Navy's Network-Centric North Sea Operations Vision 1904–1916.*

14:00–15:00 "Meet the Editor": The New International Bibliography of Military History (organized by the Bibliography Committee, in Elena Room).

16:15–18:00 Working Session 3: 18th Century, Revolutionary and Colonial Warfare (Sofia 2 Hall). Moderator: Colonel Matteo **Paesano** (Italy).

1. Captain Gernán **Segura García** (Spain): *La Technologie au Service de la Tactique.*
2. Professor Allon **Klebanoff** (Israel): *Balloons, Rockets and Conserves. Technology and Warfare during the Revolutionary and Napoleonic Wars.*
3. General Maurice **Faivre** (France): *Technologie des guerres coloniales et des opérations extérieures.*

16:15–18:00 Round Table II: New Technologies, their Implementation and Consequences (Kyoto Hall). Moderator: Dr. Ilkka **Sepinen** (Finland).

1. Colonel F. Rezzan **Ünalp** & Senior Col. (r) Professor Esat **Arslan** (Turkey): *Implications towards the Military Field of Technological Knowledge through Case Studies from the Late Turkish History.*
2. Lt. Colonel Francisco **Gómez Ramos** (Spain): *The Role of Military Factories and Laboratories in the Industrial Development of Spain during the First Half of the 20th Century.*
3. Dr. Paolo **Formicone** (Italy): *The Forgotten Innovations in the Italian Military History.*

Tuesday, 28 August

09:00–10:30 Working Session 4: Technology and Aviation (Sofia 2 Hall). Moderator: General Dominique **Juilland** (Switzerland).

1. Dr. Lasse **Laaksonen** (Finland): *Trial and Error – the Finnish Air Force and Technological Development 1918–1939.*
2. Lt. Colonel Shizue **Okada** (Japan): *The Three Falcons – The Succession of Aviation Technology in Japan after World War II.*
3. Colonel João **Vicente** (Portugal): *Technophilic Images of Remote Air Warfare: the Event Horizon" of Unmanned Aircraft Systems.*

09:00–10:30 Round Table III: Technological Development and Innovations during the Balkan Wars (Kyoto Hall). Moderator: Ambassador Dr. Dumitru **Preda** (Romania).

1. Dr. Efpraxia **Pashalidou** (Greece): Strategic and operational innovations at the Hellenic Armed Forces, as parameter of the Balkan Wars, 1912–1913.
2. Dr. Gianluca **Pastori** (Italy): *Technical Innovation and Social Conservatism in the Narrative of the Italo-Turkish War (1911–1912).*
3. Colonel Andreas **Loizou** (Cyprus): *The Development of the Technology and its Impact on the Balkan Wars 1912–1913.*

10:00–10:30 "Meet the Editor": The New International Bibliography of Military History (organized by the Bibliography Committee, in Elena Room)

11:00–12:30 Working Session 5: Technology: Transfer and Adaptation (Sofia 2 Hall). Moderator: Professor Dr. Jean-Nicolas **Corvisier** (France).

1. Dr. Alan **Lemmers** (The Netherlands): *Dutch Technology Transfer to Awakening Japan.*
2. MA Robyn **Rodriguez** (USA): *The Importation and Adaptation of Technology and Tactics: The German Military Mission in China, 1927–1938.*
3. MA Fabio Luiz Nevez **Laurentino** (Brasil): *The Influence of French military thinking and technology in the post-World War I in Brazilian Army.*

11:00–12:30 Round Table IV: Technological Development and Innovations during World War I and beyond (Kyoto Hall). Moderator: Brigadier General /r/ Michael **Clemmesen** (Denmark).

1. Professor Matitiahu **Mayzel** (Israel): *Weaponry and Revolutionary Spirit – Artillery vs. Infantry in the Russian Army 1917.*
2. Major General /r/ Dr. Mihail **Ionescu** (Romania): *Romania's War Technology: Between requirements and budgetary priorities (1920–1939).*

<u>14:00–15:30</u> Working Session 6: Fortresses, Communications and Mobility (Sofia 2 Hall). Moderator: Senior Col. (r) Professor Esat **Arslan** (Turkey).

1. Colonel (r) Professor Dr. Dimitar **Minchev** & Professor D. Sc. Svetlozar **Eldarov** (Bulgaria): *Bulgarian Military Communications 1878–1944.*
2. Professor Dr. André **Wessels** (South Africa): *A Successful Blockhouse System, or a Disastrous Blockhead System? The British Use of the "New Technology" of Blockhouses during the Anglo-Boer War in South Africa, 1899–1902.*
3. Lt. Colonel Miloslav **Čaplovič** and Dr. Peter **Chorvát** (Slovakia): *Building the Czechoslovak Fortification System – Problems of Using Technologies 1933–1938.*

<u>14.00–15.30</u> Workshop for PhD Candidates, Part One (Kyoto Hall). Moderator: Professor Dr. Rudolf **Jaun** (Switzerland).

1. Angel **Dinev** (Bulgaria): *The application of advanced military technology and innovations in warfare operations of the Bulgarian army during the First Balkan War (1912–1913).*
2. Geoff **Jackson** (Canada): *The Canadian Independent Force: The advent of Canadian mechanized warfare.*
3. Aurélien **Poilbout** (France): *Evolution stratégique et transformation technologique de l'armée de l'air française en Afrique (1945 – 1978).*
4. Major Rejane Pintu Costa (Brazil): *The Revolution in Military Affairs in the scope of military education.*

<u>16:00–17:45</u> Working Session 7: Technology and Operations (Sofia 2 Hall). Moderator: Lt. General Eduardo Jose **Barbosa** (Brasil).

1. Professor Dr. Chiharu **Inaba** (Japan): *Shadows of Submarines in the Russo-Japanese War, 1904–05.*
2. Professeur Dr. Jean **Avenel** (France): *Les progrès de la recherche opérationnelle durant les guerres mondiales.*
3. Colonel Antonio **Zarcone** (Italy): *The Precursos of the Network for Data Transmission for the Artillery Terrestrial. From the Ideas of Segre at the Sorao.*
4. Dr. Vincent **Arbaretier** (France): *Technologie et l'art de la guerre: les transmissions en 1940.*

<u>16.00–17.45</u> Workshop for PhD Candidates, Part Two (Kyoto Hall). Moderator: Professor Dr. Michael **Epkenhans** (Germany).

1. Roberto **Trajkovski** (FYR of Macedonia): *The Exploitation of the Narrow Gauge Railway in the Vardar Part of Macedonia, built during the First World War.*

2. Daniel **Fuhrer** (Switzerland): *From Air Land Battle to Effects-Based Operations: US military strategy and the end of the Cold War.*
3. Davide **Borsani** (Italy): *Beyond military technology, the cultural dimension of counterinsurgency doctrines*
4. Zhenny **Vladimirova** (Bulgaria): *European Space Program and the Arms Race*

Wednesday, 29 August

09:00–10:30 Working Session 8: Experience from African and Arab Countries (Sofia 2 Hall). Moderator: Serge Bernier (Canada).

1. Professeur Mamadou **Diallo** & Colonel Birama **Thioune** (Sénégal): *Le rôle du chemin de fer dans la conquête et la pacification de l'Hinterland Sénégalais.*
2. Dr. Mor **Ndao** (Sénégal): *Le rôle et l'impact de la modernisation du port de Dakar dans la défense de la ville pendant la Deuxième Guerre Mondiale.*
3. Dr. Saif al **Bedwawi** (UAE): *Desert Disputes in the Emirates.*

09:00–10:30 Round Table V: New Technologies, and their Implementation in the 20th Century (Kyoto Hall). Moderator: Colonel (r) Benny **Michelsohn** (Israel).

1. MA Fergal **Purcell** (Ireland): *The Long Walk: An Aspect of the Evolution of Improvised Explosives Devices from the Irish War of Independence to 21st Century Afghanistan, and Their Impact on Military Tactics and Technology.*
2. Hong Guk **Oh** (South Korea): *The Development of South Korean Army Technology and Warfare in the Vietnam War.*
3. Lt.-Colonel Dr. Flavio **Carbone** (Italy): *Technology Evolution during the Sixties in the Fight against Criminality.*

11:00–12:30 Working Session 9: Intelligence and Communications (Sofia 2 Hall). Moderator: Dr. Jan **Hoffenaar** (The Netherlands).

1. Colonel Professor Tadeusz **Panecki** (Poland): *La contribution polonaise au déchiffrage de la machine allemande Enigma* .
2. Professor Dr. Jordan **Baev** (Bulgaria): *Bulgarian Scientific & Technical Intelligence Services during the Cold War years.*
3. Capitaine de Corvette Blaise **Mbue Ngappe** (Cameroun): *L'évolution des communications dans la bataille contre les coupeurs de routes au Cameroun.*

Round Table VI: New Technologies after the End of the Cold War (Kyoto Hall).
Moderator: Dr. Hans S. **Pawlisch** (USA).

1. Dr. Azriel **Lorber** (Israel): *On the Acceptance of Technological Innovations for the Battlefield.*
2. Dr. Joseph Pat **Harahan** (USA): *Eliminating the 43rd Strategic Rocket Army in the 1990s: Using International Cooperation, Technology, and Management.*
3. Captain (Navy) Professor D.Sc. Yantsislav **Yanakiev** (Bulgaria): *Bulgarian Contributions to NATO's Science and Technology Organization Activities.*

14:00–15:30 Working Session 10: Improvisations and Innovations (Sofia 2 Hall). Moderator: Lt. General Alfonso de la Rosa Moreno (Spain).

1. Lieutenant I Wayan Agus **Apriana** (Indonesia): *Bamboo Spears as a Traditional Weapon in the Singaparna Struggle in Tasikmalaya 1944.*
2. Dr. Alejandro **Amendolara** (Argentina): *Inventiveness Under Pressure: The Exocet Coastal Launcher in The Malvinas/Falklands War.*
3. Colonel (r) Benny **Michelsohn** (Israel): *Tank Protection in Offensive against A/T Weapons: The Case of the Merkava Main Battle Tank.*

14:00–15:30 Workshop: New and Recent Books on Technology and War (Kyoto Hall).
Moderators: Dr. Joseph Pat **Harahan** & Dr. Bianka **Adams** (USA).

1. Dr. Barton **Hacker** (USA).
2. Colonel Dr. Winfried **Heinemann** (Germany).
3. Dr. Plamen **Dimitrov** (Bulgaria).

16:00–17:30 Special panel: The Representation of War and Technology in Museums (Sofia 2 Hall). Moderator: Dr. Piet **De Gryse** (Belgium), President of ICOMAM.

1. Dr. Mathieu **Willemsen** (The Netherlands): *The Development of Military Firearms in the Age of Industrialization.*
2. Dr. M. Christian **Ortner** (Austria): *From the "white coat" to the field grey tunic: The change of Austro-Hungarian uniforms 1866–1918.*

Friday, 31 August

09:00–10:30 Working Session 11: Cold War and Post-Cold War Developments (Sofia 2 Hall). Moderator: Professor Allan **Millet** (USA).

1. Colonel Jamal **Mehssani** (Morocco): *La télémédecine : Evolution d'un concept et intérêt en situation opérationnelle.*

2. Professor Brian McAllister **Linn** (USA): *Wars are fought by men supported by weapons – wars are not fought by weapons supported by men:' The US Army, Technology, and Atomic Warfare in the 1950s.*
3. Colonel Omar El **Ouadoudi** (Morocco): *Compte rendu critique de l'ouvrage «Perspectives tactiques » du Général Guy Hubin (2000).*

<u>11:00–12:30</u> Working Session 12: Technology, Society, and Operations (Sofia 2 Hall). Moderator: Captain (Navy) Professor D.Sc. Yantsislav **Yanakiev** (Bulgaria).

1. Brigadier General Marco **Ciampini** (Italy): *The importance of society/ organization cultural system in relation to technological development.*
2. Dr. Richard **Stewart** (USA): *It Seemed Like a Good Idea at the Time: Cold War Technological Dead Ends.*

<u>14.00–14.30</u> Closing Address, by Professor Dr. Luc **de Vos** (Sofia 2 Hall).

<u>14:30–16:30</u> General Assembly (Sofia 2 Hall).

MONDAY, 27 AUGUST 2012

LUNDI, LE 27 AOÛT

Welcome by the President of the Bulgarian Commission of Military History, Professor Dr. Dimitar Minchev

Dear Minister Anguelov,
Dear President Kamphuis,
Dear Colleagues,
Dear friends from all over the world,
Ladies and Gentlemen,

The Bulgarian Commission of Military History warmly welcomes you at the 38th Congress of the International Commission of Military History. It is for the first time, that this Congress is to be held at Bulgarian soil. The Bulgarian nation deserves that. It is exactly one hundred years ago, in May 1912 that *G. S. Rakovski* National Defence Academy – our military "Alma Mater" – was found in Sofia. Two years later in 1914 the first official military history research institution was established in this country as well.

Our nation has a long history. It is on Bulgarian territory inside an ancient necropolis near the town of Varna, where the oldest golden ornaments in Europe of more than 7000 years were found. Since the establishment of the Bulgarian state in 681 – to nowadays, the name of our country – Bulgaria – has remained always the same, which was not the case with other European countries. The Slavic alphabet, invented in Ninth Century by the Patrons of Europe St. St. Cyril and Methodius, was accepted and developed first in Bulgaria, and later spread to Russia and other countries.

Soon after the restoration of the Bulgarian state in 1878, the Bulgarian army introduced the modern military technologies in the warfare. The Bulgarian army was one of the first to use the aviation in war during the Balkan wars in 1912–1913. A Bulgarian, Asen Yordanov, was among the most prominent aviation engineers in the USA, and contributed to the creation of a number of American airplanes, such as the bombers Boeing B-17 and Consolidated B-24, the fighters Lockheed P-38 and Curtiss Hawk 81, the ubiquitous Transport plane Douglas DC-3, and many others. Another American of Bulgarian origin, John Atanasov, is considered one of the recognized fathers of the computer at the eve of the new information era.

We are mostly obliged for the friendly attitude and support, that we enjoyed by the Bureau of the ICMH, and different national commissions. We are thankful to our Ministry of Defence for the support of this Congress. I avail myself of the opportunity to express our sincere gratitude to all members of the Organizational Committee and the Congress Bureau and the staff for their excellent work.

Dear colleagues, I wish you fruitful work and pleasant and useful stay in Bulgaria!

Professor Dr. Dimitar Minchev,
President of the Bulgarian Commission of Military History

Allocution de bienvenue du Professeur Dr. Dimitar Minchev, Président de la Commission Bulgare d'Histoire Militaire

Monsieur le Ministre Anguelov,
Monsieur le Président Kamphuis,
Chers Collègues,
Chers amis venus des quatre coins du monde,
Mesdames et Messieurs,

La Commission Bulgare d'Histoire Militaire vous souhaite chaleureusement la bienvenue au 38ème Congrès de la Commission Internationale d'Histoire Militaire. C'est pour la première fois que ce Congrès aura lieu sur le territoire bulgare. La nation bulgare le mérite bien. Exactement c'était il y a cent ans, au mois de Mai 1912 que l'Académie Nationale Militaire au nom de *G.S.Rakovski* – notre "Alma Mater" militaire – a été fondée à Sofia. Deux années plus tard, en 1914, la première institution officielle de recherches sur l'histoire militaire a été établie dans ce pays.

Notre nation a une histoire de longue date. C'est notamment sur le territoire bulgare, à l'intérieur d'une ancienne nécropole près de la ville de Varna qu'étaient trouvés les plus anciens ornements en or en Europe de plus de 7000 ans. Depuis la fondation de l'Etat bulgare en 681 jusqu'à nos jours le nom de notre pays – Bulgarie – est resté toujours le même, ce qui n'était pas le cas des autres pays européens. L'alphabet slave, inventé au IXème siècle par les Patrons de l'Europe St. St. Cyrille and Méthode était accepté et développé premièrement en Bulgarie et propagé plus tard à la Russie et à d'autres pays.

Bientôt après le rétablissement de l'Etat bulgare en 1878 l'Armée bulgare a introduit dans l'art militaire des technologies militaires modernes. L'Armée bulgare était une des premières à utiliser l'aviation en temps de guerre, notamment pendant les guerres des Balkans en 1912–1913. Un Bulgare, Asen Yordanoff, était parmi les ingénieurs les plus éminents de l'aviation aux Etats-Unis. Il avait contribué à la création d'un certain nombre d'avions américains tels que les bombardiers Boeing B-17 et Consolidated B-24, les combattants Lockheed P-38 and Curtiss Hawk 81, l'avion de transport omniprésent Douglas DC-3, et beaucoup d'autres. Un autre Américain d'origine bulgare, John Atanasoff, est considéré comme un des pères reconnus de l'ordinateur à la veille de la nouvelle ère de l'information.

Nous sommes très reconnaissants du soutien et de l'attitude amicale dont nous avons bénéficiés de la part du Bureau de la CIHM et des différentes commissions nationales. Nous remercions notre Ministère de la Défense pour le soutien qu'il a apporté à ce Congrès. Je saisis également l'occasion d'exprimer nos remerciements les plus sincères à tous les membres du Comité d'Organisation et du Bureau du Congrès et au personnel pour l'excellent travail qu'ils ont fait.

Je vous souhaite, chers collègues, un travail fructueux ainsi qu'un séjour agréable et utile en Bulgarie!

Professeur Dr. Dimitar Minchev,
Président de la Commission Bulgare d'Histoire Militaire

Keynote Address of the Minister of Defence of the Republic of Bulgaria Mr Anu Anguelov to the Participants in the 38th World Congress of Military History

Dear President of the International Commission of Military History,
Dear President of the Bulgarian Commission of Military History,
Dear participants in the 38th World congress of military history,

It is an exceptional pleasure for me to have the opportunity to participate in the opening of this international congress of military history dedicated to the topic "Technology and Warfare". It is a particular honor for Bulgaria to host this impressive forum for the first time in its history of 75 years. The contemporary world elite of military history is gathered here today and it is a particular pleasure for me in my capacity as patron of the Congress to welcome you all – nearly 250 delegates and guests from 36 countries in Europe, Asia, Middle East, North and South America.

Although Bulgaria is a small country, beautiful minds have always been born here.

Assen Yordanov is 16 years old when he participates in the Balkan Wars as a mechanic in the airplane department. He starts designing and later completes the first Bulgarian airplane Express. Still high school student, he introduces an important improvement which does not exist in the airplanes of this time, namely a mechanism protecting the airplane from falling. His invention is accepted and used all over the world, and later Assen Yordanov becomes a fighter pilot, and aircraft designer working for Boeing and Douglas, an inventor who gained recognition as one of the pioneers of aviation.

It is exactly 100 years ago – on 16 October 2012, when the baptism of fire of the Bulgarian military aviation was conducted by the flying officer Radul Milkov and the observer flying officer Prodan Tarakchiev. Their flight with "ALBATROS" over the fortress of Odrin in the course of which they reconnoiter and manage to drop two hand grenades deliberately onto the railway station of Karaagach is defined by some historians as the first combat flight not only in the history of the Bulgarian aviation but in the European aviation as well.

Another Bulgarian – the aviation diploma engineer Dr. Ivan Nochev makes a basic contribution to the invention of the jet engines of the lunar module "Eagle" of Apollo 11 mission which makes possible the revolutionary landing of a human being on the Moon.

This year, just some decades later, Bulgarian students were honored and earned awards at a prestigious international competition on cosmic colonies launched by NASA (The National Aeronautics and Space Administration, USA). Their project is about building a cosmic home in the space between the Earth and the Moon. This is a proof that the development of technology is an achievement not only of the scientific progress and historic necessity but also of human imagination and aspiration. The relation between technology and warfare is indestructible and powerful – the development of technology in historical perspective has changed the nature and the ways of engaging and conducting warfare. On the other hand, the new requirements of the armed forces are a high incentive for the development of technology. Today, the armies rely on super-modern technologies: high precision weapons, unmanned air vehicles, on improving the technical means used in reconnaissance, communications etc.

It is important today for the countries to pool their scientific, industrial and financial resources in order to achieve common goals, especially in the sphere of research and technology. This is the basic idea behind the Smart Defense and Pooling and Sharing Initiatives of the NATO and the European Union which Bulgaria supports and in which our country actively participates. I am convinced that the topic of the congress "Technology and Warfare" will offer you an opportunity not only to share your rich experience as researchers and ideas for future scientific projects, but also that it will be very useful for all of us.

I would like to thank the President of the International Commission of Military History Mr. Piet Kamphuis and its Members for choosing the city of Sofia and the Defense and Staff College "G. S. Rakovski" to host this forum, and I hope that the days you spend in our country will leave you with unforgettable impressions related not only to the work of the congress, but also to the beauty of Bulgaria. I wish all participants in the 38th World Congress of Military History fruitful work and professional success in the future.

Discours d’ouverture de S.e. m. Anu Anguelov ministre de la defense de la Republique de Bulgarie

Monsieur le Président de la Commission Internationale d’Histoire Militaire,
Monsieur le Président de la Commission Bulgare d’Histoire Militaire,
Chers participants au 38e Congrès Mondial d’Histoire Militaire,

C’est un très grand plaisir pour moi d’avoir la possibilité de participer à l’ouverture de ce Congrès International d’Histoire Militaire consacré au thème «Technologie et Art Militaire». C’est un honneur particulier pour la Bulgarie d’accueillir ce forum impressionnant pour la première fois de son histoire de 75 ans. L’élite mondiale contemporaine d’histoire militaire est réunie ici aujourd’hui et c’est un plaisir particulier pour moi en ma qualité de patron du Congrès de vous souhaiter la bienvenue à vous tous – près de 250 délégués et invités venus de 36 pays d’Europe, d’Asie, du Moyen Orient et d’Amérique du Nord et du Sud.

Bien que la Bulgarie soit un petit pays, de beaux esprits ont toujours été nés ici.

Assen Yordanov a 16 ans quand il participe à la Guerre des Balkans en tant que mécanicien dans le département de l’avion. Il commence à faire des dessins et plus tard il complète le premier avion bulgare EXPRESS. Encore un élève du secondaire, il introduit une amélioration importante qui n’existe pas dans les avions de cette époque, à savoir un mécanisme qui protège l’avion de ne pas tomber. Son invention est acceptée et utilisée dans le monde entier et plus tard Assen Yordanov devient pilot de chasse et concepteur d’avions travaillant pour Boeing and Douglas, un inventeur qui a été reconnu comme l’un des pionniers de l’aviation.

Il y a exactement 100 ans – le 16 Octobre 1912 lorsque le baptême du feu de l’aviation militaire bulgare a été réalisé par l’officier de vol Radul Milkov et l’officier observateur du vol Prodan Tarakchiev. Leur vol avec ALBATROS au- dessus de la forteresse d’Edirne au cours duquel ils ont fait de la reconnaissance et ont réussi à laisser tomber deux grenades à main délibérément sur la gare ferroviaire de Karaagach est défini par certains historiens comme le premier vol de combat aérien non seulement dans l’histoire de l’aviation bulgare, mais aussi dans l’aviation européenne.

Un autre Bulgare, l’ingénieur diplômé de l’aviation Dr. Ivan Nochev apporte une contribution fondamentale à l’invention du moteur à réaction du module lunaire «EAGLE» de la mission APOLLO II ce qui rend possible l’atterrissage révolutionnaire d’un être humain sur la Lune.

Cette année, seulement quelques décennies plus tard, des étudiants bulgares ont été honorés et ont remporté les prix lors d’une compétition internationale prestigieuse sur les colonies cosmiques lancée par NASA (The National Aeronautics and Space Administration, USA). Leur projet concerne la construction d'une maison cosmique dans l'espace entre la Terre et la Lune. C'est la preuve que le développement de la technologie est une réalisation non seulement du progrès scientifique et de la nécessité historique mais aussi de l'imagination et de l'aspiration humaines.

La relation entre la technologie et l'art militaire est indestructible et puissante – le développement de la technologie dans une perspective historique a changé la nature et les moyens d'engager et de conduire la guerre. D'autre part, les nouvelles exigences des forces armées sont une incitative importante pour le développement de la technologie. De nos jours, les armées s'appuient sur les technologies super modernes telles les armes de haute précision, les drones et autres et sur l'amélioration des moyens techniques, utilisés dans la reconnaissance, les communications, etc.

Il est important aujourd'hui pour les pays de mettre en commun leurs ressources scientifiques, industrielles et financières en vue d'atteindre des objectifs communs dans le domaine de la recherche et de la technologie. C'est l'idée principale derrière la Défense Intelligente et la Mise en commun et le Partage des Initiatives de l'OTAN et de l'Union Européenne que la Bulgarie soutient et dans laquelle elle participe activement.

Je suis convaincu que le thème du Congrès «Technologie et Art Militaire» vous offrira une occasion non seulement de partager avec nous votre riche expérience en tant que chercheurs et de nous faire part de vos idées pour de futurs projets scientifiques, mais aussi cela sera très utile pour nous tous.

Je voudrais remercier le Président de la Commission Internationale d'Histoire Militaire M. Piet Kamphuis et ses Membres d'avoir choisi la ville de Sofia et l'Académie de la Défense Nationale «G. S. Rakovski» pour accueillir ce forum, et j'espère que les jours que vous passerez dans notre pays vous laisseront des impressions inoubliables liées non seulement aux travaux du congrès mais aussi à la beauté de la Bulgarie.

Je souhaite à tous les participants au 38e Congrès Mondial d'Histoire Militaire du travail fructueux et de la réussite professionnelle dans le future.

Speech by the President of the International Commission of Military History, Piet Kamphuis, on the occasion of the opening of the 38th International Congress

Your Excellency, generals, ladies and gentlemen,

'Dreams are just delusions' is the title of a well-known pop song in my country. The text suggests that certain desires and ideals can never be realised in practice. The song has a catchy sing-along melody, but I am not so sure if the message really rings true. History shows many examples of how ideals that were once taboo in certain political or social orders eventually became reality. The torch of freedom and the right to self-determination were ultimately stronger than the established order, as is convincingly shown by the fascinating history of the Bulgarian nation.

This is the first time that our worldwide organisation meets in this country. This congress offers an unprecedented opportunity to intensify existing contacts with Bulgarian military historians, to develop new ones and above all for us to learn more of the history and culture of Bulgaria. I have no doubt that the congress participants, from forty countries and five continents, will seize this opportunity to acquaint themselves with Bulgarian military history with both hands.

'Dreams are just delusions?' That is certainly not the case for Professor Dimitar Minchev, for many years the indefatigable apostle of Bulgarian military history in our international organisation. Years ago he shared his dream with me: to organise an ICMH Congress in Sofia. He has put his heart and soul into making this dream come true. This was no small task in a time of economic downturn, but he succeeded! I congratulate him with this fantastic achievement!

Your Excellency,

Professor Dimitar Minchev and the other members of the Bulgarian Commission for Military History have found that there are many practical obstacles between dream and reality. For a great many years, the armed forces have formed an important home base for the followers of Mars and Clio, with the Rakovski National Defence Academy as a familiar anchor point. In order to arrange the congress, they sought support from the military organisation – and obtained it! Your decision, Minister, opened up the way to Sofia. Your presence today and the words you have just spoken emphasise not only your personal commitment to our discipline, but also the fact that you do not shun international responsibilities. We owe you a great debt of gratitude.

Ladies and gentlemen,

Our train has returned from swinging Rio de Janeiro back to the Old World. I see many familiar faces in the room. To them, the ICMH veterans, I say: "Good to see you again". To the newcomers I say: "I'm glad you have come and I look forward to making your acquaintance". A special word of welcome for our colleagues from Serbia and from the former Yugoslav Republic of Macedonia, countries which join us for the first time. Welcome! To our Russian colleagues, I say: "It is great to have you among us once again!"

Dear friends. Our former president Kees Schulten recently paid a visit to our honorary president André Corvisier, who now lives in a retirement home in Normandy.

He regrets that he is unable to attend the congress, as he is now ninety-three years of age. Professor Corvisier asked Kees to pass on his good wishes to the members of our Commission, and it is with great pleasure that I now avail myself of that task.

Dear friends, our honorary president André Corvisier wishes you a successful congress! And in turn, I would like to ask the President of the French Commission, Jean-Nicolas Corvisier, to convey to his father the best wishes of all the participants here and to tell him and his wife Micheline that they are always in our thoughts.

Your Excellency, ladies and gentlemen,

Some weeks ago, an icon in the field of military historical work passed away. With his groundbreaking book "The Face of Battle", John Keegan opened our eyes to the ordinary soldier on the battlefield. With his academic publications he not only brought many people into contact with military history, but formulated novel subjects for research.

Some months earlier, we had to bid farewell to Hervé Coutau Bégarie, an eminent researcher and honorary president of the French Commission for Military History. He also put his great talents to the service of our ICMH. With his erudition, his sparkling wit and his ability to build bridges – also across national boundaries – he made a lasting impression as a member of the Board.

John Keegan and Hervé Coutau Bégarie have fought their last battle. I would ask you to stand for a moment and remember them and all other colleagues we have lost.

(Thank you)

Professor Jordan Baev has chosen a challenging topic as the theme for this week. "Technology and Warfare". According to the Dean of the USCMH, Allan Millett, this is 'an essential theme for everyone interested in the history of warfare'. And who am I to argue with his verdict? After all, technological developments ‘affect warfare like waves spreading from a stone thrown into a pond’. The theme offers plenty of ammunition for the historical debate. Historical insights can in turn help to formulate answers to topical questions on the role and possible limitations to military technology, now and in the future. Examples of future applications might include the deployment of drones, cyber warfare or robotised military operations. Professor Reiner Pommerin will soon give the kick-off for the academic discourse and – knowing him – will be sure to do this in a stimulating manner.

The theme of *Technology and Warfare* can be examined from a variety of perspectives. The comparative perspective has always been a strong point of our organisation. That is evident, this year as well, from our richly varied programme. In addition to a great many lectures, we have dedicated a panel to new and pioneering books. Led by Professor Rudolf Jaun, young colleagues will be given the opportunity of presenting the results of their PhD research. We will be able to keep abreast of the progress of the International Bibliography of Military History. We will exchange experiences and best practices in the field of military archives. And we will look at how Technology and Warfare are presented in museums. I consider myself fortunate that Piet de Gryse, the chairman of ICOMAM, the international organisation for military museums, responded enthusiastically to my suggestion that he organise this panel.

Your Excellency, generals, ladies and gentlemen,

A dream has come true. It is wonderful to be here with you. I wish you all a successful congress.

Discours du président de la Commission internationale d'histoire militaire, Monsieur P.H. Kamphuis, lors de l'ouverture du 38ème Congrès international à Sofia

Excellence, Messieurs les Généraux, Mesdames et Messieurs,

« Songes, mensonges » est le titre d'une chanson pop bien connue dans mon pays. Ce texte suggère que certains désirs, ainsi que certains idéaux ne peuvent jamais être réalisés. La musique est entraînante et nous invite à chanter, mais la question est de savoir si ce message est bien vrai. En effet, l'histoire de l'humanité connaît un grand nombre d'exemples d'idéaux, qui, tout en étant considérés comme de véritables tabous dans un certain contexte politique et sociétal, ont bel et bien pris forme dans la réalité. La flamme de la liberté et du droit à l'autodétermination s'est souvent révélée plus forte que l'ordre établi, comme le démontre clairement l'histoire fascinante de la nation bulgare.

C'est la première fois que les membres de notre organisation se retrouvent ici. Ce congrès offre une possibilité unique d'approfondir les contacts déjà existants avec les historiens militaires bulgares, ainsi que d'en développer de nouveaux, mais surtout de prendre connaissance de l'histoire et du patrimoine culturel de ce pays. Je suis convaincu que les participants au congrès, provenant de quarante pays et de cinq continents, saisissent à pleines mains cette opportunité de se familiariser avec l'histoire militaire de la Bulgarie.

« Songes, mensonges ». Rien n'est moins vrai pour le professeur Dimitar Minchev, l'apôtre infatigable de l'histoire militaire bulgare au sein de notre organisation internationale depuis longtemps. Il y a bien des années il a partagé son rêve avec moi : l'organisation d'un congrès de la CIHM à Sofia. Et il s'est investi pour que son rêve se matérialise, ce qui n'est pas une sinécure à une époque où les moteurs économiques tournent au ralenti, mais il a réussi ! Je tiens à le féliciter de cet accomplissement!

Excellence,

Le professeur Dimitar Minchev et les autres membres de la Commission de l'histoire militaire bulgare savent que la réalisation d'un rêve constitue un véritable parcours du combattant. Traditionnellement, les forces armées et l'Académie de défense nationale Rakovski constituent pour les serviteurs de Mars et de Clio un point d'ancrage. Pour ce congrès, ils ont cherché et obtenu le soutien de l'organisation militaire. Votre décision, Monsieur le Ministre, nous a ouvert la route de Sofia. Votre présence aujourd'hui et vos paroles, ne soulignent pas seulement votre engagement personnel pour notre domaine d'études, mais prouvent également que vous ne vous soustrayez pas à votre responsabilité internationale. Par conséquent, nous vous sommes extrêmement reconnaissants.

Mesdames, Messieurs,

Notre caravane a quitté Rio, ville musicale, pour retourner vers notre vieux continent. Et je retrouve un grand nombre de visages connus dans la salle. Je m'adresse à vous, vétérans de la CIHM, pour vous dire que je suis ravi de vous revoir! Et aux nouveaux venus, je dis : C'est formidable que vous soyez là et je me réjouis de faire plus ample connaissance dans les jours qui viennent. Un mot spécial de bienvenue aux collègues de Serbie et de l'ex-République Yougoslave de Macédoine, pays représentés pour la première fois parmi nous. Bienvenue à tous. Je m'adresse aussi au collègue russe pour vous dire à quel point je suis heureux de vous voir parmi nous !

Chers Amis. Récemment notre ancien président Kees Schulten a rendu visite à notre président d'honneur André Corvisier qui habite maintenant dans une maison de retraite en Normandie.

Il regrette de ne plus pouvoir assister aux congrès, parce qu'íl a maintenant quatre-vingt-treize ans. Le professeur Corvisier a demandé de transmettre son salut aux membres de notre commission. C'est avec un grand plaisir que je me charge de cette tache.

Chers Amis, notre président d'honneur André Corvisier vous souhaite un congrès réussi! De ma part, je voudrais demander au président de la Commission française Jean-Nicolas Corvisier de transmettre à son père les saluts de tous les participants et de dire à lui et à son épouse Micheline qu'íls sont toujours présents dans nos coeurs.

Excellence, Mesdames et Messieurs,

L'histoire militaire a perdu, il y a quelques semaines, une de ses icônes. Grâce à son œuvre imposante *The Face of Battle (Anatomie de la bataille)*, John Keegan nous a fait découvrir le champ de bataille vu par l'homme de troupe. Grâce à ses publications scientifiques, il a su inspirer de nombreuses personnes à s'engager sur la voie de l'histoire militaire, mais a également été capable de formuler de nouvelles questions de recherche.

Quelques mois plus tôt, nous avons appris la disparition de Hervé Couteau Begarie, chercheur éminent et président d'honneur de la Commission française d'histoire militaire, qui a mis son immense talent au service de la Commission internationale d'histoire militaire. En tant que membre du bureau, il a fait une impression durable, grâce à son érudition, son esprit perpétuellement en éveil et sa capacité à construire des passerelles, même au-delà des frontières nationales.

John Keegan et Herve Couteau Begarie ont livré leur dernière bataille. Je vous prie de vous lever afin de les commémorer un instant en silence, ainsi que nos autres collègues décédés. (Je vous remercie.)

Le professeur Jordan Baev a choisi un fil rouge pertinent pour cette semaine : *Technologie et guerre.* Selon le doyen de l'USCMH, Allan Millett, il s'agit d'un thème essentiel pour ceux qui s'intéressent à l'histoire de la guerre. Et qui suis-je pour contester son jugement? En effet, le développement technologique a un impact sur la conduite de la guerre, comme l'a le caillou jeté dans un étang, propageant des vagues à l'infini. Ce thème apporte beaucoup de munitions pour alimenter le débat historique. Des vues historiques peuvent, à leur tour, aider à formuler une réponse aux questions actuelles sur le rôle et l'éventuelle limitation de la technologie militaire, à présent et à l'avenir. Je pense, entre autres, à l'utilisation de drones, à la guerre informatique ou à la robotisation de la guerre. Le professeur Reiner Pommerin présentera le premier discours scientifique tout à l'heure et, le connaissant, je suis sûr que son exposé sera stimulant.

Le thème *Technologie et guerre* peut être abordé à partir d'angles différents. Comparer des perspectives différentes est depuis toujours la force de notre organisation. Le programme, avec son offre riche et diversifiée le prouve encore une fois. Outre un grand nombre d'exposés, il y aura un panel consacré aux livres neufs et innovateurs. Sous la direction du professeur Rudolf Jaun, de jeunes collègues auront l'occasion de présenter les résultats de leurs études de thèse. Les derniers développements concernant la Bibliographie internationale d'histoire militaire seront communiqués. Nous allons également échanger des expériences et des bonnes pratiques dans le domaine des archives militaires. Et nous allons nous intéresser à la représentation de la technologie et de la guerre dans le domaine muséal. Je me félicite que Piet de Gryse, président de l'ICOMAM, l'organisation internationale pour les musées militaires, ait réagi rapidement et positivement à ma proposition d'organiser ce panel.

Excellence, Monsieur le Général, Mesdames et Messieurs,

Un rêve a été réalisé. Il est formidable de me trouver ici parmi vous. Je vous souhaite un excellent congrès.

Keynote speech:
Colonel (Res) Prof. Dr. Reiner Pommerin (Germany)
"FROM STONE AXE to NUKES – Technology and Warfare"

> *"Ut quod tibi prodest adversarium noceat, quod illum adiuvat tibi semper officiat".*[1]
> (All that is advantageous to the enemy is disadvantageous to you, and all that is useful to you, damages the enemy).

Introduction

This maxim has been written down by Flavius Vegetius Renatus 390 ante Christum natum in book III of his work De Re Militari under the headline regulae bellorum generales.[2] It does serve as a perfect key to this year's conference theme "Technology and Warfare". The wording only has slightly to be changed to "All technology that is advantageous to the enemy is disadvantageous to you and all technology that is useful to you, damages the enemy". Vegetius language of course was Latin and he therefore could not have used the term technology. However, in his fourth book Vegetius described: "universas machinas, quibus vel opugnantur civitates vel defenduntur". The machines or technology Vegetius referred to were those used in his time to attack and defend fortified places.

In 1405 Konrad Kyeser was able to offer in his book Bellifortis quite a number of more machines, as well as old and new technology.[3] Weapons like trebuchets, cannons and crossbows, battering rams, movable portable bridges, rockets, chariots, ships, mills, scaling ladders; incendiary devices were in this book not only described in length but even illustrated. His text was written in Latin and therefore also Kyeser like Vegetius did not use the term technology.

Technology (in German Technologie) refers to the knowledge of making and usage of tools, machines, crafts, systems or methods. It does stem from the Greek word technologia. Téchné meaning art, skill, craft, and logia does mean "study of". However, these days technology no longer is only the study of Téchné. Technology actually does mean new technique.

As obvious as the impact of technical and technological means is on warfare as astonishing is that there are not very many books describing the long history of technology and warfare. I just want to mention a few like Kenneth Macksey, Technology in War. The Impact of Science on Weapon Development and Modern

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1 Flavi Vegeti Renati Virir Ilustris Comitis, Epitoma Rei Militaris Libri III, in: thelatinlibrary.com/vegetius3.html, 42.

2 The Latin text of Vegetius' Epitoma Rei Militaris in: mcbishop@zetnet.co.uk, book I, 1.

3 Götz Quarg, *Conrad Kyeser aus Eichstätt: Bellifortis* (2 Vols. Düsseldorf 1967).

Battle which was published in 1986,[4] Martin van Creveld, Technology and War: From 2000 BC to the Present[5] which was published in 1991 and last but not least Max Boot who published in 2006 "Technology, Warfare and the Course of History, 1500 to Today".[6]

Of special interest for military historians has been the impact of technology on military doctrines and strategy. Irving Brinton Holley published in this context an interesting paper: "Technology and Military Doctrine: Essays on a challenging relationship".[7] And always there were authors, sometimes even historians, trying to identify the impact of new technologies on future warfare. Michael E. O'Hanlon for example published in 2000 a book titled "Technological Change and the Future of Warfare".[8]

Other military historians concentrated in their works on special technologies like chemical weapons, ballistic missiles or nukes and studied the influence of those weapons on warfare.

Some looked at the subject out of a national point of view like for example our dear friends and colleagues Barton C. Hacker and Margaret Vining, in 2006 with their book American Military Technology.[9]

But the majority of Military Historians studied the development and use of weapons, constructions and fortifications, communications, transport means or orientation devices only in the context of their works when describing certain battles operations or wars.

It definitely is true, as van Creveld stated: "that war is completely permeated by technology and governed by it. The causes that lead to wars, and the goals for which they are fought; the blows with which campaigns open, and the victories with which they (sometimes) end; the relationship between the armed forces and the societies that they serve; planning, preparation, execution, and evaluation; operations and intelligence and organization and supply; objectives and methods and capabilities and missions; command and leadership and strategy and tactics; even the very conceptual frameworks employed by our brains in order to think about war and its conduct – not one of these is immune to the impact that technology has had and does have and always will have".[10]

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4 Kenneth Macksey, Technology *in War: The Impact of Science on Weapon Development and Modern Battle* (London 1986).

5 Martin L. van Creveld, *Technology and War: From 2000 B.C. to the Present* (Revised and extended Edition, New York 1991).

6 Max Boot, War *Made New: Technology, Warfare and the Course of History, 1500 to Today* (New York 2006).

7 Irving B. Holley, *Technology and Military Doctrine: Essays on a challenging relationship* (Maxwell 2004).

8 Michael E. O'Hanlon, *Technological Change and the Future of Warfare* (Washington 2000).

9 Baron C. Hacker/Margaret Vining, *American Military Technology: The Life Story of a Technology* (Westport 2006).

10 Van Creveld, *Technology and War*, 1.

"War is impacted by technology in all its forms".[11] This fact is the reason why our dear colleague Dmitri Minchev and the Bulgarian Commission for Military History have chosen "Technology and Warfare" as their theme for this year's conference of the International Commission of Military History at Sofia. "Technology and Warfare" does allow numerous interesting and challenging approaches. Each participating national commission could therefore have offered infinite papers on the subject out of infinite points of view.

But the time for a Keynote speech is finite and of course I am not at all intending a par force ride through 2000 years or more of military history. I just want to touch very briefly three topics: first civilian technology which quickly was turned into military technology, second a research result which directly turned into military technology and finally the impact of technology on warfare after 1990.

Civilian technology used for warfare

Barton Hacker wrote: "Although war has often served as a forcing bed for military-technological innovation, war cannot be the centerpiece of a history of military technology. The sporadic impact of a specific war or wars or even of war in general – the fostering of technological change by wartime demands, for instance – pales in comparison with the powerful and persistent, if not always obvious, interaction of military with other social institutions over extended periods of time. And influence always flowed both ways: society's impact on technology is not less important than technology's on society".[12]

Some technology definitely was originally not developed and designed for warfare. In what van Creveld calls the "Age of Tools, from Earliest Times to 1500 A.D.", the stone ax may first have been used to split heavy bones and to cut wood needed for fires. But very soon the ax was also used to defend or attack other clans in the neighborhood and became a deadly weapon.

Chinese alchemists in the 9th century were looking for a mixture which could serve as an elixir for immortality and discovered the basis for gunpowder. The powder they mixed did in no way help to became immortal. Instead soon packed behind a bullet, it fired a muzzle with high speed making men in warfare more mortal than ever before in history.

When French and Spanish hunters in the early 17th century went out hunting dangerous game like wild boars, they attached knives to their muskets. These knives had been manufactured in Bayonne, a town in southern France close to the border to Spain, and famous for the high quality of its cutlery production. In 1671, all French infantrymen added the long knives from Bayonne to their muskets and the bayonet soon became standard for infantry in all European states.

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[11] Ibid.

[12] Hacker/Vining, *American Military Technology*, IX.

In 1846 the Italian Medical doctor Ascanio Sobrero found the highly explosive Nitroglycerin. In his experiments he injured himself badly.

In the 1850ties a mixture using Nitroglycerin in a very limited dose together with some oil under the name of Glonoine served as a medicine against angina pectoris. Alfred Nobel used this medicine exactly for this purpose. But he also found a way to stabilize and transport Nitroglycerin by using diatomaceous earth. Very soon his Dynamite proved to be a useful high explosive material for construction, and mining. After Nobel's invention of the percussion cap Dynamite could also be used by the military. Dynamite could now end angina pectoris and any other illnesses forever! It did not only kill in 1881 Czar Alexander II but at the end of the 19th century terrorist in Western Europe had used the explosive in more than 1.000 attacks, most of them in France.[13] The so called Military Dynamite avoided the dangerous Nitroglycerin using more stable chemicals.

To stop cattle in the American west to run away, barbed wire was developed. During World War I thousands of soldiers lost their lives when attacking the ditches of the enemy which efficiently were protected by barbed wire.

The last example to show how a result of scientific research usable for civilian purpose was soon to be adopted by the military was the detection of electromagnetic waves. Heinrich Hertz generated and detected in his experiments electromagnetic radio waves. It turned out that these waves transmitted through different materials but were reflected by others. Christian Hülsmeyer showed in 1904 that the echoes of these electromagnetic waves could be used to detect ships. Even if the distance to the ship was not possible to predict, the waves could help to avoid collisions in fog much earlier than using the foghorn. The Hülsmeyer device received the German Imperial Patent Nr. 165546, but the market was not really interested in his invention. Only in 1940 the U.S. Navy was able to finish their classified work in Radio Detection and Ranging. In this case the use of a civilian technology for military purposes obviously took quite some time.

Research results and military purpose

Not always have research results as fast been identified as being useful for the development of weapons as in the case of the nuclear chain reaction. The news that Otto Hahn had been bombarding uranium with neutrons and that the uranium broke up in two halves, giving elements of about half the atomic weight of Uranium, was unexpected and exiting for physicists all over the world. Hahn published the outcome of his experiments on January 6, 1939 in the German Scientific Magazine "Die Naturwissenschaften (The Natural Sciences)".

Leo Szilard, a physicist originally from Austria, had worked in the field of nuclear physics together with Enrico Fermi at London. Just having arrived in the

[13] Otto Krätz, *Die andere Seite der Medaille, in: Die Zeit*, Wissenschaft online, Zeitläufte, Ausgabe 42/2002, www.wissenschaft–online.de/artikel/605873.

United States, Szilard immediately recognized the military potential of Hahn's experiment. In a letter to Lewis L. Strauss, an entrepreneur who originally had graduated in physics and had established a fund to support the research of physicists in the field of radiation treatment for cancer patients, he wrote on January 25, 1939: "Apart from the purely scientific interest there may be another aspect of this discovery, which so far does not seem to have caught the attention of those to whom I spoke. […] I see however, in connection with this new discovery potential possibilities in another direction. This might lead to a large-scale production of energy and radioactive elements, unfortunately also perhaps to atomic bombs".[14]

Szilard and Fermi therefore successfully convinced the famous Nobel Prize Winner Albert Einstein to write a letter to President Franklin Delano Roosevelt explaining: "*This new phenomenon would also lead to the construction of bombs, and it is conceivable – though much less certain – those extremely powerful bombs of a new type may thus be constructed. A. single bomb of this type, carried by boat and exploded in a port, might well destroy the whole port together with some of the surrounding territory. However, such bombs might very well prove to be too heavy for transportation by air*".[15]

Like in many other cases the development of a functioning weapon took some time. But the fear that Hitler's Germany might use the chain reaction for military purpose pushed the appointment of the "Manhattan Engineer District (MED)". The "Manhattan Project" started under the command of US Army General Leslie R. Groves in August 1942 Los Alamos, New Mexico and the first atomic device was successfully tested there on the trinity test side on July 16, 1945.

But quite unique in the long history of the development of military technology: before the test took place some of the physicists involved in the construction of the bomb became scruples. Concerned about how nuclear bombs might be used in the current war they discussed the moral responsibilities involved in using nuclear weapons. A petition, the so called »Franck Report« was written for the Interim Committee established by President Roosevelt to advise him on the use of the atomic bomb. The report, signed by seven prominent physicists, one of them by the way Szilard, stated: "*Among all arguments calling for an efficient international organization for peace, the existence of nuclear weapons is the most compelling one. […] From this point of view, a demonstration of the new weapon might best be made, before the eyes of representatives from all the United Nations on the desert or a barren island. The best possible atmosphere for the achievement of an international agreement could be achieved if America could say to the world, »You see what sort of a weapon we had but did not use. We are ready to renounce*

[14] Letter Leo Szilard to Lewis L. Strauss, January 25, 1939, in: Nuclear Files.Org: A Project of the Nuclear Age Peace Foundation: Correspondence Leo Szilard.

[15] Letter Albert Einstein to President Franklin Delano Roosevelt, August 2, 1939, in: hypertextbook.com/eworld/Einstein.shtml.

its use in the future if other nations join us in this renunciation and agree to the establishment of efficient control".[16]

But other physicists involved, like Fermi and Julius Robert Oppenheimer came to quite a different conclusion. In a paper with the headline *Recommendation on the Immediate Use of Nuclear Weapons* they declared: *"The opinions of our scientific colleagues on the initial use of these weapons are not unanimous: they range from the proposal of a purely technical demonstration to that of the military application best designed to induce surrender [...]Others emphasize the opportunity of saving American lives by immediate military use, and believe that such use will improve the international prospects, in that they are more concerned with the prevention of war than with the elimination of this specific weapon. We find ourselves closer to these latter views; we can propose no technical demonstration likely to bring an end to the war, we see no acceptable alternative to direct military use"*.[17]

This point of view also marked the position of the Interim Committee and President Harry S. Truman and resulted in the construction of the Atomic Bombs "Little Boy" and "Fat Man" and the bombing and terrible destruction of Hiroshima and Nagasaki.

The use of the nuclear chain reaction for warfare is comparable to Radar, GPS or internet, all technologies first developed for military purpose and only later used for civilian purpose. Quite unique for a weapon the atomic bomb became the first weapon in military history connected with the hope of creating and stabilizing eternal peace. But that hope, as we all know, only lasted for a short time.

Technology and Warfare after 1990

After the end of the Cold War the chance of one nation fighting another one seems to be small. As General Sir Rupert Murdoch has stated in his book *The Utility of Force*, the form of war has changed from industrial war to war amongst the people".[18] In global perspective the world is confronted with sometimes well organized and executed acts of brutal terrorism, with insurgency and counterinsurgency, with civil wars.

In wars like the one against Iraq new technology has been used and the effects of the so called "Revolution in Military Affairs" became obvious. Surveillance, communication and intelligence can be done by satellites and unmanned aircraft. The GPS is not only offering drivers an easy navigation during holidays in foreign countries. The laser guided bomb proved to be able to hit precisely buildings at

[16] The Franck Report" A report to the Secretary of War, June 1945, in: www.fas.org/spg/eprint/franck.html

[17] Recommendations on the Immediate Use of Nuclear Weapons, June 16, 1945, in: www.gwu.edu/~narchiv/NSAEBB/NSAEBB162/19pdf.

[18] Sir Rupert Smith, *The Utility of Force: The Art of War in a Modern World* (London 2005) 241.

Baghdad, but missed Saddam who finally was found in a ditch close to a road. Cruise missiles fired from ships were hitting their distant targets precisely, but could also stay in the air for three hours and wait for new in-flight retargeting instructions.

In Afghanistan it became normal duty to send collected data in real time to bombers in flight which made it possible for them to attack moving or hidden targets. Surveillance crafts like the second generation unmanned Predator B is operated out of a far distance. The operator of this effective weapon himself has no longer, like the pilots of former generations, to cross the dangerous battlefield. Being based in his country he even can return home after the mission is completed, and his shift has ended, and plays with his children and kisses his wife. The decision to purchase surveillance crafts for the German Armed Forces has by the way caused a debate on moral or ethical responsibility in the use of this weapon.

But drones are not the end of the technical development, as the new Long Endurance Multi-Intelligence Vehicle (LEMV) is just proving. And who knows, maybe really in the near future there will be only robots on the battlefields.

"The trend is clear: metal-bashing in terms of protected vehicles or naval vessels is no longer the prerogative […] new technologies will dominate the future (virtual?) Battlefield and include space technology, the software to dominate cyberspace, laser weapons, autonomous unmanned vehicles (land, air, on water), and the development of reliable and ample non-fossil fuel for military use".[19]

To sum up: "It was the superiority of arms in sufficient quantities and the invention of revolutionary instruments of war – the chariot, the crossbow, the needle gun, the computer – which made the difference between victory and defeat".[20] "It should not be forgotten, however, that there are exceptions to the general rule of the supremacy of industrial might in warfare […] An AK-47 assault rifle and an RPG-7 rocket propelled grenade launcher in determined hands have often put a stop to over-confidence in military high-tech![21]

The same is true for IEDs, "the home-made bombs that changed modern war." "For less than $ 30 in raw materials each, roadside bombs and other IEDs can wreak disproportionable damage and disruption. They can be strategic, not just tactical, weapons, by sowing fear, lowering troops morale, limiting freedom of movement and undermining public support for combat operations".[22]

"Though advancing military technology has caused the conduct of war to change and change again, it does not seem to have affected the causes of armed

[19] Heinz Schulte, *Industry and War, in: The Oxford Handbook of War. Ed. by Julian Lindley-French and Yves Boyer*, The Oxford Handbook of War (Oxford 2012) 529.

[20] Ibid, 517.

[21] Ibid, 518.

[22] IISS Strategic Comments – IEDs: the home-made bombs that changed the modern war, August 10, 2012, 1.

conflict."[23] One therefore should bring back to memory these words of Albert Einstein: "Peace can never be secured by threats, but only by an honest attempt to create mutual trust".[24]

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[23] Van Creveld, *Technology and War*, 297.

[24] Albert Einstein, *Waging Peace*, in, www.GSloan@liberator.net, 1.

Professeur Dr. Jean-Nicolas Corvisier (France)

DE L'ARME A LA TACTIQUE ET A LA STRATEGIE : UN CYCLE PERPETUEL ?

Les armes de l'Antiquité et du Haut Moyen Âge sont connues de tous et je n'ai certes pas la prétention d'apporter des révélations à leur sujet. Je souhaiterais plus simplement, à partir d'une brève analyse de leurs caractéristiques et de leurs modifications, engager une réflexion plus générale, celle que permet la longue durée, sur la perpétuelle interaction entre arme et technique de fabrication et intégrer à cette réflexion les nécessités tactiques et leur évolution.

Dans cette réflexion, on n'oubliera bien entendu pas que l'usage de l'arme est fonction de 3 impératifs : a) les possibilités techniques liées au matériau : sa nature (bois, bronze, fer), son usinage (trempage, type d'alliage), sa déformabilité ; b) l'utilisation qu'on en attend : types de coup (estoc, taille), ou types de parades ; c) possibilités physiques de son porteur de l'utiliser à son emploi prévu, ce qui est normalement rendu possible par l'équilibrage de l'arme. Ces impératifs sont de tous temps. Reste à savoir s'ils ont la même pertinence dans un monde où l'armement est individuel et dont par conséquent les qualités dépendent des possibilités financières de son utilisateur qui à la fois les possède et les paye, que dans un monde où l'armement est standardisé et fourni par l'Etat. La réponse n'est pas uniquement du domaine financier ou sociologique ; elle est aussi militaire et tactique : jusqu'où peut-on envisager qu'une unité munie d'armes nécessairement un peu disparates puisse être tactiquement efficace ? Le corollaire en est : jusqu'où la tactique peut-elle en être contraignante ? Ainsi donc, sans l'imposer, cette diversité de détail dans l'arme ne favorise-t-elle pas l'utilisation de l'arme à contre-emploi, et donc n'est-elle pas, par là même, génératrice d'une nouvelle tactique qui, inévitablement, finira par rejaillir sur l'arme elle-même et sur son usinage ? Ces interrogations vont loin ! Essayons de nous les poser ensemble simplement dans le cas du bouclier, de la lance et de l'épée – ces trois postes n'étant évidemment pas choisis au hasard ni placés dans cet ordre au hasard[1].

I : Le bouclier

A priori, le rôle défensif d'un bouclier est triple : l'ambon sert à détourner les coups fondés sur le jet violent d'un projectile (javelot, flèche) et à dévier les coups

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[1] Sur les armes grecques, renvoyons simplement à la synthèse d'A. Snodgrass, *Arms and Armour of the Greeks*², John Hopkins Univ. Pr., 1998 et aux références contenues dans notre bulletin bibliographique « 1985–2005 : vingt ans de travaux sur la guerre antique », *Revue des Études Militaires Antiques* 2, 2005, p. 31–55 et 3, 2006, p. 29–74. Sur les armes romaines, voir de même M. Feugère, *Les armes des Romains*, Paris, Errance, 1993.

d'une arme de poing ; la surface sert à protéger le corps ; la forme enfin est fonction de son utilisation tactique.

Les formes de bouclier ont varié durant l'époque mycénienne géométrique. Les représentations montrent des boucliers allongés et font une large place au « bouclier en forme de 8 ». La difficulté est que les textes font défaut pour comprendre leur usage et que les seuls vases ne permettent pas de savoir s'ils étaient utilisés pour une simple protection individuelle ou si cette protection s'étendait aux voisins, dans le cadre d'une formation serrée. La seule certitude qu'on puisse avoir est qu'ils étaient en bronze, en tout ou en partie, et que leur forme en faisait des protections destinées à servir individuellement et que le rétrécissement médian servait à réduire le poids.

Comparativement, le bouclier archaïque marque une rupture. D'abord, par la forme, ronde. Ensuite par le matériau : un ambon solide de bronze, mais ailleurs un cadre de bois plus ou moins recouvert de peau ou de lamelles de bonze, ce qui réduit le poids mais évidemment en proportion le pouvoir protecteur contre le jet, enfin et surtout le *porpax* ou deuxième poignée, qu'on met traditionnellement en rapport avec la tactique hoplitique. En effet, en solidarisant le bouclier, malgré son poids, par deux points d'appui, l'un au niveau de la poignée, l'autre au niveau du coude, au bras de son porteur, on réduit à la fois le risque de fatigue et celui de voir pivoter à la moindre poussée la surface protectrice si la pression s'exerce sur le bords du bouclier. Désormais, celui-ci est porté non pas par le seul poing mais par tout le coude et, loin de pouvoir être déplacé dans tous les sens pour parer les coups d'où qu'ils viennent, est porté près du corps. L'opération n'a de sens que dans le cadre d'une troupe disposée en rangs serrés, au coude à coude, le côté droit du bouclier protégeant son porteur et le gauche du bouclier protégeant le voisin de gauche sur son côté droit. Tel est le principe de la phalange hoplitique, qui vaut par sa masse et par sa solidarité. Celle-ci est assurée, que les boucliers soient placés à bout touchant ou en recouvrement[2]. La conséquence en est que, le but étant de présenter à l'ennemi un front continu qui soit à la fois compact et protégé, le bouclier se doit d'être à la fois large et haut, d'où la forme circulaire d'environ 90 centimètres à un à 1 mètre dix centimètres de diamètre. Celle-ci est adaptée à un type de formation qui sacrifie la mobilité tant individuelle que collective à la puissance de choc. Elle est adaptée à un type de guerre qui oppose

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[2] D'après les théoriciens hellénistiques et notamment Asclépiodote, les alignements pouvaient même laisser un espace entre les boucliers (la pyknôsis où les hommes étaient séparés de 90 centimètres). K. W. Pritchett a montré (*Ancient Military Greek Pratice*, 1971, p. 144–153) qu'en formation de combat, le *synapismos* seul était pratiqué et que la distance entre eux était de 45 cm. Mais on ne doit pas exclure un recouvrement , ne serait-ce que pour des raisons physiologiques, afin de faciliter la poussée et de combler des distances entre les hommes rendues trop grandes par la trop grande taille de leur avant bras (cf. notre *Bataille de Chéronée*, Économica, 2012, Note sur les alignements poussée et taille des champs de bataille, p. 95–99).

soit deux phalanges entre-elles, soit des phalangites en rangs serrés à des troupes très légèrement armées.

Mais ces avantages peuvent devenir des inconvénients dans une autre forme de combat. Et l'inconvénient ne sera pas seulement stratégique, mais aussi inhérent à l'arme elle-même : vu sa dimension, le poids et le coût interdisent que le bouclier soit en bronze massif. Il s'agit, dans des proportions variables selon les moyens du propriétaire, de feuilles de bronze plaquées sur un cadre de bois. Il risque de se froisser ou de se briser lors de la poussée et devient forcément inutilisable au bout de quelques combats. De plus, le bouclier ne peut être standardisé, car son rayon dépend de la distance qui sépare la poignée de la saignée du bras de son porteur, distance qui bien entendu varie selon les individus. Tout ceci explique que, hors la tactique hoplitique, ce bouclier soit inadapté. C'est pourquoi il fut abandonné lors du passage à la phalange macédonienne dont l'arme principale, la sarisse, était tenue à deux mains. Il fut remplacé par un petit bouclier (50 cm de diamètre maximum) fixé à la ceinture du phalangite et servant, tout comme une épée courte, en cas de corps à corps.

Un autre type de bouclier n'avait de sens que dans le cadre d'une tactique bien précise : celui des peltastes qui est léger, allongé et en forme de croissant : il ne peut vu sa forme protéger également tout le corps, mais il permet de faire en sorte que, le peltaste étant accroupi avant de bondir, il puisse tout en étant à l'abri, guetter le moment opportun en surveillant par l'échancrure du bouclier, et bénéficier ensuite, lors de l'attaque, d'une protection minimale. Mais une telle forme ne put se maintenir que dans le cadre de la tactique correspondante. Sans celle-ci, elle disparut.

Le nouveau bouclier, le *scutum* romain, était, lui, adapté à toutes les circonstances. Constitué d'une plaque de fer ou de lamelles de fer sur un cadre, il est déformable et réparable. Plus léger, il n'exige donc pas de deuxième poignée. Il peut donc revenir à la forme allongée et protéger tout le corps. Il est ainsi adapté à la fois au corps à corps ou à la formation groupée et, dans le cadre de la *tortue*, n'impose pas le recouvrement. C'est donc une arme défensive à tout faire qui peut même être produite de façon standardisée. Elle est adaptable à tout type de tactique. C'est pourquoi on put l'utiliser pendant un demi-millénaire.

II : La lance

Le problème propre à une telle arme est double. D'abord, il faut choisir entre la fonction de jet et la fonction d'estoc. La première exige une légèreté et un équilibrage particulier, la seconde une solidité de la hampe et une résistance aux vibrations, indépendamment de la taille et de la forme de la pointe qu'il reste à adapter aux tactiques employées et aux protections individuelles à percer. D'autre part, il faut bien penser que, après une utilisation comme arme de jet, son porteur est désarmé, ce qui exige qu'il ne fasse usage de son arme que de loin et ce qui rend aussi nécessaire soit qu'il dispose d'un (ou de plusieurs) autres javelots, soit d'un autre type d'armement. Entre le javelot de jet et la lance d'estoc, il y a donc une contradiction qui n'a pas échappé au monde antique.

S'il reste difficile de savoir si le monde mycénien ou homérique a bien opéré la distinction, la contradiction est bien perceptible à l'époque hoplitique. Car le javelot utilisé par les hoplites est un javelot d'estoc, dont la caractéristique est qu'il reste encore proche du javelot de jet qu'il peut éventuellement remplacer : la finesse de la hampe et sa longueur de l'ordre d'1,70 à 2 mètres permettent ce double usage. Et la présence d'un javelot de réserve empêche d'être désarmé soit si l'on recourt – mais le cas est de plus en plus rare – au jet de javelot avant l'arrivée au contact, soit, si le javelot se brise lors de la poussée et qu'il convient de combattre au corps à corps. Le javelot est en tout cas adapté pour atteindre en passant sous ou au dessus de son propre bouclier, lorsque les deux troupes sont au contact en rangs serrés, l'adversaire au défaut de sa cuirasse, soit ordinairement au cou, au visage en passant par les échancrures du casque, au bas ventre ou aux membres. Il reste que, en dehors de la tactique hoplitique, un tel javelot n'a pas sa pleine efficacité, ni comme défense individuelle, ni comme arme de jet. C'est pourquoi, lorsque le besoin se fit sentir de corps spécialisés, les Grecs d'époque classique se dotèrent, en complément de la phalange, d'archers mais aussi de javelotiers en formation ; leur javelot, devenu uniquement arme de jet, s'affina et s'allégea, se différenciant ainsi du javelot hoplitique.

Dans une certaine mesure, la création de la phalange macédonienne leva la contradiction entre les deux types de javelot. Sa logique était de découpler la puissance de choc, désormais dévolue à la cavalerie lourde, et l'effet de masse que gardait une phalange devenue plus mobile car moins lourdement protégée, mais combattant toujours en rangs serrés. Au point de vue défensif, les membres de cette « phalange du pauvre » ont l'équipement du peltaste ; il est donc non seulement moins lourd, mais aussi moins coûteux et plus facilement standardisé. Au point de vue offensif, le javelot a été remplacé par la sarisse, longue lance d'au moins 5,5 mètres, en bois de cornouiller, tenue à deux mains, pourvue d'un fer, d'un talon métallique et même d'un cerclage aux 2/3 de sa longueur, pour éviter une cassure due aux vibrations. Ainsi, les pointes des sarisses dépassent de près de 3,5 mètres le front serré de leurs porteurs placés en rang serrés, lorsque les javelots hoplitiques ne dépassent que d'1 mètre au plus. L'avantage est appréciable quand les formations arrivent au contact. Au reste, archers, javelotiers, fantassins légers ou cavalerie sont là pour protéger la phalange. Et, avantage appréciable sur un corps d'hoplites, au cas où la cohésion de la phalange macédonienne se brise, ses membres disposent d'un petit bouclier et d'une épée large et courte, et donc peuvent combattre au corps à corps.

C'est un lieu commun depuis les interrogations dont Polybe s'était fait l'écho, de développer le thème de l'infériorité de la phalange macédonienne sur la légion romaine, en oubliant que la défaite des Grecs est bien davantage due à l'infériorité de leur commandement d'alors[3]. Force est cependant de constater que, avant que la standardisation de l'armement romain ne donne naissance, à la fin de la République, au *pilum* d'environ 3 mètres de long, la *hasta* du premier sang des *triarii* n'est pas fondamentalement différente de la sarisse avec ses plus de 4 mètres de long. La différence ne réside donc pas dans l'arme mais dans la tactique : destinée à être fichée en terre et disposée obliquement, la *hasta* sert de lance d'arrêt. Cet usage est donc ce qu'on peut qualifier d'utilisation d'une sarisse à contre emploi, et de fait, il en existe quand même des exemples dans le monde grec. Mais, une fois le choc supporté, la *hasta* perd son utilité militaire et n'a donc comme intérêt que si le second et le troisième rang des *triarii* monte ensuite en ligne.

Comparativement à la *hasta*, le *pilum* a l'avantage de pouvoir être jeté ou être manié par un légionnaire en combat individuel. Il peut aussi être utilisé en formation serrée pour opposer à l'ennemi un front hérissé de lances. Il représente donc une bonne synthèse entre le javelot hoplitique et la sarisse. Mais sa valeur réside dans le fait qu'il n'est pas une arme contraignante : où le phalangite macédonien combattait au corps à corps en dernier ressort et une fois la sarisse inutilisable, le légionnaire porte *pilum* l'aura jeté avant de combattre au *gladius*, dans le cadre manipulaire. On le voit, les choix sont plus ouverts.

On n'en déduira pas pour autant que le pilum ait rendu définitivement caduque la sarisse. Nous retrouvons son équivalent pendant une bonne partie de l'époque Moderne avec les piquiers.

III : L'épée.

La difficulté qui pèse sur l'épée est qu'elle peut être utilisée soit pour frapper d'estoc, et alors il y aura avantage à ce qu'elle soit longue et fine, ou de taille, et alors il conviendra qu'elle soit plus courte mas large. Mais d'autres critères rentrent aussi en jeu : la déformabilité et le poids tout d'abord : en fer, elle sera légère mais se déformera tout en pouvant être redressée ; en bronze, elle se déformera moins mais sera lourde. De plus, il faut pour la manier disposer d'un espace qui varie selon la disposition des troupes : l'épée courte est adaptée à une phalange, l'épée longue au combat individuel. Enfin, courbe ou droite, sa forme est adaptée au type de coup qu'on entend donner avec elle.

L'archéologie mycénienne nous a légué de nombreuses formes d'épées de bronze. Elles sont en général allongées et peuvent frapper à la fois d'estoc et de taille, à l'exemple du type dit Naue II, le plus caractéristique. C'était l'arme des riches et des nobles. A côté, existent de longs couteaux. L'épopée homérique mon-

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[3] Voir simplement M. Roux, « Recherches sur les aspects militaires de la conquête du monde gréco-hellénistique par Rome au II^e siècle avant Jésus-Christ, *Revue des Études Anciennes* 95, 1993, p. 444-457.

tre à quel point la piétaille pouvait utiliser de tels couteaux soit pour le combat en rangs serrés, soit de façon dispersée en combat individuel ou pour achever les blessés et nettoyer le champ de bataille. Alors que le javelot n'est encore qu'une arme de jet, l'épée est l'arme offensive essentielle.

Avec la tactique hoplitique, l'épée perd son importance et tend même à tomber en désuétude : un phalangite peut en posséder une, mais c'est à titre individuel et elle n'est pas indispensable au combat en rangs serrés. Elle ne réapparaît vraiment que lors de la guerre du Péloponnèse, et ce n'est pas l'épée longue et fine mais une sorte de long couteau parfois recourbé, la *machaira*. Ses porteurs ne sont pas les hoplites, mais les peltastes qui sont, on l'a déjà vu, des fantassins légers et mobiles formés à l'attaque surprise rapide suivie d'une retraite aussi rapide, ou à la protection de la phalange. Son utilisation est individuelle. La *machaira* n'est souvent tranchante que d'un seul côté et sa largeur n'est pas un obstacle : faite de bronze, elle risque peu de se déformer et sa faible longueur concourt à réduire son poids – mais aussi son coût ! On retrouvera une forme proche de la *machaira* avec l'épée courte du phalangite macédonien, celle qui lui sert en cas de corps à corps.

Le monde romain va connaître la même évolution vers le raccourcissement des épées pour aboutir au gladius, cette épée de fer large et plate du légionnaire sous le Haut Empire. Elle peut se déformer mais aussi être redressée, et sa production peut être standardisée.

Faut-il croire pour autant que l'épée longue soit devenue caduque ? En fait, l'obstacle à son utilisation suivie résidait dans la trop grande importance de son poids pour un pouvoir vulnérant non décisif. Car, pour blesser ou tuer un adversaire qui n'est protégé que par un justaucorps de cuir ou des bandelettes de métal sur tissu épais, il n'est pas besoin d'une force et d'une vitesse de coup telle que seule une épée longue et bien équilibrée, décrivant une courbe importante avant l'impact, permet d'obtenir. L'épée courte suffit et elle peut être adaptée à toutes les situations. En revanche, avec le retour des protections individuelles, au Haut Moyen Âge, l'épée longue retrouva sa place, tout comme la hache de guerre, jusqu'à même être maniée à deux mains. Mais il fallait trouver un nouvel équilibrage. On explora même toutes les possibilités d'usage de l'épée à contre emploi. La création artificielle d'ouvertures dans ses propres rangs afin d'inciter l'adversaire à s'y engouffrer mais pour mieux l'y atteindre, le *scramasax* décrivant des cercles au dessus de la tête de son porteur est là pour le prouver. Dans cette tactique franque, l'arme n'était pas fondamentalement nouvelle, elle avait à peine été modifiée par un équilibrage nouveau, mais l'usage en était nouveau car il se faisait à contre-emploi.

Dans cette courte communication, trois armes seules ont été prises pour exemple. On pourrait en ajouter d'autres. Mais on voit dès maintenant vers quelles conclusions s'achemine notre réflexion commune : hors bouleversement technique tel que l'apparition des armes à feu ou de l'arme aérienne, les types d'arme ne peuvent fondamentalement changer. Grand bouclier ou petit bouclier, javelot ou pique, épée longue ou épée courte, les choix se font en fonction de critères purement techniques ou financiers, mais plus encore pour des raisons tactiques. Ce qui compte, c'est soit d'obtenir la supériorité sur l'adversaire en utilisant mieux la même tactique et donc par une qualité meilleure de l'armement ou un entraînement meilleur des troupes, soit de l'obtenir en surprenant l'adversaire par une arme nouvelle et, plus encore, par une utilisation nouvelle d'une arme connue. C'est ce qu'en définitive ont su faire tous les grands capitaines ; et ceux d'entre eux qui ont duré sont ceux qui ne se sont pas progressivement sclérosés. Aussi, il semble qu'on puisse conclure de cette présentation qu'il existe un cycle du type *arme nouvelle, tactique nouvelle, adaptation nouvelle de l'arme et/ou utilisation de l'arme à contre-emploi*. Reste à déterminer si cette constatation a valeur pour d'autres périodes et si on peut trouver en elle la justification à de nouvelles recherches.

Captaine Grand Julien (Switzerland)
Production autonome d'avions de combats : quels défis pour un petit pays neutre ?

Le principe de la neutralité suisse est consacré par le Congrès de Vienne en 1815 et perdure jusqu'à nos jours pour devenir un élément central de notre politique de sécurité actuelle. Cette neutralité se veut armée, c'est-à-dire que la Suisse prétend assumer la défense de ce statut contre toutes les menaces pouvant atteindre à sa souveraineté, et ce de manière indépendante à toutes alliances ou blocs de pays. En corollaire, le problème de l'équipement des forces armées nécessaires à la défense de ce statut se pose, tant sur les plans politique, économique que militaire. Au sortir de la Seconde Guerre mondiale, la vision de la neutralité est marquée par les événements récents qui ont contribué à isoler le pays ; et la Suisse neutre doit trouver sa place entre l'Alliance atlantique et le pacte de Varsovie nouvellement nés. Le pays cherche alors une voie autarcique et indigène pour équiper ses forces, en conduisant des projets de construction nationale dans les domaines des blindés, avec le char 68, ou encore avec les projets d'avions de combat N-20 et P-16. Cette communication traitera de ces derniers, sous l'angle des problèmes que posent de tels développements pour un petit pays neutre et isolé sur la scène internationale. Notre plan introduira tout d'abord le contexte général du pays, dans les années 1950–60, puis traitera des défis posés à la Suisse dans le domaine du développement des jets, à savoir : 1) Les crédits de recherche et de développement 2) La neutralité au carrefour des intérêts politiques et économiques et 3) Une volonté politique et militaire chancelante avec la *Konzeptionsstreit.*

Contexte militaro-stratégique

Alors que débute la Seconde Guerre mondiale, l'armée suisse n'est pas prête pour ses missions et mal équipée en blindés et avions. Certaines escadrilles d'aviation mises sur pied en 1939 sont licenciées sur le champ, car les appareils manquent pour les équiper. En fait, seuls une douzaine de Messerschmitt 109 seraient réellement aptes à mener campagne. Les autres appareils sont obsolètes ou manquent d'équipements spécifiques comme les radios. En effet, les années 1920 furent marquées par l'esprit de Locarno qui reléguait la guerre à un lointain cauchemar qui ne se reproduirait plus. Les investissements dans le domaine militaire furent ainsi au plus bas et les plans d'équipement, ambitieux dans le domaine de l'aviation, demeurèrent un vœu pieux. En 1924, si on envisageait 31 escadrilles, seule une petite dizaine est effectivement disponible en 1939. L'arrivée des Nazis au pouvoir en Allemagne et la montée des tensions en Europe réveillèrent quelque peu nos responsables politiques. Mais les dépenses militaires ne commencèrent à augmenter qu'en

1936, soit trop tard pour influencer de manière décisive la disponibilité de l'armée. La campagne de France, en 1940, met la Suisse neutre aux premières loges des combats et la *Luftwaffe* viole à plusieurs reprises l'espace aérien suisse lors de raids menés vers le sud et le centre de notre voisin occidental. La troupe d'aviation suisse réagit en faisant décoller plusieurs patrouilles pour intercepter les intrus. Des Messerschmitt 110 allemands sont alors abattus par les Messerschmitt 109 suisses. Le *Feldmarschall* Göring se trouve outré que du matériel livré par les Allemands à la neutre suisse puisse servir à abattre des appareils germaniques. La tension monte entre Berne et Berlin et, suite à de nombreuses pressions politiques, la troupe d'aviation suisse est clouée au sol sur ordre du Général Guisan, commandant en chef de l'armée. Cet ordre restera en vigueur jusqu'à la fin de l'année 1943, soit durant une bonne partie de la Seconde Guerre mondiale. Seule la DCA contribuera dorénavant à la défense de l'espace aérien contre les violations adverses, à savoir que celle-ci est encore sous-équipée et très peu engageable en 1940 et que sa montée en puissance ne se fera que très lentement durant le conflit. La suite de la guerre éloigne les théâtres d'opération de la Confédération helvétique, mais celle-ci rencontre alors d'énormes difficultés pour s'approvisionner en matériel. Car, la France tombée, les Puissances de l'Axe nous encerclent complètement. Nous sommes donc contraints de développer nos avions par nos propres moyens, ou alors de plier le genou face au *Führer* afin d'obtenir du matériel. Toutefois l'Allemagne ne livre de l'équipement que moyennant concessions politiques et économiques, ne laissant alors à la Confédération que le seul choix d'emprunter le chemin des développements autonomes et, si possible autarciques, afin d'éviter tout marchandage avec l'Axe. Non seulement la Suisse doit faire des concessions pour obtenir du matériel, mais elle reçoit également des remontrances de l'un ou l'autre camp en guerre lors de ses différentes tractations commerciales.

Lorsque le conflit se termine, la Suisse est intacte, mais a reçu un sévère avertissement quant à sa fébrilité en cas de crise sur le continent européen. Les esprits des principaux acteurs de cette époque en resteront marqués, notamment le Conseiller fédéral Karl Kobelt, en charge du Département militaire jusqu'en 1954, mais surtout le Colonel-Divisionnaire Fritz Rihner, commandant des troupes d'aviation de de défense contre avions (DCA). L'effort commencé sera ainsi poursuivi durant les années 1950 sur fond, cette fois-ci, de début de guerre froide. La neutralité suisse est plus marquée que jamais et les nouveaux matériels mis au point durant la conflagration mondiale, avions et chars essentiellement, doivent être acquis en nombre suffisant pour former une armée forte. La Suisse, bien qu'ancrée politiquement et économiquement dans le camp occidental, ne désire pas rejoindre une alliance, mais poursuivre son propre chemin puisqu'elle est unique. Le terme allemand de *Sonderfall*, « cas unique » en français, rend particulièrement bien de cette réalité mentale présente dans les esprits suisses de l'époque. Ainsi la Suisse lance, dès 1945, des projets de recherche dans le domaine de l'aviation à réaction, motivés par les trois piliers suivant : 1) Traumatisme de la Suisse suite à la guerre : par le développement d'une base industrielle suisse, on désire se rendre autonome et autarcique afin d'assurer l'acquisition de matériel, également durant les phases de crise et de façon politiquement autonome. 2) Neutralité : en produisant son propre matériel, la Suisse va ainsi montrer son indépendance vis-à-vis des deux blocs alors en formation et démontrer qu'elle ne peut faire l'objet de pression. 3) La suisse unique : de par ses vallées encaissées et sa topographie, la Suisse a besoin d'avions aux caractéristiques bien spécifiques qui ne sont pas produits ailleurs dans le monde et qui nécessitent donc une production indigène.

La production d'avions suisses

Dès 1945, la Suisse lance des projets de recherche d'avions de combats à réaction, projets supervisés par la commission d'acquisition d'avions, composée de militaires, scientifiques et industriels. La technologie de l'aviation à réaction vient d'apparaitre dans le monde et les travaux des scientifiques et industriels suisses doivent débuter de zéro. Tout est à faire : développement de réacteurs, cellules, système d'armement,… Car un appareil ne peut être produit de manière autarcique que si tous les composants sont développés en Suisse. La situation de la base industrielle suisse de défense est alors un mélange d'industries publique et privée. Le Service technique militaire, dirigé par le Colonel-Brigadier Von Wattenwyl, dont la mission est la conduite de tous les projets d'acquisition de matériel pour l'armée, dispose en effet des ateliers fédéraux de constructions d'avions d'Emmen (acronyme F+W), créés en 1941 durant la guerre, pour mener des travaux dans le domaine de l'aviation et représente le volet public de l'industrie aéronautique (ces ateliers ont formé la base de l'actuelle entreprise RUAG). La firme FFA, à Altenrhein, entreprise privée, est la seconde entité retenue pour ses projets, dirigée par Claudio Caroni. Celle-ci est l'héritière des usines allemandes Dornier, qui ont dû se déplacer sur les rives du Lac de Constance à la suite du traité de Versailles et poursuivre leurs activités sous l'acronyme Doflug. Le manque de collaboration et la compétition entre ces deux entités seront d'ailleurs l'une des causes de l'échec des projets d'avions à réaction suisses, signe peut-être qu'il ne fait pas bon mélanger industrie publique et privée. Dans le domaine des projets d'avions à réaction et suite à un cahier des charges émis en 1946 par les troupes d'aviation et de DCA, la fabrique fédérale d'avions lance ses recherches sur deux projets : le N-10/N-11, appareil monomoteur et le N-20, un quadrimoteur qui compte trois versions. La firme Dornier qui, lors de la guerre, n'a travaillé qu'exclusivement pour l'armée suisse, reçoit la mission de poursuivre, en collaboration avec Pilatus, le projet de N-10/N-11 débuté par la F+W, alors que la firme publique doit se concentrer sur le N-20. Néanmoins la FFA n'est pas convaincue du projet qu'on lui confie et lance, de sa propre initiative, des recherches sur le projet P-23, avion bimoteur présenté en 1946, décliné en version P-25 et P-26 avec au total 4 sous-versions. Mais le prototye

P-26 sera refusée en 1949 puis abandonné, car la commission pour l'acquisition d'avions demande un appareil monomoteur. On désire alors se concentrer sur le seul N-20 de la F+W qui semble très prometteur. C'est sans compter sur la firme Dornier et la fougue d'une industrie publique entre-temps renommée FFA pour Flug- Fahrzeugwerke Altenrhein, qui revient alors au N-10/11 et lance la série P-12, P-13, P-14, P-15 et P-16. Ainsi entrent en concurrence, en 1949, les deux appareils N-20 et P-16, alors même que la commission d'acquisition désirait éviter un affrontement entre deux projets. En 1952, il apparait que le N-20 n'atteindra pas les performances promises et surtout qu'il sera bien trop cher. Cet appareil à aile delta se veut en effet révolutionnaire pour son temps. Mais la technologie a son prix : un N-20 devrait couter 3'000'000 de francs suisses alors qu'à la même époque, l'armée de l'air obtient un Venom pour 175'000 francs « seulement ». En doute, la commission autorise tout de même le décollage du prototype n° 1. En 1952, les Chambres fédérales réduisent les crédits de développements pour l'année 1953. La poursuite de front de deux projets devient tout bonnement impossible financièrement et la Commission de défense nationale donne le coup de grâce au N-20 en 1953, en interdisant l'essai du second prototype. Dès 1953, le seul projet P-16 demeure donc en lice.

Mais un appareil ne se compose pas uniquement d'une cellule, un réacteur est nécessaire. Dès la fin de la guerre, les recherches sont lancées également dans ce domaine. Or, le chemin à parcourir par rapport à l'étranger est énorme et quasi insurmontable. La Seconde Guerre mondiale a en effet permis de faire des bonds de géant en matière technologique et le retard helvétique est assez conséquent. Trois firmes sont contactées par le Service technique militaire, en 1945, pour développer un réacteur suisse : Brown Boveri, Sulzer et Escher-Wyss. Si ces firmes sont à la pointe pour certains travaux d'ingénierie, elles doivent néanmoins construire leur savoir-faire à partir d'une feuille blanche. Très rapidement, Brown Boveri et Escher-Wyss abandonnent leurs travaux et seule la firme Sulzer poursuit le développement du réacteur type D-45. De son côté, la fabrique fédérale d'avions ne se satisfait pas de ces travaux et mène son propre projet de réacteur pour le N-20 avec le prototype Swiss Mamba. Les trop rares crédits de développement sont donc à nouveau éparpillés entre deux projets. Dès 1951, Sulzer ne reçoit plus de financement de la Confédération et poursuit les tests de manière réduite sur ses propres fonds. En 1953, lorsque le programme N-20 est abandonné, le projet de réacteur Swiss Mamba devient lui également caduc. Il faut maintenant trouver un réacteur pour le P-16 qui devient le projet de recherche d'avion à réaction principal. La seule solution qui demeure est la production de réacteurs sous licence, donc achetés depuis l'étranger. La reprise des travaux chez Sulzer est illusoire, car la recherche prendrait trop de temps. Avec un réacteur étranger, la production autonome helvétique devient donc, dès 1954, un mirage. Il ne sert en effet à rien de construire une cellule qui ne pourrait pas voler car les réacteurs ne peuvent plus être importés.

Le développement du P-16 se poursuivra néanmoins jusqu'en 1958. Une commande ferme de 100 appareils sera même passée par les autorités fédérales. Mais la perte accidentelle d'un prototype, seulement quelques jours après la commande, permettra d'évacuer cet avion devenu gênant car déjà quasi obsolète et dont le développement dure déjà depuis environ 15 ans… En fait, il est surtout mis de côté car ne correspondant plus à la doctrine de la défense nationale. La Suisse ne mènera plus alors de projets d'une telle ampleur et acquerra jusqu'à nos jours tous ses appareils à l'étranger.

Le défi financier des crédits de recherche
Le premier défi qui se pose à un petit état lors de telles recherches est celui du financement. Comme nous avons pu le constater plus haut, les crédits de recherche sont éparpillés entre deux projets ainsi qu'entre trois, puis deux réacteurs. Nous illustrerons cette difficulté par la planification des crédits militaires de 1947. Celle-ci prévoit de l'argent pour deux cas de figure : le premier, où un seul appareil est développé, et le second, plus optimiste, où deux prototypes sont menés de front. Sont ainsi prévus, pour la période 1947–1951, 14 millions de francs suisses de l'époque, pour le premier cas, et 25 millions pour le second. Cela représente une moyenne de 2,33 millions par année, respectivement de 4,16 millions pour la variante à deux prototypes. Converties en francs suisse de 2006, ces sommes donnent des moyennes de 10,6 contre 19 millions de francs. Vous trouvez dans le tableau ci-dessous une récapitulation de ces chiffres. En réalité toutefois, on ne dépensera que 2,39 millions par année durant cette période pour le développement de deux prototypes, y compris les réacteurs ! Soit environ 11 millions de francs suisses d'aujourd'hui ou environ 10 millions d'euros. Ces sommes paraissent bien dérisoires et prouvent que, sans volonté politique ferme avec les sacrifices financiers nécessaires, il est tout bonnement impossible de mener à bien de tels projets de développement. A la fin des années 1940, la Commission de défense nationale avait en effet retenu le projet N-20 essentiellement pour éviter de disperser ses trop rares crédits. La firme privée de la FFA jouera les trouble-fêtes en revenant à la charge avec son projet P-16. Celui-ci est en effet rustique, donc moins coûteux que le projet avancé d'avion à aile-delta N-20. La question des crédits sera également centrale lors de l'abandon de ce dernier. Pour revenir à la différence de prix évoquée plus haut entre un N-20 et un Venom, cela représente un coût dix-sept fois plus élevé, ce qui ne pouvait être envisagée pour les moyens financiers limités du pays. Qui dit autonomie, dit également investissements conséquents, que l'autorité politique et militaire n'étaient pas prêtes à engager. En ce qui concerne le P-16, certes son prix (4,41 millions de francs par appareil, mais dix ans après le N-20) est moins élevé mais, entre-temps, le marché de l'aviation, bloqué du fait de la guerre froide, s'est ouvert, et il est désormais possible d'obtenir des appareils de meilleure qualité pour un prix tout autant attractif à l'étranger. Alors que les finances ont

toujours joué un grand rôle en Suisse (y compris lors du processus d'acquisition du Gripen), la conséquence sera sans appel, soit la fin de l'industrie aéronautique indigène helvétique, ne lui laissant plus que des niches pour se développer, comme les appareils d'entrainement avancés fabriqué par les usines Pilatus.

	Variante optimiste : 2 prototypes développés (en millions de francs)	Variante pessimiste, un seul prototype (en millions de francs)
1947	3,3	3,3
1948	8,2	3,5
1949	9,0	4,5
1950	4,1	2,3
1951	0,4	0,4
Total	**25**	**14**
Moyenne/ année [161]	**4,16**	**2,33**

La neutralité au carrefour des intérêts politiques et économiques

Le second défi qui se posera à la Suisse neutre est l'imbroglio des intérêts politiques, économiques et militaires qui gravita autour de ces deux projets. Idéalement, la production d'un avion de combat ne doit poursuivre que le but de livrer l'appareil demandé par les Forces aériennes. Or, en Suisse, aucune acquisition d'avions ne s'est déroulée sans heurt. Tous les citoyens suisses effectuent du service militaire et restent incorporés une bonne partie de leur vie. Ainsi le pays compte des millions de « généraux » qui pensent connaitre la solution miracle pour la défense nationale. Ces recherches seront donc hautement thématisées dans la presse et suivies de près par la population suisse. Par exemple, lors du second accident du prototype P-16, en 1958, la firme FFA sera la risée de l'opinion publique avec des caricatures avançant, par exemple, qu'elle était enfin parvenue à trouver la formule chimique du lac de Constance, dans lequel l'avion s'était écrasé : H2OP16 ! Mais le gros défi viendra du côté de l'industrie. En effet, comme nous l'avons vu plus haut, la Suisse dut avoir recours tant à l'industrie publique que privée pour la construction de ses appareils de combat. La neutralité poursuivie par la Suisse demandait, d'un côté, le développement de ses avions mais hypothéquait grandement, d'un autre côté, les possibilités d'exportation de ceux-ci. Le coût de l'appareil futur devait alors s'en ressentir et, vus les crédits limités, le processus de développement de l'appareil dura quinze ans, l'industrie privée rechignant à s'engager trop en avant dans un projet encore incertain quant à sa viabilité financière. La collaboration entre la FFA et la F+W n'était pas des meilleures, surtout depuis que la commission pour l'acquisition d'avions avait laissé leurs deux projets entrer en concurrence. Lors de la mise à l'écart du N-20, développé par l'industrie publique, au profit du P-16 de l'industrie privée, les ateliers fédéraux d'Emmen gardèrent une défiance viscérale à l'égard de la FFA, ressentant l'abandon du N-20 comme un véritable coup de poignard dans le dos. La suite du projet obligeait à une collaboration, car la FFA n'avait pas les capacités, seule, de mener les travaux à bien. Le climat délétère dans lequel celle-ci se déroula ne facilita en rien le succès de l'opération, chacune des firmes rejetant la responsabilité des problèmes et retards sur le compte de son partenaire. De plus, au sein de l'industrie, il ne faut également pas oublier que les petites entreprises liées au domaine aéronautique ne penchaient pas toutes du côté du P-16 car, pour elles, une construction sous licence d'appareils acquis à l'étranger pouvait s'avérer plus intéressante d'un point de vue économique. Un plan de charge assuré vaut mieux qu'un hypothétique travail basé sur un prototype encore en cours de test. De leur côté, les militaires aussi ne présentaient pas un front uni en faveur de l'appareil. Le service technique militaire recevait souvent le reproche d'être juge et partie puisque la F+W d'Emmen dépendait directement de lui. En outre, il entrait en concurrence avec les services de l'Etat-major général et des troupes d'aviation qui voulaient chacun avoir leur mot à dire dans la conduite du programme du nouvel appareil. Toutes ces luttes d'influence nuirent au P-16 qui fut ainsi enterré lorsque le deuxième prototype s'abîma dans le Lac de Constance.

Une volonté politique et militaire chancelante

Dès 1945, des voix s'élevèrent déjà contre le développement d'avions suisses. Certains officiers généraux, comme le chef d'arme de l'infanterie, avançaient que l'argent dépensé pour ces appareils manquerait ainsi pour équiper l'infanterie. Il fallut donc convaincre les militaires non-aériens du bien-fondé de la démarche. De même, seule une minorité de politiciens s'engagèrent en vue de ce développement, certains pour des intérêts économiques, puisque représentant les régions à fortes concentration d'entreprises actives dans le domaine aéronautique. Mais le grand problème viendra du côté de la conception de la défense nationale elle-même. Au sortir de la Seconde Guerre mondiale, l'armée suisse est à grande consonance d'infanterie. Elle envisage donc de mener un combat statique, tirant profit du terrain fort qui forme notre pays. L'arrivée de l'arme atomique et l'apparition, bientôt, d'armes nucléaires tactiques remit en cause toute forme de combat qui nécessitait une concentration de troupes trop forte, comme celle pratiquée en Suisse. Les années 1950 sont ainsi marquées, en terre helvétique, par ce que l'on appelle la *Konzeptionsstreit* (débat des conceptions, en français) ou l'opposition entre les partisans d'une *mobile defence* et ceux de l'*area defence*. Non seulement ces deux courants s'opposaient quant à la façon de mener le combat mais aussi se déchiraient sur l'organisation sociologique des forces militaires du pays. La place manque ici pour entrer plus en détail sur cette problématique. De façon caricaturale, la première solution envisageait une armée moderne, à forte composante mobile, donc mécanisée. En ce qui concerne l'aviation celle-ci aurait nécessité des avions de chasse rapides, censés obtenir et garder la supériorité aérienne dans le but de protéger les mouvements mécanisés. Cette mission de chasse serait la principale pour l'aviation suisse, alors que le soutien rapproché aux troupes au sol deviendrait secondaire. La seconde solution prône une armée à base d'infanterie, peu mobile et enterrée dans ses positions, soutenue au maximum par le feu d'appui de l'artillerie et des forts disséminés dans tout le pays. Cette vision aurait permis d'utiliser au mieux le peu d'argent disponible et aurait limité le plus possible les connaissances nécessaires à une armée peu technologisée et basée sur un service de conscription de courte durée dans lequel les soldats ne sont en service que quelques semaines par année. Du point de vue de l'aviation, elle se serait bornée à utiliser des avions plus rustiques pour l'attaque au sol et l'appui direct des troupes terrestres, mission principale des troupes d'aviation, la chasse devenant secondaire. Acquérir la supériorité aérienne n'est pas nécessaire pour les tenants de cette vision, car ils partent du principe que même en investissant dans des avions de chasse perfectionnés, le pays n'atteindra jamais la masse critique pour la disputer aux ennemis potentiels. Le P-16 répond clairement au besoin de la seconde solution, alors que la Commission de défense nationale prend le chemin de la première variante, avec l'arrivée en son sein, en 1958, de nouvelles têtes, comme le chef de l'état-major général, le commandant de corps Annasohn, qui opteraient plutôt pour un appareil comme le Draken ou le Mirage. Mais le P-16 vient d'être commandé, et ces nouveaux chefs doivent respecter les décisions de leurs prédécesseurs. L'accident du troisième prototype, à l'aube de l'été 1958, change la donne et c'est l'occasion rêvée de l'évacuer et de développer, enfin, une armée hautement technologique et mobile. La priorité n'est plus mise alors sur un développement autonome mais bien sur la qualité du matériel livré, que les entreprises suisses ne sont en mesure de fournir. L'ère du Mirage pourra ainsi commencer ! Et nous en arrivons ainsi au troisième défi que la Suisse n'a su relever dans ce développement, à savoir que les projets de recherche ont été menés sans même que le type d'appareil et les missions ne soient clairement définis et sans vision claire de la doctrine devant présider à la défense nationale. Alors que l'appareil est là, bien que déjà dépassé techniquement avant son entrée en service, il ne correspond pas aux besoins opératifs des troupes d'aviation.

Conclusion

Dans notre analyse, nous avons relevé trois défis que la Suisse n'a pu ou su surmonter pour mener à bien ses projets d'avions de combat. Le financement de telles recherches n'a su être assuré, tant par manque de volonté politique que militaire. De plus, les rares crédits de recherche furent par trop éparpillés, entre deux avions et trois réacteurs, et les projets en pâtirent, notamment en ce qui concerne le temps qui fut nécessaire à conduire les recherches, soit environ quinze ans. Deuxièmement, les différents conflits d'intérêts entre l'industrie publique et privée n'ont pas su être maitrisés. La première erreur fut de mettre en concurrence deux prototypes, l'un de l'industrie publique et l'autre de l'industrie privée. Alors que le N-20 de l'atelier fédéral d'Emmen fut mis de côté, on décida d'associer le même atelier, donc le même personnel, aux travaux de recherche du P-16. La collaboration entre les deux firmes ne pouvait qu'être mauvaise et déboucher sur un échec, vu le ressentiment perçu à Emmen lors de l'annonce de l'abandon du projet dans lequel tant d'énergie et de motivation avaient été investies. Notre troisième point d'analyse a montré que, sans une vision très claire de l'appareil à développer ainsi que de son utilisation dans la doctrine de la défense nationale, le risque de se retrouver avec le mauvais appareil est bien présent. Ce fut le cas pour le P-16. Ainsi, la Suisse ne parvint pas à mener à bien les recherches dans ce domaine, au contraire de ce qui se fit pour les blindés, puisqu'elle parvint à mettre au point le char 68. Dans le domaine aérien, elle dut continuer à acquérir ses avions à l'étranger, tout d'abord se chargeant de la construction sous licence, avant de passer à l'achat sur étagère, moyennant des commandes financières compensatoires.

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Lt. Gen. REN Haiquan (China)
Military Technology and Strategy
A study in the context of war history of People Liberation Army of China

New science and technology have always been first applied in military field and been exerting significant impact upon the final result of war. Military technology is the prerequisite and material foundation for the development of strategy and tactics. However, the one with the technical superiority may not necessarily win the war, and the technically inferior one if able to compensate the inferiority by implementing adaptive strategy and tactics, still is possible to win. I will share my perspective on the relation between military technology and strategy in the context of PLA war history.

First, military technology decides strategy and tactics, and the strategy and tactics taken must be adaptive to the technology level.

Persons and equipments are two major constituents of fighting capability. Equipments are materialized military technology. They are important material basis for waging war, and significantly influence the mode of war, type of operation, strategy and tactics, progress and result of war. Strategy and tactics whatsoever must be developed on some technological foundation. Such connection could never be severed.

PLA grew out of a red army guerrilla force, which was small in size and poor in equipment at its inception. Chinese communists led by Mao Zedong, were fully aware of the underpinning role of military technology on strategy and tactics. They suffered personally the extreme difficulty and passivity due to backward military technology and poor weaponry. Therefore, they had been seeking to create a favorable physical condition by upgrading military technology and weaponry through all means, even when under the most tough conditions and in extreme poverty.

However, one has to bear in mind that upgrading military technology is not one-day effort. Throughout Chinese revolutionary wars, either in comparison with Japanese aggressors or the KMT forces, the PLA had been on the inferior side in terms of military technology. It was impossible for the PLA to conduct strategic decisive operation or large scale position battle. During its early days, even mobile operation was beyond PLA’s capability. In such situation, commanders of the PLA had no other choice but to find a set of strategy and tactics which met the features of Chinese revolutionary war and equipment situation. They had to follow the principle of “fighting wars according the equipment”, “fighting in our own way regardless of enemy’s way of fighting”, “if able to win, then fight; if unable to win, then flee". A strategy of active defense had to be adopted. At strategic level conducting endurance war and at tactical lever conducting speed operations. There had to be a transition from guerrilla warfare to combination of mobile operation, guerrilla operation and position operation. During the land revolutionary war, the "leftist" leaders led by Wang Ming neglected the fact that enemy was much stronger than us, and they were in a favorable situation, and adopted an adventurist offensive strategy. He defied the operation principles put forward by Mao Tsedong, launched "whole-frontier attack" when conducting offensive operation and "divides troops into small groups to protect all points" while taking defensive postures. He adopted position operation and garrison operation, and decided to fight attrition war against the superior enemy. His plan was to fight a quick and decisive war at strategic level by conducting enduring operation at operational and tactical level. His leadership severely undermined the strength of red army and hindered Chinese revolution effort gravely.

The war history of PLA proves that the right strategy and tactics should be based upon a certain military technology, and must be compatible with the technology level. The strategy and tactics not compatible with weaponry level are absolutely not wise, and will result in losses.

Second, when military technology level is at a given level, strategy and tactics will decide the result of war.

The dialectic materialist view holds that military technology carries great weight on the result of the war, but one should not attribute the result merely to military technology or a certain kind of weaponry. In history theories such as "wining by tanks", "mechanized warfare", "wining by air", "wining by nuclear weapons" and "wining by missiles" once were very popular. They reflected the wisdom and vision of their inventors, and consequently were recorded in the world military history. However, such technocratic military theories could not lead to the final victory. Believing in their weaponry overwhelming superiority, Japanese aggressors announced to occupy China within 3 months, while Cheng Kai-shek planned to eliminate all PLA forces in 3 to 6 months, and Mac Arthur bragged ending Korean War before the Christmas of 1950. History proved that all these were just illusive boast and their arrogance became the history's laughing stocks.

War is a confrontation of comprehensive strengths. Advantages in military technology and weaponry merely provides a potential to win, while turning technological edge into dominance in war requires right strategic guidance, strategy and tactics. The side weak in military technology and weaponry should put more weight on fully exploiting human's initiative, study the strategy of winning wars and master the features and principles of war. Only in this way could it formulate a strategy to "exploit to the full his favorable conditions and avoid unfavorable conditions" and offset the weakness in weaponry. "If one's sword is not good as his opponent, his swordsmanship has to be better in order to win". In revolutionary wars, PLA was poor in equipment and minimal in supplies. In such circumstances, PLA stressed more than ever on the human's initiative and flexibility of strategy and tactics. The strategy of "People's War" is the panacea of PLA to win at various historical stages.

When the predecessor of PLA, the China's Red Army of Workers and Farmers, was established, it conducted studies on war while still fighting war. A 16 Chinese characters' formula was created which says "when enemy advances, we will retreat; when enemy stays, we will harass them; when enemy becomes tired, we will launch attack; when enemy retreats, we will chase". The rationale behind this strategy is that the Red Army will make a full use of all favorable conditions and avoid unfavorable points, evade strong enemy forces and attack its weak forces, thus attacking enemies with a flexible tactics. In such a way, the balance of strength will gradually shift to our favor and final victory will be achieved. With the improvement of military technology and enhancement of strength, red army changes its mode of operation at proper time from guerilla warfare to mobile warfare, and established through exploration the operation principles such as "concentration of strength, mobile operation, speed operation and annihilation operation" etc.

By implementing such operation principles, the weak and small Central red army defeated three large-scale "encircle and annihilate" attempts by KMT, with 100,000, 20,000, and 30,000 persons enemy forces respectively. When national anti-Japanese aggression war fully broke out, the red army was reorganized into KMT forces and renamed by "the 8th Route Army" and "the New 4th Army". These two troops fully aware of their small number, poor equipment and rich experience in guerrilla warfare, decided to adjust its strategy from conducting regular warfare in domestic war into fighting guerrilla warfare in the national anti-Japanese aggression war, and fight a long-duration war. The military strategic guideline they followed is to "conduct mainly guerrilla warfare, but not to rule out the possibility of fighting mobile warfare under favorable conditions." Guerrilla warfare was raised to strategic level and majority of population was mobilized and organized, thus the advantage in territory and population was played into full. "The support and participation of vast population was like a vast ocean, and submerged the enemy in it. Peoples support and participation compensated the disadvantages in equipment, and created the possibility of overcoming all difficulties." The miracle in human's war history was created.

After the breakout of national liberation war in 1946, PLA followed a guideline of annihilating KMT's effective forces instead of conservative regional strength as the major target of operation, conducted maneuver operation according to weaponry level, and implemented the principle of "concentrating preponderant troops and annihilating enemy separately". The PLA conducted outer line offensive and speed operations, and defeated the KMT's all-out offense and focused offense attempts. The balance of strength shifted from in KMT's favor towards PLA's favor gradually, and established preconditions for the strategic counteroffensive and offensive. In the War of counter-US and Assisting Korea which Chinese Volunteer forces were in extreme inferior than its opponents in terms of weaponry, it developed and implemented "people's war" strategy, and solved the question of "whether to fight, to hold and to guarantee the transportation of supply". The victory was won by the troop, and set an example of weak side defeating strong side.

The war history of PLA demonstrated that the party superior in military technology and weaponry inherently possesses certain strategic advantages and has initiatives, but it does not mean the party inferior in military technology could do nothing but wait for the defeat. The fact is if the weak side set right strategic guidance, design and implement strategy and tactics according to its own features and adaptive to its military technology, such as "you fight in your way while I will fight in my own way", minimizes the influence of opponent's technological advantages, make a full use of weapons at hand and the great potential and creativity of officers, soldiers and general populations, it is very likely for the inferior to win the superior, and the weak to defeat the strong.

Third, military technology and strategy and tactics are mutual promoted. The relation between them is in a dynamic balance.

Military technology is always developing, which demands strategy and tactics make adaption accordingly. On the other hand, strategy and tactics also affect or even decide the direction and focus of military technology development. In today's world, science and technology are developing very rapidly, and relation between military technology and strategy and tactics is mutually-promoting. However, there is no fundamental change regarding this relation. The ideal relation between them is a dynamic balance. PLA has been seeking for a dynamic balance between military technology and strategy, between military technology and persons' competence. Commanders and leaders of Chinese revolutionary war highly stressed the human's initiative given military technology and weaponry is certain, and created new strategy and tactics while improving technology and equipment.

After the founding the People's Republic of China, leaders of both Central Committee and Central Military Commission of CPC realized that to safeguard the country from foreign aggression, it was no longer enough to rely solely on the weaponry and tactics that were used against relatively weak domestic enemies and new China must possess the most updated weaponry and tactics. When the anti-US and assisting Korea war broke out, the Chinese people's volunteer army chose to fight land battle, mobile operation, close combat and night combat which it specialized in, and soon reversed the unfavorable situation. However it was also exposed that the volunteer army could not bring its competence into full and achieve greater victory due to the poor weapons and equipments. Therefore, the Volunteer army adopted a strategy of building troops while fighting, spared no efforts in updating weaponry and equipments, and accelerating the pace of artillery, armor and air force modernization. With the improvement in technology and equipments and the strengthening of new service and arms, the volunteer army created tactics and principles for air battle, and became stronger and stronger and gained greater initiative.

The war history of People's liberation army shows that if a dynamic balance could be established between military technology and strategy and tactics, the operation competence of troops could be played to its full. To reach such a dynamic balance, one must take into consideration enemy's equipments, technology level and its strategy and tactics.

Concluding remarks

As early as during the anti-Japanese aggression war, Mao Tsedong has put forward the conclusion that "weaponry is an important factor of war, but not the decisive one. The decisive factor is human, not equipment." The war history of PLA is a story of the weak winning the strong and the inferior defeating the superior. It is the best support to Mao's conclusion. In the foreseeable future, the PLA remains at the weak and inferior side in comparison with strong components. Therefore it will stick to the principle of "fighting a war according to the weaponry level" and "you fight your war and I will fight my own war". It will innovatively develop people's war strategy in the new information condition in order to win. This is a conclusion based on history, and also the revelation of history.

Prof. Dr. John Hosler (USA)
Military Technology in the Writings of John of Salisbury

The 2011 Weapons System Handbook, accessible online, provides a ready guide to non-classified ammunition, weapons, vehicles, intelligence and control equipment, and a host of other current military technologies used by the United States Army. In over three hundred pages it not only provides the Army's official terminology for these devices but also their dimensions, capabilities, and applications.[1] Medieval military historians can only dream of such detailed, government-approved, technical sources. Outright descriptions of military materials are rare in the Middle Ages, which was an era without standing armies or military-industrial complexes. Medievalists also face another peculiar challenge: the extant sources for military affairs were often written by ecclesiastics who were relatively ignorant of troop-types, tactics, and military technology. As a result, modern interpretation of medieval campaigns hinges on language that is often imprecise, misleading, or wholly incorrect.[2]

I have lately written a book on one of the major ecclesiastical sources for warfare in the twelfth century, John of Salisbury.[3] John was one of the best-educated men of his day and worked as a clerk to the archbishops of Canterbury; later in life, he became the treasurer of Exeter Cathedral and also the bishop of Chartres. John was a prolific author who wrote three major books, two saints' lives, two moralistic poems, and 325 personal letters. Of these works, undoubtedly the most famous is the treatise *Policraticus*, which was heavily read in the later Middle Ages and remains on many university political science reading lists today.

In the course of my research, I endeavored to catalog every technological military term John of Salisbury used across his entire corpus: every word for arms, armor, equipment, and transportation. The result is a collection of over six hundred Latin terms that, on face value, constitutes an important resource for military historians. Yet caution is needed because John neither participated in combat nor witnessed an actual battle with his own eyes, and much of his terminology came not from contemporary sources but rather from a sizable array of Biblical and ancient texts in his library. Before properly assessing John's contribution to the study of

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1 Weapons Systems 2011, accessed 27 June 2012, <http://www.army.mil/info/references/>.

2 On the relative strengths and weaknesses of clerical military descriptions before the fourteenth century, see J. F. Verbruggen, *The Art of Warfare in Western Europe during the Middle Ages from the Eighth Century to 1340*, trans. S. Willard and Mrs. R. W. Southern, 2nd ed. (Woodbridge 1997), 10–11.

3 J. D. Hosler, *John of Salisbury: Military Authority of the Twelfth-Century Renaissance* (Leiden forthcoming); this paper contains material from chapter one.

medieval warfare one must first come to grips with his military language. The precision or vagueness of his word choices often affects the reliability of his military descriptions and, therefore, the utility of his writings for military historians.

It is my argument that John of Salisbury's soundness as a source for medieval military technology is a provable notion. To do this, I will first explain my method of checking the accuracy of his terminology. Then, I will demonstrate the extent to which his descriptions of arms and armor mesh well with the military customs of his own day. Finally, I will offer some thoughts on the applicability of my method to other medieval, ecclesiastical sources.

The Assizes

In order to check the accuracy of John of Salisbury's language, I have employed my own (medieval) version of the U.S. Army's Weapons System Handbook: two *assizes* ("decrees/inquests") issued in the year 1181 at the court of King Henry II of England (1154–1189). These assizes required citizens to possess specific types of weapons and armor for the common defense, with each man's required array differing according to his financial condition. In the Assize of Arms, which was issued in England, mail, helmet, shield, and lance were all required for a holder of a knight's fee (*feodum unius militis*) as well as a free layman holding chattels or rents worth sixteen marks (*liber laicus*). Free laymen with chattels or rents of ten marks could forego the shield, and every other English freeman was to possess a quilted doublet, helmet, and lance.[4]

The second assize, issued at Le Mans (Maine), has similar financial delineations, except that instead of lances swords, bows, and horses were required for some men [5] The richest citizens (with chattels valued in excess of 100 pounds) were required to maintain "a complete set of military accoutrements" (*arma militaria plenarie*). Other contemporary documents from the 1180s suggest that such a full knightly array would have included: spurs, mail leggings, hauberk, helmet, sword, lance, and shield. [6] Although this description refers to the ideal armament of a knight competing in a tournament, it is roughly contemporary to Henry II's assizes and fits particularly well with the Le Mans assize, which, unlike the Assize of Arms, demands possession of a sword.

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4 The text of the Assize of Arms is printed in W. Stubbs (ed.), Select Charters and other Illustrations of English Constitutional History, 9th ed. (Oxford 1913), 183; in English translation, see D. C. Douglas and G. W. Greenaway (eds.), English Historical Documents Volume II: 1042–1189 (London 1953), no. 27.

5 The text of the assize at Le Mans is printed in W. Stubbs (ed.), Chronica Magistri Rogeri de Houedene, 3 vols. (London 1868–1871), 2.253; in English translation, see H. T. Riley (trans.), *The Annals of Roger de Hoveden*, 2 vols. (Reprint, New York 1968), 2.1.

6 D. Crouch, Tournament (Reprint, London 2006), 141, has usefully employed a description of a knightly array from Ralph Niger's *De re miltari et triplici via peregrinationis Iersolimitane* (circa 1187): spurs, mail leggings, hauberk, helmet, sword, lance, and shield.

The exact purpose of these assizes has been a matter of great debate. Some historians have seen them as a reconstituting of the old Anglo-Saxon militia system, known as the *fyrd*. The *fyrd* was conceptualized as a means of regional defense against Viking raids in the ninth and tenth centuries, which could occur suddenly and in random locales. Localized militias, it was reasoned, could mobilize and respond to these raids much more quickly than could the king's host. Other historians have contended that the assizes were intended to arm the townsfolk in order to check the power of the nobility and/or to increase the stock of available weapons in the kingdom. I myself have argued that Henry II was not creating a militia but a system of military reserves that would be suitably equipped for participation in the king's formal military campaigns, if need be.[7]

Yet whatever their true purpose, my interest in the assizes in this paper is their technical content. They are royal, not ecclesiastical, documents: the types of weapons contained therein, therefore, represent accurate terminology for the late twelfth century–words that were in use in the court of one of Europe's most powerful military leaders. In the assizes are found the following Latin terms for the arms and armor:

Assize of Arms, 1181		**Assize at Le Mans, 1181**	
clypeus	shield	*arcus et sagittae*	bow and arrows
lancea	lance	*equus*	horse
capellum ferreum	iron cap	*gladius*	sword
cassis	helmet	*capellum ferreum*	iron cap
aubergel	mail shirt	*albergellum*	hauberk
lorica			hauberk[8]
wambasia		quilted doublet[9]	

These assizes were issued in 1181, the year immediately following John of Salisbury's death in 1180. I have therefore employed these two assizes as ciphers, of a sort, in order to assess the accuracy of his military terminology. In particular, I will focus on John's military lexicon regarding armor, hand-held, and missile weaponry.

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7 For the principal theories, see: W. Stubbs, *The Early Plantagenets* (New York 1889), 88; H. G. Richardson and G. O. Sayles, *The Governance of Medieval England from the Conquest to Magna Carta* (Edinburgh 1963); P. Contamine, *War in the Middle Ages*, trans. M. Jones (London 1984); and J. D. Hosler, *Henry II: a Medieval Soldier at War, 1147–1189* (Leiden 2007), 118–119.

8 A form of mail shirt; see I. Peirce, *"Arms, Armour and Warfare in the Eleventh Century"*, Anglo-Norman Studies 10 (1987): 237–240.

9 An *aubergel* was a mail shirt, similar to the *lorica* but lighter and with shorter sleeves; see D. Nicolle, *Medieval Warfare Sourcebook, Volume I: Warfare in Western Christendom* (London 1995), 135. A *wambais* was also called a *gambeson*, or a quilted coat of fabric to be worn underneath armor; see M. Bennett, *Dictionary of Ancient and Medieval Warfare* (Mechanicsburg 1998), 125.

Armor

John of Salisbury uses four different words to refer to shields. The first and most common is *clypeus*, of which there are twelve appearances in his writings. As seen in the Assize of Arms, this was indeed the contemporary term in England. What is impossible to know is if John was referring to kite-shaped or round shields, both of which were used by the Anglo-Normans.[10] His other three words for shield are not contemporary but are rather taken from the Old Testament and Roman texts that informed his research. The Latin *scutum* he acquired from both the Book of Job (*corpus illius quasi scuta fusilia*; "his body is like molten shields") and the *Strategemata* of Sextus Julius Frontinus (*ornatum scutum elegantius*; "shield elegantly decorated").[11] *Umbone* he took from both the *Punica* of Silius Italicus as well as Juvenal's second satire.[12] Finally, John found the word *ancilis* in Ovid's poem *Fasti*.[13] Interestingly, John applies Ovid's *ancilis* in order to describe the small shields used by Harold Godwinson's skirmishes in Wales in 1063–this is an example of John applying classical language to modern events.[14]

Three of the words for body armor in the assizes (*wambasia*, a quilted doublet; *aubergel*, a mail shirt; and *albergellum*, a mail-shirt with short sleeves) do not appear in John of Salisbury's works. The only one that does is *lorica*, which was a hauberk, that ubiquitous medieval mail tunic with short or long sleeves. However, his language is imprecise as to the armor's design and function. He could have been referring a Roman *lorica*, which appears in his sources and can be found in three different styles: a basic bronze breastplate, the *lorica squamata* (scales attached to linen); a *lorica hamata* (metal rings hammered together); or a *lorica segmentata*, or cuirass, which was bands of bronze attached to leather.[15] Overall, John seems rather uninterested in accuracy regarding armor. In fact, he most often uses the generic word *arma* with adjectives added to describe its function: "costly armor" (*pretiose armatorum*), "light armor" (*leui armorum*), and "heavy armor" (*graui armorum*). His generic *arma* references outnumber his more-precise use of *lorica* and other terms by a ratio of at least 2:1.

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10 Peirce, "*Arms, Armour, and Warfare*", 243–244.

11 C. C. J. Webb (ed.), *Ioannis Saresberiensis Episcopi Carnotensis Policratici*, 2 vols. (London 1909), 2.6.1; cf. Job 41.6, and M. B. McElwain (ed.) and C. E. Bennett (trans.), *Sextus Julius Frontinus: Stratagems, Aqueducts of Rome* (Reprint, Cambridge, MA 1997), 4.1.5.

12 Policratici, 6.6 and 3.13; cf. J. D. Duff (trans.), *Silius Italicus: Punica*, 2 vols. (Cambridge, MA 1934), 1.4.354 (*umbonibus umo*); and S. M. Braund (ed. and trans.), *Juvenal and Persius* (Cambridge, MA 2004), 2.45-46 (*sed illos / Defendit numerus junctae umbone phalanges*).

13 Policratici 5.3; "Salii," in S. Hornblower and A. Spawforth (eds.), *Oxford Classical Dictionary*, 3rd ed. (Oxford 1996), 1348.

14 Policratici, 6.6.

15 W. J. Millor and C. N. L. Brooke (ed. and trans.), *The Letters of John of Salisbury, Volume Two: the Later Letters*, (Oxford 1979), no. 279 (*loricatorum*); Policratici, 6.19 (*loricam*); K. DeVries and R. D. Smith, *Medieval Military Technology*, 2nd ed. (Toronto 2012), 55–56.

John's term for military helmets is *galeae*, which appears four times. Again, he acquired the term from two of his ancient sources: a *galea* appears in the Book of Wisdom 5.19, and also in the *Germania* of the Roman historian Tacitus.[16] This is an antiquated term: it does not appear in the assizes, and John does not seem to have taken it from any contemporary source.

Weapons

The most-frequently referenced weapons in John of Salisbury's writings are swords. He employs three specific terms for sword, explaining why he does so in his book *Metalogicon*, his defense of the seven liberal arts: "In the case of 'multivocal' terms, several words, such as *ensis*, *mucro*, and *gladius*, all mean and name the same thing."[17] *Gladius* and its variations is easily his most-used term for the weapon: there are at least 121 uses of this word in John's writings. It is also the sword-term to which he most often adds an adjective to convey a larger point: there is, for example, the "sword of sorrow" (*doloris gladius*) that pierced the Virgin Mary; as well as the "sword of the spirit" (*spiritualem gladium*).[18] In contrast, the word *ensis* is used only nine times and *mucro* only six. More general words also appear: *ferrum,* which literally means a piece of metal, appears nine times; *telum*, which can also refer to a projectile, appears three times, and in these cases only the context reveals that John is actually writing about a sword.

It is the massive numerical difference between the appearances of *gladius* and *ensis*/*mucro* that bears further consideration. *Gladius* is the term used in Henry II's assize at Le Mans, so its frequent appearance in John of Salisbury's writings does indeed reflect contemporary usage. It is clearly his preferred term for sword. Unlike his outdated terminology for shields and helmets, however, his use of *ensis* and *mucro* do not seem to coincide with his quoting of ancient texts; their relative infrequence suggests that John may have used them simply for variety's sake.

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16 Letters of John of Salisbury, Volume Two, nos. 279 and 299; cf. Wisdom, 5.19 (*induet pro torace iustitiam et accipiet pro galea iudicium certum*; "He will put on justice as a breastplate, and will take true judgment instead of a helmet"); and W. Peterson and M. Hutton (eds.), *Tacitus: Dialogus, Agricola, Germania* (Reprint, London 1925), 272–273 (*Paucis loricae vix uni alterive cassis aut galea*").

17 J. B. Hall and K. S. B. Keats-Rohan (eds.), *Ioannis Saresberiensis: Metalogicon, Corpus Christianorum Continuatio Mediaevalis 98* (Turnhout 1991), 3.3; the translation is from D. D. McGarry (trans.), *John of Salisbury: the Metalogicon. A Twelfth-Century Defense of the Verbal and Logical Arts of the Trivium* (Berkeley 1955), 156. John attributes the "multivocal" concept to Boethius; see In categorias Aristotelis Commentaria, in J-P Migne (ed.), *Patrologia Latina*, 221 vols. (Paris 1844–1864), 64.168D (*multivoca sunt quorum plura nomina una diffinitio est, ut est scutum, clypeus…*).

18 J. C. Robertson (ed.), Vita Sancti Thomæ Cantuariensis Archiepiscopi et Martyris, in *Materials for the History of Thomas Becket*, 7 vols. (London 1875-1885), 2.19.301-322; Letters of John of Salisbury, Volume Two, no. 269.

The only polearm mentioned in the Assize of Arms is the *lancea*, but John of Salisbury only uses it three times. In each case it is in reference to a different type of weapon: a couched lance, the spear of King Saul, and the thrown javelin that killed the Emperor Julian in 363.[19] More common references to polearms in John's works are the Latin *hasta*, which is a thrusting spear. He also uses the words *teli*, *pila*, and *iacula*, all of which typically denote thrown spears or javelins; however, in some contexts John is referring to javelins being employed by foot-soldiers in a thrusting manner.

I would argue, however, that the usage of *lancea* in the Assize of Arms is just as vague as in John of Salisbury's works. Although the assize required every freeman to possess a *lancea*, these could not have all been the identical weapon: poorer citizens were extremely unlikely to own a horse, for example, and so would not need the longer, lighter lance preferred for mounted use.[20] Lances themselves were an adaptation from the customary infantry spear: two meters long, of uniform width up and down its length, and tipped with a leaf-shaped iron point.[21] In other words, a lack of specificity exists on the part of both John and the assize, for which we can hardly fault only one party.

Regarding missile weapons, the assize at Le Mans required men carry an *arcus et sagittae*, or bow and arrows. John of Salisbury's terminology is entirely in line with the assize. *Arcus* is the only word he uses for "bow," and it makes five appearances in his writings. The accompanying arrows he calls *sagittae* on several occasions, although at one point he uses *spicului* instead; while this could refer to different types of missiles, the *spiculum* in this case is definitely an arrow because John is writing about the untimely death of King William Rufus in 1100–shot dead with a hunting arrow in the New Forest.[22] When writing more generally about "missiles" or "darts" John uses one of three ambiguous terms: *iaculi*, *teli*, or *missilis*.

Conclusions

As ciphers go, the two assizes from King Henry II's reign can provide only a baseline for determining the accuracy of technological terminology in medieval ecclesiastical sources. Their use is restricted to the Anglo-Norman and Angevin

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19 W. J. Millor, H. E. Butler, and C. N. L. Brooke (eds. and trans.), *The Letters of John of Salisbury, Volume One: the Early Letters* (London 1955), no. 65; Letters of John of Salisbury, Volume Two, no. 176; Policratici, 8.21.

20 B. S. Bachrach, "'A Lying Legacy' Revisited: the Abels-Morillo Defense of Discontinuity", *Journal of Medieval Military History 5* (2007): 154, notes how *lancea* can mean either "spear" or "lance," depending upon context.

21 DeVries and Smith, *Medieval Military Technology*, 11–15; E. Oakeshott, *The Archaeology of Weapons: Arms and Armour from Prehistory to the Age of Cavalry* (Reprint, Woodbridge 1994), 258-259.

22 Policratici, 6.18; E. Mason, *William II: Rufus, the Red King* (Stroud 2005), 223.

realms, and they are best-applied in the eleventh and twelfth centuries because weapon types and terminology changed rapidly in the thirteenth. John of Salisbury himself discusses a range of additional weapons and armors that are never mentioned in the assizes, such as axes, cudgels, daggers, hooks, slings, and mechanical devices such as catapults and battering rams. Moreover, he himself was privy to documents originating outside of northwestern Europe and could therefore appropriate contemporary terms for these items that were common in other locales.

Nevertheless, this brief survey demonstrates that John of Salisbury had, to some extent, a sound knowledge of contemporary military technology. *Lancea*, *clypeus*, *lorica*, *gladius*, and *arcus et sagittae* were all proper military terms in his day. Together with the *equus* in the Le Mans assize, they represent nearly the whole array of an armored, elite soldier in the twelfth century. John employed some of these words frequently and accurately in context. Out of eleven different terms for arms and armor in the assizes, John employs six, for an accuracy rate of fifty-five percent. This is not a bad demonstration of military terminology at all, especially when considering that he had no military training and probably little personal experience with violence until the last decade of his life. His technological terms that do not match those in the assizes are either vague references such as *arma* or outdated words that he took from his Biblical, ancient, and Patristic sources. Therefore, I would argue that John's value to historians researching medieval warfare and military technology should necessarily increase.

Finally, I would suggest that this is a method that can be employed in other areas and periods in early and high-medieval Europe. Whether one is researching the Carolingian Empire or the Crusades, ecclesiastical sources form an important basis for our knowledge of military technology, but they should be checked at every possible turn against governmental record documents such as charters, laws, and financial rolls.[23] The elite men who initiated military campaigns necessarily had more experience with battle, and the scribes who wrote down their dictates and counted their money had motivation to seek greater precision in their terminology. The result of more-careful word-study will be a better knowledge of the tools available to the practitioners of medieval warfare.

[23] For example, a statute of William the Lion of Scotland (1165–1214) that reads, "*habeat equum, habergeon, capitum e ferro, et cultellum qui dicitur dagger*"; see Oakeshott, *Archaeology of Weapons*, 253. Past scholarly efforts in this vein have yielded significant results; see for example D. S. Bachrach, "English Artillery 1189–1307: the Implications of Terminology", *English Historical Review 121* (2006): 1408–30.

Professor Dr.Sc. Vladimir Artamonov (Russia)

La guerre Russo-turque de 1710–1713: un changement de stratégie et de tactique

Ni l'Empire ottoman, ni la Russie au début du XVIIIe siècle, ne cherche pas à se battre entre eux._L'armée russe se sont battus contre les Suédois dans la Baltique._Grand Empire ottoman dans le "roll-back période» de l'Europe_prend une plus grande protection de leurs biens, pas une agression. Les principaux adversaires des Ottomans étaient les Habsbourg et de Venise, qui a remporté en 1699, la Hongrie, la Transylvanie et le Péloponnèse._Après la victoire de Pierre le Grand à Poltava en 1709,_les diplomates français et suédois persuadé Istanbul dans le «expansionnisme russe». Russie possèdent la Pologne, envoyer une flotte dans la mer Noire,_vont se battre dans les Balkans et de faire revivre l'«Empire byzantin».

9 novembre 1710 l'Empire ottoman déclare la guerre à la Russie.

Pierre le Grand élaboré une invasion profonde et rapide des Balkans dans le but de «conquête de l'espace». Il a décidé de compter sur l'aide des chrétiens._On a supposé que l'apparition du roi orthodoxe dans le Danube provoquer un soulèvement en Bulgarie, la Serbie, la Moldavie, la Valachie, et la Grèce._

Par rapport à Eugène de Savoie, Pierre I-er (avec le même courage) différaient de plus de prudence et d'une volonté de prendre en compte le maximum de chances._

En Russie connaissait de l'expérience autrichienne: ils reflétaient les janissaires par armes à feu pour les empêcher de combat au corps à corps. En Russie savait que les Autrichiens mettre une partie du hussard hongrois et Serbes sur les flancs de l'infanterie._Dragons russes dans la bataille descendus de leurs chevaux, et des irréguliers se cachant derrière l'infanterie. Enseigner tactiques autrichiens de combat équestre en Russie a commencé seulement en 1723.

Blitzkrieg plan pour le Danube, la Crimée et du Kouban était risqué._On savait que le numéro de l'armée ottomane est d'environ 118 400 personnes. Istanbul armée formée à l'image de 1683 et a présenté une augmentation musulmans de Russie, qui vivait autour de la mer Caspienne. Devlet Giray khan a été chargé de brûler cour à Voronej.

La capacité de combat de l'armée russe à cette époque était inférieur à son apogée dans les 1770-1814 ans. N'ont pas été créés quantités suffisantes de nourriture,_chemin inexplorée de la région des Balkans et des ressources en eau._

Actions défensives prévu en Pologne, d'Azov et de Taganrog. Troopers de la mer à la Crimée n'a pas été fournie._Moscou a offert des Chevaliers de Malte par l'argent russe pour compléter leur flotte de quatre navires et de faire un raid à l'Archipel égéen.

Pas de chrétiens rébellions eu dans le passage des Ottomans par la Bulgarie, la Valachie et la Moldavie._Seulement la révolte les Serbes Monténégro et en Herzégovine bloqué Musulmans de Bosnie._Cependant, l'expédition russe vers le Sud a été grandement compliquée par les attaques des Tatars.

Dans la bataille sur les Prut 8–10 juillet 1711 opposants se méfient les uns des autres. Russe sur le périmètre d'une longueur triangle cassé de 7,5 km,_plus de murets et de frondes mettre 30.846 fantassins et 6692 dragons à pied. A l'intérieur du camp se cacha 3000 de Cosaques et 6–7000 de cavaliers moldaves._

L'équipement technique et le cycle de tir de l'infanterie et de l'artillerie russe était mieux et les Turcs ont perdu 7000 personnes._Traditionnels frontaux janissaires attaques ont été repoussées par le feu des fusils et d'artillerie de 122 canons. Amateur dans les affaires militaires, le grand vizir Mehmed Baltadzhi pas mappé sur des attaques de diversion ailleurs. Commandement turc ne se casse pas la défense russe._Sipahi encerclant, cri effrayé, flèches et viennent rarement à la ligne russe. Tatar cavalerie était impuissant, même face à des défenses faibles et effrayés «combattre le feu.» Tir à l'arc n'était pas assez efficace.

Dans la bataille de Poltava en 1709, Pierre le Grand a montré miracles de bravoure. Toutefois, le total blocus 10 Juillet 1711, bombardements des centaines de canons, temporairement plongé Pierre Ier dans un état de choc. Chef survécu au désespoir le plus terrible dans leur vie._La mort de l'armée, avec le monarque, la reine, l'appareil gouvernemental, de la trésorerie, le général-feld-maréchal, tous les gardes, lui semblait indiquer une catastrophe._Chef de oublia sa capacité à inspirer les hommes à une impulsion victorieuse. Il n'a pas osé envoyer l'infanterie à l'attaque.

Les pertes au combat russes tués et blessés étaient moins que les Turcs._Tués, faits prisonniers, blessés et disparus 2872 personnes. Mort de maladie a eu un montant égal._La bataille sur le Prout sur les pertes comparables à la bataille de Vienne en 1683, il ya perte de forces ottomanes s'élève à 10 mille morts, et Christian forces alliées – deux mille morts._Pour sortir de l'état de siège, Pierre le Grand entra en négociations avec la commande turque._

Il était prêt à renoncer non seulement les gains dans le sud de 1695–1696, мais aussi sur les résultats d'une lutte de 10 ans pour la mer Baltique. Horreur de Pierre je n'ai pas infecter l'armée. L'armée était docile, robuste et prêt à sacrifier. Entraînement au combat n'était pas inférieur à celui des années, 1708–1710. Combattants se sont battus courageusement.

Bataille du Pruth sur Juillet 8–10. 1711. fut une victoire non pas russe ou turc. Les deux parties ont cherché à mettre fin au conflit le plus rapidement possible._11 juillet, Pierre le Grand lui-même entièrement récupéré et rendu une ordonnance – de faire une percée, si les Turcs exigent la reddition inconditionnelle.

Russes "cadeaux" d'un montant de 250 mille roubles ne sont pas la cause principale de la "Paix Eternelle» avec la Turquie Juillet 12, 1711. La paix a été faite trois jours seulement._Azov a été retourné Baltadzhi Mehmed en seulement deux mois._

3 juillet 1711 20 000 Kalmouks avec six mille soldats P.M.Apraksin est passé de Tsaritsyne._Cette campagne, qui a également été suivi par les Circassiens et les Kabarde, se termina par la ruine de la Petite Horde Nogaï. En Valachie s'empara la forteresse de Braila._Plan pour s'emparer de la Crimée s'est terminée sans résultat. Marine turque près de Taganrog ne pouvait rien faire. 25 juillet flotte turque est sorti d'Azov.

Sous le prétexte que la Russie n'a pas laissé cette fois dans une ville la garnison turque_Istanbul à l'automne 1711 a de nouveau déclaré la guerre.

En 1712–1713, la stratégie de Pierre le Grand est complètement remplacée. Il a développé un plan détaillé guerre purement défensive dans le sud. Ligne défensive a été construit autour de Kiev. La perte potentielle de Kiev n'a pas été exclue. Même commencé à renforcer la défense de Moscou. La nouvelle technologie militaire fournie bataille évasion avec l'ennemi, mis le feu à la steppe et de la nourriture avant que l'ennemi avance. En supposant que le conflit ira plus d'un an. 2 janvier 1712 Azov a reçu les Turcs, éclaté Taganrog et deux forts dans le Bas-Dniepr_et 5 Avril, 1712, un armistice est conclu pour 25 ans._L'Empire ottoman ont été cédées à des steppes à l'ouest de Zaporozhye.

En 1712–1713, les efforts de la Russie visaient à la conquête de la mer et la terre de la Finlande._Istanbul a exigé le retrait complet des troupes russes de la Pologne, et 6 Novembre, 1712 pour la troisième fois déclaré la guerre. Pierre a ordonné toute la frontière avec le Khanat de Crimée pour aller sur la défensive. Au printemps de 1713 réunis 50.000 agriculteurs renforcer Kiev et d'autres villes ukrainiennes._A rendu une ordonnance de ne pas tenir toute action hostile contre les Turcs et Tatars_et de ne pas poursuivre les nomades attaquants de la frontière russe.

Raid réussi des Tatars de Crimée et Nogaï en 1713 leur a permis de se qualifier pour la reprise du royaume russe de paiements annuels d'un montant de 13.500 roubles par an. Toutefois, la décision «demande de Khan» a été reportée pour l'avenir.

13 juin 1713 à Edirne a été rouvert 25 ans trêve._Aujourd'hui, la Russie a perdu la steppe orientale espaces Zaporozhye. Toutefois, la menace de la guerre russo-turque était dans l'air jusqu'à ce que la démarcation des frontières nouvelles de la mer Noire en Juillet 1714.

Pour la victoire sur la Suède, Pierre le Grand a fait don d'énormes sommes d'argent et de vastes zones dans le sud._La Russie a perdu l'accès à la mer d'Azov, toute la flotte d'Azov, les chantiers navals et la construction navale dans la région de Voronej.

Cependant, en allant à la direction du Danube, la Crimée et le Caucase a ouvert une nouvelle étape de la politique russe dans les Balkans_et identifié tous les composants de l'Est Question XVIII–XIX siècles.

Dr. Sandrine Picaud-Monnerat (Switzerland)
L'artillerie légère en campagne au long du XVIIIe siècle : nouvelles réflexions

Plan de la communication

I. Artillerie « légère » : de quoi parle-t-on ?

A. L'artillerie légère dans la pensée de quelques théoriciens de la petite guerre

B. Le contexte : les contraintes techniques et politiques, et les systèmes successifs (en France)

C. Controverses autour du canon à la suédoise et des pièces d'accompagnement des bataillons

II. Blocages tactiques, réticences et solutions

A. Dans la petite guerre : la volonté de concilier artillerie et effet de surprise

B. Dans les marches et les batailles : la volonté d'augmenter la capacité de manœuvre

III. Le canon léger en campagne

A. Les conditions d'emploi : similitudes entre la bataille et la petite guerre

B. Traces de l'emploi de l'artillerie légère dans la bataille

C. Les pièces légères dans la tactique de petite guerre : une synthèse théorique et pratique

Introduction

Tout au long du XVIII^e siècle, on chercha, dans les principales armées européennes, à alléger les pièces d'artillerie pour les rendre plus mobiles et plus maniables, et à les standardiser pour en accroître l'efficacité. Après les Autrichiens au milieu du siècle, on reconnaît à la France un rôle de 'leader' en la matière à partir des années 1760, selon Jeremy Black, avec l'adoption du système d'artillerie de Gribeauval[1]. Ces efforts aboutirent à un rôle plus grand de l'artillerie dans la bataille. Or, parallèlement à un allégement des systèmes d'artillerie en général, apparurent dans plusieurs pays d'Europe des pièces très légères ; pour la France, l'exemple le plus marquant fut l'introduction du canon dit « à la suédoise », qui fut employé, à partir du milieu du siècle, à la fois dans les batailles et dans ce que l'on appelait à l'époque la « petite guerre », guerre de surprises et d'embuscades, qui prenait place au quotidien en marge des sièges et des batailles.

Après un panorama de ce que l'on entendait au XVIIIe siècle sous le vocable d' « artillerie légère » et une évocation des difficultés et contraintes auxquelles

[1] Jeremy Black, *La guerre au XVIIIe siècle* (traduit de l'anglais et revu par Jacques Vernet), Paris, éditions Autrement, 2003 [éd. originale en anglais parue en 1999], p. 163.

les techniciens, les tacticiens et les politiques durent faire face dans ces efforts d'allégement des pièces d'artillerie, la communication montrera les ressorts de la volonté d'allégement de l'artillerie : la recherche de la mobilité, pour plus de rapidité ou de manœuvre, selon les cas. Enfin, dans une troisième partie, plus axée sur des études de cas, on tentera de rassembler d'une part les traces d'emploi de l'artillerie légère dans quelques batailles à travers l'historiographie. On montrera, d'autre part, en quoi, en marge des batailles, la pratique de la petite guerre et la réflexion à son sujet ont été infléchies par l'emploi du canon plus souvent que l'on aurait pu l'imaginer. Le présent article offre un approfondissement et de nouvelles pistes dans le cadre d'une réflexion déjà bien entamée – pour ce qui concerne le rapport entre artillerie et petite guerre –, à la fois dans un article[2] et dans notre livre sur la petite guerre[3].

I. Artillerie « légère » : de quoi parle-t-on ?

A. L'artillerie légère dans la pensée de quelques théoriciens de la petite guerre

Le comte de La Roche, alors ancien colonel de dragons, fut en 1770 le premier des théoriciens de la petite guerre connus de nous à accorder une grande place à l'artillerie dans sa réflexion[4]. Son traité propose aux jeunes officiers – public avoué de la plupart des publications similaires – « les principes de la petite guerre », en appliquant ces principes à un corps fictif de troupes légères de 2500 hommes (1600 à pied et 900 à cheval)[5]. Dans le chapitre sur les approvisionnements nécessaires à un tel corps de troupes légères, La Roche ne consacre pas moins du tiers de son propos (7 pages sur 21) à l'artillerie, sachant que ce chapitre ne traite pas seulement des munitions de guerre, mais de bien d'autres matériels destinés à accompagner le corps, sans compter les pétards, les grenades et les chariots de munitions : des pelles, des pioches, des haches portées par les hommes, et des chariots portant la pharmacie, des échelles et des planches (pour réaliser des ponts), et deux bateaux plats (pour le cas où les ponts seraient impossibles à construire)[6]. Or, il écrit dans ce chapitre :

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2 Sandrine Picaud, « Artillerie et art de la petite guerre : un long cheminement », *Carnet de la Sabretache*, nouvelle série, n° 148, juin 2001, p. 46–50 [réimprimé dans *L'Objectif*, bulletin trimestriel de la Fédération nationale de l'artillerie, Paris, janvier 2002, n° 99, p. 38–46].

3 Sandrine Picaud-Monnerat, *La petite guerre au XVIIIe siècle*, Paris, Economica, 2010, p. 257–307 : « Petite guerre et progrès technique : le cas des armes à usage du corps entier (théorie et pratique) ».

4 Le premier traité de petite guerre paru en Europe de façon autonome (sans être seulement un chapitre parmi d'autres dans un ouvrage) fut publié en France en 1752 : Armand-François de La Croix, *Traité de la petite guerre pour les compagnies franches*, Paris, Antoine Boudet, 1752.

5 Comte de La Roche, *Essai sur la petite guerre, ou Méthode de diriger les différentes opérations d'un Corps de deux mille cinq cens Hommes de Troupes légeres, dont seize cens d'Infanterie & neuf cens de Cavalerie*, Paris, Saillant et Nyon, 1770, deux tomes. Citation dans le t. I, p. 3.

6 *Ibid.*, t. I, chap. II, « Des munitions de guerre, et autres approvisionnemens nécessaires », p. 21–43.

« Puisqu'on donne, depuis quelques années des pièces de canon à chaque régiment, pourquoi n'en donneroit-on pas au corps dont je parle ? Certainement il aura bien plus d'occasion d'en faire usage dans le cours d'une campagne. Il est vrai que les canons confiés aux régimens sont rarement exposés à l'incident d'être pris par les ennemis, parce qu'il n'est point ordinaire que ces régimens soient fort isolés. D'ailleurs, étant en ligne, ils sont à l'abri des insultes des troupes légeres, et ce n'est, pour ainsi dire, que dans un jour de bataille, qu'ils auroient à craindre de perdre leurs canons : cependant je ne crois pas que quatre ou six pièces de canon soient fort embarrassantes pour un corps de deux mille cinq cens hommes, d'autant plus que les services infinis qu'il peut en attendre, engageront toute la troupe à concourir avec empressement à tous les soins du transport, dans les occasions même où il deviendroit plus pénible, par la difficulté des chemins, ou par tout autre obstacle. »

D'emblée, on constate que le propos de La Roche nous permet d'envisager la question de l'artillerie légère en campagne de façon globale. C'est en cela qu'il est particulièrement intéressant d'en faire en quelque sorte un fil directeur pour plusieurs des chapitres du présent article. Dans ces quelques lignes sont ramassés plusieurs des points d'achoppement qui ont donné lieu à des débats au long du XVIIIe siècle : non seulement l'usage de l'artillerie à la petite guerre (les canons risquant de ralentir les opérations), mais l'usage de l'artillerie en accompagnement des bataillons ou des régiments. Et le problème de la perte des canons un jour de bataille, qui a partie liée à la mobilité, donc aussi à la légèreté des pièces…

C'est après la guerre de Sept Ans (1756-1763) que des écrivains militaires recommandent l'usage de pièces de canon (légères ou très légères) à la petite guerre d'une part, et en accompagnement des corps de troupes légères d'une manière générale. Tous les théoriciens de la petite guerre ayant servi en France et publié dans les années 1760-1780 abordent le sujet (il s'agit Ray de Saint-Geniès, de La Roche, de Vernier, de Grimoard et de Lacuée de Cessac), de même qu'un tacticien plus généraliste comme Joly de Maizeroy[7]. Les théoriciens de la petite guerre qui publièrent leur traité avant la guerre de Sept Ans ou au début de celle-ci, dans les années 1750, ne parlent pas, ou très peu, de l'artillerie. Cette chronologie n'est pas anodine. Elle est liée à l'évolution de la masse des pièces de canon des systèmes d'artillerie successifs adoptés en France, comme nous le verrons en 2e partie ci-après.

Qu'entend-on par « artillerie légère » dans les traités de petite guerre ? Le comte de La Roche (1770) souhaite voir accompagner son corps de troupes lé-

[7] Saint-Geniès, *L'Officier partisan* (1766), t. I, p. 143–144 (pour l'attaque d'une maison) ; La Roche, *Essai*… (1770), t. I, p. 22 ; Vernier, *Militärische Anweisung*... (1773), § 71, « Bewaffnung und Rüstung eines Jäger Corps oder anderer leichten Truppen » ; Grimoard, *Traité*... (1782), p. 19–20 ; Cessac, *Le guide des officiers*… (1785), t. II, p. 45.

gères de quatre pièces d'un calibre de 8 livres de balle, ou de six pièces de 6[8]. Notons que, à l'époque où il écrivit, les pièces de 6 n'existaient pas dans le système d'artillerie de campagne alors en usage en France. Ray de Saint-Geniès (1766) va aussi jusqu'à recommander des pièces de 8, à côté de pièces de 4. Les pièces de 4 et de 8 étaient les deux calibres les plus légers des systèmes d'artillerie de campagne successifs en France à partir de 1732, qui en comptaient cinq, comme on le verra ci-après. Mais Grimoard récuse le bien fondé de pièces d'artillerie de campagne pour accompagner des régiments de troupes légères. Il souhaite voir chaque régiment de troupes légères doté de deux pièces tirant des balles d'une livre et demie. Peut-être fait-il allusion là au canon « à la Rostaing », une pièce de montagne qui fut en service dans l'armée française pendant la guerre de Sept Ans. Cessac, quant à lui, parle de pièces « très légères », sans citer de calibre. Le manque de précision des calibres dans les sources est un problème auquel est confronté le chercheur qui veut explorer la place de l'artillerie légère – et définir cette artillerie légère – dans les guerres et dans la pensée militaire du XVIIIe siècle. Nous y reviendrons à propos de la bataille. Il faut s'en remettre alors à des indices. Ici, Cessac précise que les pièces très légères dont il parle seraient portées sur un brancard par quatre soldats, ou mises chacune sur un mulet (ou tirées par un ou deux chevaux ; un à l'ordinaire ; deux pour suivre la cavalerie dans tous ses mouvements). Or, les canons à la Rostaing pouvaient précisément être portés, si c'était nécessaire, par quatre hommes[9].

B. Le contexte :
les contraintes techniques et politiques, et les systèmes successifs (en France)

Prenons de la hauteur pour caractériser les évolutions que connut l'artillerie en Europe au XVIIIe siècle, dans le sens de l'allégement.

Parler de « l'allégement » global du parc d'artillerie renvoie à deux réalités :

L'adoption et la généralisation, dans l'armée, de pièces légères, c'est-à-dire de petit calibre, c'est-à-dire encore, lançant des boulets plus petits. Dans le système d'artillerie de campagne et de siège français à partir de l'adoption du système de Vallière en 1732, la pièce de 4 était la pièce la plus petite. Dans les premières campagnes de Flandre de la guerre de Succession d'Autriche (1744–1748), le maréchal de Saxe, commandant les troupes françaises à partir de 1745[10], choisit de privilégier pour son armée, au titre des pièces de campagne, les plus petites, ces pièces de 4 (l'équipage de campagne de l'armée française comprit, entre 1744 et 1747, suivant les années, de 70 à 120 pièces de 4 – 120 pour 1744 -, en y comprenant à

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8 Rappelons que le calibre, ici, désigne le poids des boulets lancés par la pièce, exprimé en livres.

9 Picard, *L'artillerie française au* XVIII*e* *siècle* (1906), p. 70.

10 En 1744, le maréchal de Noailles commande l'armée du roi et le maréchal de Saxe commande une armée de couverture ; à partir de 1745 et jusqu'à kla fin de la guerre en 1748, le maréchal de Saxe fut le commandant en chef de l'armée française sur le théâtre d'opérations principal, en Flandre.

la fois les pièces du système de campagne de Vallière, et les pièces plus légères « à la suédoise », dont nous reparlerons ci-après)[11]. Cette généralisation de pièces de petit calibre était utile pour pouvoir mener du canon au quotidien en de nombreuses actions de guerre.

Les efforts d'allégement de toutes les pièces, à calibre égal, en allégeant la masse des tubes, sans toucher au poids du boulet ni, donc, à la portée de la pièce. La portée utile d'une pièce de 4 du système de Vallière était par exemple de 300 mètres (F. Naulet) ; celle d'une pièce de 12 était par exemple de 800 mètres environ. Ce maintien de la portée tout en allégeant les pièces était utile pour augmenter la maniabilité des pièces sur le champ de bataille lors de la canonnade initiale, sans amoindrir l'efficacité.

Les deux types de recherches et d'expériences ont été menés conjointement.

Quant au 2e point, les artilleurs ont été confrontés à des problèmes techniques qui ont été progressivement résolus (risque d'éclatement des tubes – si on en diminue l'épaisseur -, du fait de la pression exercée par la poudre au moment de la mise à feu pour l'expulsion du boulet…). La chronologie des progrès techniques au XVIIIe siècle qui ont permis la diminution de la charge de poudre utilisée, puis de l'épaisseur et de la longueur des tubes, donc de la masse des pièces, est aujourd'hui bien connue[12].

Appuyé sur ces progrès techniques, le système de Gribeauval finit par emporter en France la décision politique, et fut mis en place en 1765. Les pièces voyaient leur longueur et l'épaisseur des tubes diminués ; le nouveau système gardait trois calibres pour les pièces de campagne, à savoir 4, 8 et 12, et prévoyait des pièces de siège de 16 et de 24. Du fait de la plus grande mobilité de l'artillerie, une coopération plus étroite était possible entre l'infanterie et l'artillerie, ce qui motiva la poursuite de la réflexion sur les canons d'accompagnement de l'infanterie, avec un succès mitigé toutefois.

Il reste à dire, pour mettre ces évolutions en perspective, que les recherches dans le domaine de la mobilité de l'artillerie n'étaient pas nouvelles. On avait imaginé par exemple aux XVIe et XVIIe siècles des canons revêtus de cuir cousu (à l'âme renforcée de barres de fer et d'un étui en bois)… Il existait, au XVIIe siècle, des pièces d'un calibre inférieur à 4. Mais elles étaient longues et lourdes. Il reste aussi à évoquer les expériences faites ailleurs en Europe. Avant les Français, Prussiens et Autrichiens, à l'exemple de la Suède, avaient allégé leur matériel

[11] Naulet (Frédéric), *L'artillerie française (1665–1765). Naissance d'une arme*, Paris, Economica, 2002, p. 324, « Tableau comparatif de la composition des équipages d'artillerie de campagne (1672–1761) ».

[12] Voir, pour une explication claire : Mac Neill, *La recherche de la puissance…* (1992), p. 187–188. Nous donnons dans notre livre sur la petite guerre un résumé pratique de l'enchaînement de ces progrès techniques successifs : Sandrine Picaud-Monnerat, *La petite guerre au XVIIIe siècle*, 2010, *op. cit.*, p. 296.

d'artillerie. C'est grâce aux missions à l'étranger confiées à Gribeauval par le roi de France, en Prusse puis en Autriche, que l'artillerie légère nouvelle mise en place par Frédéric II fut plus amplement connue…

C. Controverses autour du canon à la suédoise et des pièces d'accompagnement des bataillons

A partir des années 1740, à côté du système de Vallière, système de campagne « classique », apparurent en France des pièces plus légères, d'un calibre de 4, dites « canons à la suédoise ». Vallière les utilisa déjà en Bohème en 1742. Ces pièces pesaient entre 600 et 660 livres, et étaient aisément transportées sur leur affût par trois chevaux, alors que quatre chevaux traînaient péniblement les pièces de 4 du système de Vallière correspondantes. Les canons « à la suédoise », dont l'utilisation fut laissée à l'initiative des généraux durant la guerre de Succession d'Autriche, donnèrent satisfaction en Bohême et en Bavière ; si bien que les régiments mixtes de troupes légères créés à partie de 1744 furent dotés de deux pièces à la suédoise. Le premier fut le régiment des arquebusiers de Grassin, créé en janvier 1744.

Ces pièces à la suédoise devinrent canons d'accompagnement de tous els bataillons d'infanterie à partir de 1757… Mais leur efficacité dans la guerre de Sept ans fut sujette à controverse, si bien que, au cours des décennies suivantes, leur utilisation comme canon d'accompagnement fut d'abord supprimée, avant d'être rétablie…

A côté des pièces à la suédoise, d'autres canons très légers furent introduits dans l'armée française : on a parlé déjà du « canon à la Rostaing », ci-dessus…

II. Blocages tactiques, réticences et solutions

A. Dans la petite guerre : la volonté de concilier artillerie et effet de surprise

Recherche de : *légèreté*, *maniabilité*, *vitesse de tir*.

Pourquoi était-ce particulièrement important à la petite guerre ?

Employer de l'artillerie dans des opérations de petite guerre nécessitait que les pièces fussent compatibles avec l'effet de surprise qui était l'essence de cette manière de faire la guerre. Or, l'effet de surprise, conditionné par la capacité à cacher les objectifs poursuivis et les marches d'approche, dépendait beaucoup de la rapidité d'exécution des actions. Il s'agissait d'arriver sur l'ennemi avant qu'il ait pu s'y préparer ; il s'agissait aussi de pouvoir se retirer le plus promptement possible après une attaque.

Il fallait donc, d'une part, pouvoir transporter rapidement le canon, pour que la marche des partis de guerre vers le lieu de l'action ne fût pas ralentie par celle de l'artillerie ; la facilité du transport dépendait de l'allégement de la masse des pièces mais aussi de l'ingéniosité dans le mode de transport des pièces, en particulier pour les faire passer par des parcours difficiles, par exemple des chemins de montagne.

Il fallait, d'autre part, que le canon pût concourir à la rapidité d'exécution de l'action, pour contribuer efficacement à l'exploitation de l'effet de surprise. Ici intervient la recherche de la rapidité du tir des pièces.

C'est en partie l'expérience à la guerre de montagne qui a suscité la réflexion de certains auteurs sur les moyens d'augmenter la mobilité des pièces d'artillerie légère. Toutefois, les opérations en montagne étant souvent secondaires dans les guerres du temps, les innovations en matière d'artillerie de montagne étaient souvent ponctuelles, sans solution de continuité.

Un auteur militaire, Sionville, s'est particulièrement intéressé, dans un ouvrage en plusieurs volumes intitulé *Œuvres militaires*, aux conditions propices à l'usage de l'artillerie légère dans la petite guerre, et dans la guerre de montagne, puisque les méthodes de cette dernière ont grand rapport avec la petite guerre. Ayant lui-même combattu dans le comté de Nice durant la guerre de Succession d'Autriche (1740–1748), il base sa réflexion sur ses propres observations et son expérience à la guerre, et à la guerre de montagne en particulier. Par ailleurs, tout naturellement, sa réflexion sur l'artillerie légère porte essentiellement sur le canon à la suédoise, puisque c'est l'introduction de ce canon en France qui a permis l'utilisation de l'artillerie par les corps de troupes légères.

Certaines des idées présentées par Sionville dans son livre sont neuves ; d'autres ont été éprouvées par son expérience dans la guerre de Succession d'Autriche. Pour ce qui est du transport, Sionville assure s'être servi dans le comté de Nice, en 1747, d'un affût pour canons à la suédoise fort léger monté sur roulettes[13]. Un mulet pouvait selon lui porter deux de ces affûts sans faiblir. Le principe de l'affût à roulette n'était cependant pas nouveau.

En revanche, en vue de résoudre les contraintes liées à la montagne, Sionville présente fièrement à ses lecteurs un moyen de transport des canons à la suédoise qu'il dit être de son invention. Il s'agit d'un brancard transporté par deux mulets, perpendiculairement, la bouche du canon en haut[14]. C'est là la nouveauté de son système. Le brancard est composé de deux pièces de bois longues de 10 pieds (3,20 m. environ). Entre ces pièces de bois, deux traverses, attachées au brancard par des boulons, et comportant une entaille en arrondi à l'intérieur, enserrent le canon ; celui-ci repose sur les entailles des traverses par ses tourillons, la culasse vers le bas. Il ne faut que 45 secondes pour décharger le canon de son brancard, et autant pour le mettre sur son affût : en tout, une minute et demie[15].

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[13] Sionville (capitaine d'infanterie), *Œuvres militaires*, dédiées à Son Altesse Monseigneur le Prince de Bouillon, fils de Son Alt. Sér. Mgr. le Prince de Turenne, Charleville, Pierre Thesin, 1756, 4 vol., t. II, livre XIII, § 4, « Nouvel affût de Pièce à la Suédoise, pour en faire usage dans les Montagnes », p. 281–283.

[14] Sionville, *op. cit.*, t. II, p. 276–277.

[15] Après Sionville, Le Blond évoque en 1761, dans sa typologie des pièces d'artillerie, « des pièces de 4, qu'on appelle de brancard & à dos de mulet, dont on se sert dans les pays de montagnes,

A côté de la légèreté, l'autre atout du canon à la suédoise était sa vitesse de tir. En conditions réelles, le canon à la suédoise tirait entre 3 et 8 coups par minute[16]. Il est intéressant de se pencher sur les propositions de Sionville pour en accélérer encore la vitesse de tir, parce qu'il insiste sur quelques points : d'abord, un usage systématique de la hampe double, faisant office, à un bout d'écouvillon, et à l'autre de refouloir (c'était en usage, à l'occasion, pour les pièces d'un calibre inférieur à 16)[17]. Ensuite, il faut selon lui exercer les hommes à placer lestement les pièces sur leurs affûts, à mettre plusieurs pièces en ligne, à faire des quarts de conversion et des demi-tours, « manœuvres essentielles pour un Combat en avant ou en retraite »[18]. Sionville recommande encore l'usage de la « vis de pointage », pour accélérer l'évaluation d'une visée précise. Ce nouveau système fut inventé en 1747[19]. Auparavant, on utilisait des leviers et des coins de mire. C'est précisément en 1747 que Sionville dit s'être servi d'un affût de pièce à la suédoise muni d'une vis de pointage, le même affût qui était aussi muni de roulettes.

B. Dans les marches et les batailles : la volonté d'augmenter la capacité de manœuvre

Augmenter la mobilité des armées en général permettait un retour à l'offensive et, donc, l'allégement de l'artillerie participa à la réflexion en vue de la résolution du problème du blocage tactique de la première moitié du XVIIIe siècle, ce dernier étant désormais bien connu et analysé par les historiens…

Augmenter la mobilité de l'artillerie sur le champ de bataille permettait d'augmenter la capacité de manœuvre et, aussi, de pouvoir garder ses canons en cas de retraite, au lieu de les abandonner à l'ennemi…

III. Le canon léger en campagne

Partir de la réflexion du comte de La Roche en matière d'emploi de l'artillerie légère permet d'emblée une vision relativement globale, avons-nous dit au début de cet article. Il y a au moins deux autres raisons :

C'est un théoricien de la petite guerre. Or, l'emploi de l'artillerie à la petite guerre, sur le terrain comme dans la réflexion théorique, est une des nouveautés de l'art de la guerre du XVIIIe siècle, comme on le verra en troisième partie ci-dessous – une nouveauté dans la nouveauté, pourrait-on même avancer, si tant est

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où les passages sont difficiles, pour le transport de l'artillerie… ». Cf. : Guillaume Le Blond, *L'Artillerie raisonnée*, *op. cit.*, p. 69.

16 Voir les différents éléments du débat sur la vitesse de tir du canon à la suédoise, et les références, dans : Sandrine Picaud-Monnerat, *La petite guerre au XVIIIe siècle*, *op. cit.*, p. 274–275.

17 Sionville, *op. cit.*, t. II, p. 241.

18 *Ibid.*, p. 246.

19 John Childs, *Armies and Warfare in Europe : 1648–1789*, New York, Holmes and Meier, 1982, p. 109–110.

que la réflexion sur la petite guerre elle-même intervint seulement vraiment dans la seconde moitié du XVIIIe siècle.

Au surplus, aborder l'artillerie légère par le biais des théoriciens de la petite guerre, c'est être sûr que l'on va parler d'artillerie légère ; c'est en effet seulement de celle-là qu'il est question à la petite guerre comme dans toutes les autres opérations où intervenaient les troupes légères, ces spécialistes de ladite petite guerre. Or, trop souvent, les sources sont évasives quant à la spécification du calibre des pièces, ce qui complique singulièrement l'étude, notamment pour le rôle de l'artillerie légère dans la bataille, c'est pourquoi nous parlerons de « traces », en 2e partie, ci-après.

A. Les conditions d'emploi : similitudes entre la bataille et la petite guerre

==> Engagement du corps de troupes légères de La Roche en bataille pour un combat particulier

B. Traces de l'emploi de l'artillerie légère dans la bataille

Dans les efforts d'allégement des pièces d'artillerie au long du XVIIIe siècle, il faut préciser qu'il ne s'est pas agi de se départir des pièces de calibre moyen de l'artillerie de campagne, dont on avait besoin pour le tir à longue portée dans la bataille. Les pièces de 12 sont celles qui ont vu leur importance croître le plus dans la bataille, au fil de l'importance croissante de l'artillerie en général dans la bataille au long du XVIIIe siècle, du fait de la plus grande capacité de manœuvre liée à l'allégement des tubes…

Mais c'est la place de l'artillerie plus légère dans la bataille que nous voulons envisager ici, parce que c'est un sujet qui n'a pas encore été traité de façon synthétique (peut-être faute de précision des sources ? peut-être parce que son rôle, pris isolément, fut le plus souvent secondaire ?), et parce que c'est le type d'artillerie qui fut utilisé aussi dans la guerre du quotidien de l'armée, et envisagée comme telle par les théoriciens de la petite guerre que nous avons étudiés. De fait, c'est un théoricien de la petite guerre, le comte de La Roche, qui fait sentir d'un ton presque emporté l'utilité de l'artillerie dans la guerre en général et dans la bataille en particulier, pour faire sentir son rôle, aussi, à la petite guerre : « *Depuis long-tems c'est le canon qui fait la guerre et qui gagne des batailles ; c'est le canon qui perce les murs, qui renverse les portes, qui brise les ponts, et qui s'oppose impérieusement à l'audacieuse approche des ennemis* »[20].

Si on a pu utiliser de l'artillerie légère dans les batailles, c'est que plusieurs de celles-ci, à partir du milieu du XVIIIe siècle, devinrent de plus en plus des affaires de postes. Ce que le prince de Ligne retient des batailles de Rocoux (11 octobre 1746) et de Lawfeld (2 juillet 1747) dans le catalogue des livres de sa bibliothèque, est éclairant à cet égard. Evoquant le maréchal de Saxe, il parle de

[20] La Roche, *Essai*… (1770), t. I, p. 21.

« …ses tueries des villages de Lawfeldt et à Rocoux. »[21] Ce sont des résumés pour le moins lapidaires. Le prince de Ligne en est coutumier dans ses commentaires de livres ; mais le caractère expéditif ici est un avantage, il dit un trait saillant des batailles en question.
==> Je détaillerai ensuite, entre autres exemples, l'emploi de quatre pièces à la suédoise à Fontenoy…
==> Je montrerai le rôle que le comte de La Roche assigne à l'artillerie légère quand son corps de troupes légères est mis en bataille, pour un combat de facture classique contre l'ennemi.
==> Je montrerai enfin, en contrepoint, la place que Frédéric II, le roi de Prusse, assigne à l'artillerie légère dans quelques-unes de ses instructions militaires destinées à ses généraux.

C. Les pièces légères dans la tactique de petite guerre : une synthèse théorique et pratique

La multiplicité des occasions où le canon pouvait être utilisé est le meilleur argument des théoriciens de la petite guerre pour leur emploi. D'abord, le canon peut arrêter les ennemis au passage d'une rivière, si l'on tire d'une berge à l'autre, écrit La Roche[22] ; les « *foudroyer* » en surplomb, lorsqu'ils sont postés à l'entrée d'un défilé ; chargé à mitraille et caché au bord d'un chemin, le canon surprend les ennemis qui doivent y passer[23]. Saint-Geniès évoque le rôle du canon pour la défense d'un fourrage ou celle d'un convoi[24]. De nuit, de l'avis de La Roche, si l'ennemi défend l'entrée ou l'issue d'un défilé que l'on doit emprunter dans une retraite, c'est toute l'artillerie qu'il faut employer contre lui. Et lorsque le passage est dégagé, cette artillerie doit franchir le défilé en restant au centre de la troupe, pour plus de sûreté[25]. Si, après que le partisan a attaqué et a pris les équipages de l'ennemi, celui-ci s'avise de le poursuivre, le premier peut également faire usage du canon contre lui[26]. Le canon a encore sa place dans un combat particulier du corps en bataille rangée[27].

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[21] Prince Charles-Joseph de Ligne,…, p. 323. Pour comprendre le contexte de l'exclamation abrupte du prince, voici l'article complet, précédé du livre auquel il se rapporte :
« *Supplément aux Rêveries*, par le baron de P. N. La Haye, 1757, 1 vol. in-12.
Supplément est mal dit. Ce sont des excellentes réflexions sur les Rêveries. C'est une récapitulation très bien faite d'un ouvrage que, plus je lis, et plus je le trouve excellent. Comme j'en ai parlé ailleurs, je me contente de dire qu'il fait plus pour la gloire de ce grand Général, que la bataille d'un malade désespéré à Fontenoy, où il auroit dû être jetté dans l'Escaut, et ses tueries des villages de Lawfeldt et à Rocoux. »
http://www.chjdeligne-integral-34melanges.be/htm/textes.html

[22] La Roche, *Essai*... (1770), t. I, p. 26, et t. II, p. 141.

[23] *Ibid.*, t. I, p. 26.

[24] Saint-Geniès, *L'Officier partisan* (1766), t. II, p. 160, p. 202-203.

[25] La Roche, *Essai*… (1770), t. II, p. 170.

[26] *Ibid.*, t. I, p. 257.

[27] T. II, p. 61-62 et 174.

C'était surtout dans l'attaque et dans la défense d'un poste, semble-t-il, que le canon pouvait être utile (mais de jour seulement, pour son emploi dans l'attaque). Si cette destination n'est que l'une de celles dont parle La Roche[28], elle est majoritaire chez les théoriciens qui furent publiés postérieurement, Grimoard et Lacuée de Cessac ; même si Cessac est plus réservé que Grimoard sur l'usage du canon dans l'attaque[29]. D'une manière générale, puisque le frein à la présence du canon à la petite guerre tenait au retard dans le déplacement des soldats, son utilisation dans l'attaque et la défense des postes était logique. Installée dans un poste pour sa défense, la troupe d'un partisan n'avait pas à déplacer son artillerie. L'attaquant, de son côté, devait s'en prendre à un point fixe ; il y avait moins d'urgence à se déplacer avec célérité (moins d'urgence que dans le cas d'une retraite gênée par la poursuite de l'ennemi ; moins d'urgence que dans le cas d'une embuscade, quand il fallait arriver avant que l'ennemi ne fût passé !). Par conséquent, « *Le train d'artillerie étant un des moyens principaux pour l'attaque et la défense des postes, dont les troupes légères peuvent être chargées, il est nécessaire que le service en soit bien fait* », énonce Grimoard[30].
==> Sur le terrain, enfin, évocation de l'exemple de l'emploi de l'artillerie à la petite guerre, dès les campagnes de Flandre de la guerre de Succession d'Autriche (1744–1748)…

[28] *Ibid.*, t. I, p. 131.
[29] Grimoard, *Traité*… (1782), p. 10 (pour l'attaque et la défense) ; p. 178–179 (pour l'attaque) ; Cessac, *Le guide*… (1785), t. I, p. 47 (pour la défense) ; t. II, p. 44–45 (pour l'attaque).
[30] Grimoard, *Traité*… (1782), p. 10.

Francesco Loriga (Italy)
The Italian Navy and the Technological Developmentthe Guglielmo Marconi Experience

Technological development has always been considered a key element of the armed forces around the world and this is even true today, an era in which the superiority over the opponent's potential depends very much on the technology. And the start can be traced back to the late nineteenth century, when scientific discoveries and inventions resulting received a decisive impulse, in some ways totally unexpected and unpredictable.

This presentation, as evidenced by the title, is focused on something that has profoundly influenced the development of armed forces around the world and the role played in it by the Italian Navy: remote wireless communications.

Talking about this means to speak about the great Italian scientist Guglielmo Marconi.

Born in Bologna on 25 April 1874 by Giuseppe, wealthy landowner, and Annie Jameson, his second wife of Irish descent, Guglielmo spent his childhood and adolescence in Italy, Bologna and Livorno in particular, and the United Kingdom and Ireland. Just in the Tuscan city of Livorno Marconi developed a deep love for the sea and a strong interest in physics and electrology, science in those years was much in vogue as a result of experiments and discoveries, especially of Maxwell and Hertz.

In 1895, at the age of 21, in the family villa in Pontecchio, near Bologna, he experienced his own intuition about the application of electric waves for wireless telegraphy. Here I shall not recall the enormous impact that had practical applications of electrical communications at a distance, especially in the military, then imagine what could be the boundless horizon that opened the evolution that allowed them to depart from the communications link physically possible for them to function.

In 1895, in fact, Marconi verified that connecting a generator of electrical oscillations to an insulated wire in the air and the land was obtained an emissivity of these waves in the air and that these could be proved by a similar device in a remote place. The first experiment was successfully conducted between two stations located at a distance of two kilometers at the foot of a hill opposite.

A year after Marconi had the opportunity to publicly present their invention to Sir William Preece, chief engineer of the Post Office in London, and the following year won the British Patent Office for a patent for "wireless telegraphy by electric waves." The first demonstration was followed by many others, and this aroused the interest of the great nations of the time. Given the growing interest shown, Marconi decided to provide its patent to the Ministry of Posts and Telegraphs in Italy, but at the time a zealous bureaucrat rejected the proposal because of young age (27 years!) of proposer.

Fortunately the Italian Naval Attaché in London, Cpt (N) Augusto Bianco, meticulously reported to the Navy on the experiments of this Italian with British blood, particularly noting successes. This led to a debate developed on Maritime Magazine, a journal of the Navy which compared ideas to be developed in the maritime field, which allowed the Minister of the Navy at the time, Admiral Benedetto Brin, to remedy the egregious error of assessment Ministry of Posts and Telegraphs. Brin, in fact, following the tradition that saw the Navy extremely attentive and caring towards all the new scientific applications, asked Marconi to return to Italy to demonstrate the effectiveness of the new communication system for the Royal Italian Navy.

On 2 July 1897, at presence of high government and military authorities, Marconi offered a successful presentation of his invention at the Navy Department in Rome. The next 3 and 5 July followed, also in Rome, other demonstrations in favor of the Minister Brin and, above all, national and foreign press, who reported the results with great emphasis.

Marconi later moved to La Spezia, at the Laboratory of Navy Maritime Electric, where he continued with demonstrations and experiments performed with units at sea, both anchored and moving. The results were all positive and demonstrated the great validity, but also the potential of the new communications system, which allowed the Italian Navy to have a revolutionary piece of technology, placing it in the forefront in the world. In memory of these experiments thirty years later, in 1927, was placed a commemorative plaque at the local Naval Command.

When the tests aboard the battleship San Martino were completed, Marconi donated their equipment to the Navy and returned to Britain. Here, while continuing in their research, he went into business and founded the Wireless Telegraph and Signal Company, later changed to Marconi Wireless Telegraph Company Limited. His reputation extended enormously: even Queen Victory turned to him to make contact with the Yacht Osborne, where was her son, then expressing her satisfaction and inviting him to the Royal Court.

If the Italian Navy was the first ever to use the new equipment, the Royal Navy was not to be outdone. In fact, during the great maneuvers of 1899, Marconi was entrusted with the task of ensuring communications between ships at sea. He embarked himself on board cruiser Juno, in order to personally follow the operations. In 1899 as well the German Kaiser Wilhelm II became interested in Marconi's work and sent to Great Britain, Professor Slaby, who, on the basis of the extensive explanations and experiences shared with the Italian scientist, once back in Germany laid the foundations the first German telegraph company, the Telefunken.

Then followed further demonstrations and experiments in Germany, France, the United States and Canada, thus helping to raise the world fame of the young scientist.

The Italian Navy had also the merit to allow Marconi to continue his studies during his military obligations, destining him to the Italian Naval Attaché Office in London. After that period Marconi embarked on Italian Cruiser Carlo Alberto, a ship expressly given at his disposition in order to continue the development of his experiments. The Carlo Alberto conducted, during the 1902 summer, an experiments campaign in Great Britain and Russia and the next year in the Atlantic Ocean, off the coast of Nova Scotia, Canada. During these campaigns he was ably assisted by a young Italian officer, Lieutenant Solari, who afterwards became his first and close collaborator.

Following these trials the Italian Navy drew enormous benefits: in fact was decided to build a radio station to maintain communications with operations located in Libya, Eritrea and China.

Thus was built the Coltano radio station, between Pisa and Livorno, which from 1911 began regular communications with the Italian concession of Tien-Tsin, China. Importantly, the Italian Navy base in Tien-Tsin was the only one, at the time, to be able to communicate by radio both with the Italian naval units stationed there and with the mother country. Later, during the First World War, the Navy built another radio station in Rome, named St. Paul, destined to long distance communication. Then, after the war, the Coltano radio station was further developed, remaining for a long time the world's most powerful broadcasting station, starting regular public service with Eritrea, Somalia, the Far East and North America. In 1930 the station was transferred from the Navy to the Posts and Telegraphs Department.

In 1915 Marconi was appointed as Senator reign by the King, in consideration and recognition of his outstanding merits as a scholar who greatly honored the country.

During World War I Marconi was back in the Armed Forces, first in the Army and then transferred to the Navy. In 1916 he was appointed as Navy Reserve Officer and intended to the newest Navy Radio Telegraphy Laboratory in Livorno, a prestigious Institute still active today, where Marconi had the opportunity to continue in his studies and researches.

During the first period of war the long-wave technology at the time used for radio communication showed many problems; this fact offered Marconi the chance for the study and implementation of first short-wave devices, thereby opening new horizons in the development of distance communications by radio.

In 1919, in order to conduct experiments on shortwave, Marconi bought in Great Britain a yacht, which he renamed Elettra (one of his daughter's name) and that became his "floating laboratory", with which he carried out many campaigns of experimentation, especially in the Atlantic Ocean. It was aboard Elettra, anchored in Genova harbour, that Marconi conducted his famous experiment on 26 March 1930, when he turned on by a radio impulse the lights of the town hall in Sydney, Australia. On board Elettra Marconi also conducted the first experiments on microwaves, successively carried out in the Navy site of Chiaruccia Tower, near Rome, until his death in Rome 20 July 1937.

In honor and remembrance of Marconi’s memory and the great contribution he gave to the development of telecommunications science, the Italian Navy has awarded its name to two submarines, one entered service in 1940 and lost in war action in the Atlantic in 1941, and one entered service in 1982 and disarmed in 2003. She also named Elettra a logistics ship in service since 2001, reminiscent of his famous yacht.-

Dr. Zisis Fotakis (Greece)
Technological Progress and National Defense: The Case of the Greek Navy, 1821–1914

It has been observed in world military history that smaller states with limited means are frequently open to innovative weapon technology, which promises to meet their defense needs cheaply.[1] During the first century of Greek Independence the Greek Navy occasionally enjoyed a technological advantage over its Turkish opponent and most other navies for similar reasons. The present paper presents such instances and their importance for international naval history.

The first century of Greek Independence was marked by intermittent antagonism between Greece and Turkey. Despite the importance of the military dimension of this antagonism, its naval aspect was central by reason of geography. Sharing its land frontiers with the Ottoman Empire alone it was only from the sea that Greece could receive all the necessary supplies in times of war with the Ottomans. Her mountainous terrain, her many islands and peninsulas, and her insufficient land transportation network, meant that the sea borne mobilisation of the Greek land forces was the only effective form of mobilisation. In addition, the Turkish islands of the Greek Archipelago and much of the Turkish Aegean littoral had always been a principal Greek war objective. Their occupation could not have been effected without the support of a Navy.[2]

In the course of the Greek War of Independence in the 1820s the European Chancelleries discovered that what had been during the previous four centuries a recurrent business of comfortable Turkish victories over Greek rebellious activity had developed, into a solid Greek revolutionary movement, which owed much to the Turkish inability to destroy the Greek fleet. The slow-moving, badly handled capital ship squadrons of the Ottoman fleet proved incapable of facing down the light and speedy, well-handled ex-merchantmen of the Greek fleet. Furthermore, the rigid adherence of the Turk to the 'line ahead' and the inflexible organisation of the Turkish fleet compared unfavourably with the innovative Greek spirit.[3]

The Greeks adopted the semi-forgotten 'fire ship' heeding to the advice of the Russian philhellene Ivan Afanassiev.[4] They also upgraded it technically by speeding up its ignition and fire transmission mechanisms and developed it tactically

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1 Philip Pugh, *The Cost of Sea Power. The Influence of Money on Naval Affairs from 1815 to the Present Day* (London 1986) 4.

2 Zisis Fotakis, *Greek Naval Strategy and Policy, 1910–1919* (London and New York 2005) 16–17.

3 Ibid., 2.

4 Tryphon Konstantinidis, "Ta Pirpolika ke e paradoksologie ton Philhellenon", *Nautiki Epitheorisis, no. 211* (1948) 313–315.

by manning it, unlike most fire-ships in other navies that were usually unmanned. These developments facilitated the success of Greek fire ships until the first half of 1825. When counter-measures were successfully employed, alternative techonological solutions were sought.[5] French friends of the Greeks were at this time advocating the adoption of a ship which could sail under water. The submarine in 1825 was at about the same stage of development as the steamship but the argument for procuring steam-driven warships was more persuasive.[6]

Frank Abney Hastings, a philehellene and former British naval officer introduced the idea of employing stream-driven warships by the Greek Navy. In his memorandum to Lord Byron in 1823, Hastings argued that since the Greek revolutionaries had no artillery or engineers they could never capture the remaining Turkish fortresses in Peloponnesus, unless they starved them out. Since these were all supplied by sea and any Turkish invasion of Greece would also be dependent on its continual resupply by sea, naval superiority was required.[7]

Hastings reasoned that naval superiority could be achieved by the possession of one steam vessel. In action, such a vessel could be maneuvered to produce a higher rate of fire than the enemy. Furthermore instead of firing cold cannon balls, she could, with certain precautions, fire red-hot shot, heated in the ship's boilers, which would have a far greater destructive effect. Hastings also suggested numerous other technical and tactical improvements and sketched out the chief characteristics of the type of vessel he had in mind.[8]

Hastings' proposals were obviously novel. "The steamship had far from proved itself as a naval weapon although well enough tested for civil purposes. The East India Company had made use of one in the Burma River War with some success, but that was hardly decisive evidence. No major navy had yet adopted steam in any of its main ships."[9] Despite the risk of adopting an untested technology, the declining reliability of the fire ship and the replenishment of the Greek public coffers by the proceeds of the City loans which were contracted for Greece

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[5] Konstantinos A. Alexandris, *E Nautike Epichiriseis tou iper Anexartisias Agonos 1821–29* (2nd ed., Athens 1976) 20, 141. Marios Simpsas, *To Nautiko stin Historia ton Hellenon* (vol. 3, Athens 2006) 248. Tryphon Konstantinidis, "To Skandalon tou Londinou", Ta Ethnika Atmokinita kai I hypothesis ton en Ameriki fregaton 1825-1828, *Naftiki Epitheoris, no. 222* (1950) 126.

[6] William St. Clair, *That Greece might still be free* (London 1972) 307.

[7] Ibid., 297.

[8] Ibid. See also, Tryphon Konstantinidis, "To Skandalon tou Londinou", Ta Ethnika Atmokinita kai I Hypothesis ton en Ameriki Fregaton 1825-1828, *Naftiki Epitheoris, no. 223* (1950) 247–255. Tryphon Konstantinidis, "To Archeion Astigos para ti en Athinai Agliki Archaiologiki Scholi", *Naftiki Epitheorisis, no. 216* (1949) 166–209. Constantine Rados, O Hastings ke to Ergo tou en Elladi (Naftiki Epitheorisis : Athens, 1928), 22–31. Constantine Rados, *Frank Abney Hastings (Egrapha ke Simioseis peri tou Ergou aftou en Elladi*) (Eleftheroudaki & Bart : Athens, 1917), 19, 24–29, 107–116.

[9] St. Clair, *That Greece might still be free*, 307.

between 1824 and 1825, facilitated its adoption by the Greek Navy.[10] Furthermore, Lord Cochrane, the new C-in-C of the Greek Navy and an early advocate of steam driven warships also required “six steam vessels having each two guns in the bow and perhaps two in the stern not less than 68-pounder long guns.”[11]

A considerable part of the loan money was consequently set aside for building a steam fleet, whose completion was expected to take place in November 1825. However, the incorporation of new technology in the design of its ships, the troubled relationship between those who superintended their construction -the deputies of the Greek Government in London and the London Greek Committee- and the skillful attempts of Mehemet Ali of Egypt to delay their building by the firm of Alexander Galloway of Smithfield London meant that only one of them, the *Karteria* (Perseverance) arrived in Greece in time to make a worthy contribution to the fighting.[12]

The *Perseverance* was a four masted paddle steamer with schooner rigging who was armed with four 68 pounder guns and four 68 pounder Paixhans carronades.[13] She was not short of problems; under canvas she seemed satisfactory if slow, her engines were not powerful enough and the paddles were too high in the water.[14] These problems were hardly significant though, in view of her autonomy of movement and her few but powerful guns, which contrasted with the large number of less powerful naval canons that most warships carried at the time.[15] Her many successes, in particular that of the Itea naval battle in which the *Perseverance* sunk nine Ottoman warships, provided the first persuasive evidence of the fighting ability of steam-driven warships in world naval history.[16]

The successful record of *the Perseverance* was not met by the performance of her sister ships. The *Enterprize*, the *Irresistible* and the *Mercury* came to Greece late in the war and in no technical capacity to fight successfully at sea. No further funds were made available for the completion of the *Alert* and the *Lasher* and they

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[10] Ibid., 308. Konstantinidis, “*To Skandalon tou Londinou*”, 115–116. Konstantinidis, “*To Skandalon tou Londinou*”, no. 223, 252.

[11] St. Clair, *That Greece might still be free*, 307. Konstantinidis, “*To Skandalon tou Londinou*”, no. 223, 257–270. Ioannes Phakidis, *O Archinavarhos Cochran kai he drasi tou stin Helleniki Epanastasi* (Bratsioti: Athens, 1999), 31, 33. The intention of Cochrane to arm the Greek steamships with heavy guns is disputed in Rados, *O Hastings ke to Ergo tou*, 33.

[12] St. Clair, *That Greece might still be free*, 308–310.

[13] Constantine Paizis-Paradellis, *Hellenic Warships, 1829–2001* (Athens 2002) 89.

[14] St. Clair, *That Greece might still be free*, 309.

[15] Alexandris, *E Nautike Epichiriseis*, 157.

[16] Ioannes Paloumbis, “Technikes ke Tactikes kenotomies pou iothetithikan gia proti fora apo to Elliniko Polemiko Nautiko” in *Periplous Nautikis Historias*, no. 77 (2011) 16. Simpsas, *To Nautiko stin Historia ton Hellenon*, 291–298. Rados, *Frank Abney Hastings*, 50–58, 100–102. Rados, *O Hastings ke to Ergo tou*, 51–57. On the influence of Hastinng’s innovative thinking on the Royal Navy see Rados, *Frank Abney Hastings*, 92–93.

were abandoned to rot in the Thames.[17] Thus, the Cochranite vision of the destruction of the whole Ottoman fleet could not be realised.[18] In the end, Turkish naval inability, Greek innovation and seamanship and the generally indecisive nature of most sea fights in the age of sail contributed to a six-year protraction of the Greek War of Independence, a recurrent phenomenon in wars between land and naval powers. In the course of the Greek War of Independence, the Greek navy effected the replenishment of the Greek revolutionary forces and hindered that of the Turkish armies fighting in mountainous and poorly endowed southern Greece. As a result, the numerical superiority of the Turkish forces was never crushing and peace was restored only after great power intervention.[19]

The foreign policy of independent Greece until the First World War was determined by her lack of resources. Being an agricultural economy, Greece faced the severest natural limitations; less than 20 per cent of Greek territory was arable, compared with over 40 per cent for the rest of South-eastern Europe. Limited Greek cultivation goes a long way towards explaining the country's low birth rate and its highest rate of emigration among any of the Balkan states that, in turn, resulted in the creation of a small domestic market. It also accounts to some extent for the slow industrialisation of the country, since its agricultural production was but a fraction of the surplus that is required to support the creation of an industrial economy. This situation intensified Greek irredentism.[20]

The Cretan Revolution of 1866–1869 was a major test for Greek irredentism.[21] In the course of it, Greece came near to war with Turkey and the threat of the Ottoman war fleet, which was one of the largest in the world at the time,[22] had to be countered qualitatively rather than quantitatively for reasons of economy. The technological advantage that the Greek Navy sought to gain over its Turkish opponent took the form of the 1867 order of the novel turret ship type, a turret ship which was designed along the lines of HMS *Captain* whose designer was Captain Cowper Phipps Coles. The completion of this ship, which was named after King George of Greece, was delayed for two years and arrived in Piraeus more than a year after the end of the Cretan Revolution. Although her speed was low, only 9 knots, due to the poor performance of her engine, she did not suffer the poor fate of her prototype. On the contrary, her excessive armament fired people's imagination who attributed her with exceptional powers.[23]

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17 St. Clair, *That Greece might still be free*, 313.
18 Ibid., 307.
19 Fotakis, *Greek Naval Strategy and Policy*, 2.
20 Ibid., p. 3.
21 On the Cretan Revolution of 1866–1868 see, amongst others, Mathew S. Anderson, *The Eastern Question, 1774–1923* (New York 1966) 159–162 & Hekdotike Athinon, *Historia tou Hellenikou Ethnous: Neoteros Hellenismos apo 1833 os 1881* (Athens 1977) 253–289.
22 Laurence Sondhaus, *Navies of Europe, 1815–2002* (London 2002) 87–88.
23 Paizis-Paradellis, *Hellenic Warships*, 185. Paloumbis, "*Technikes ke Tactikes kenotomies*", 17.

In the aftermath of the Eastern Crisis of 1875–1878 and in the midst of the uncertainty regarding the accession to Greece of the Ottoman provinces that were given her by the Berlin Conference,[24] a hybrid submarine was constructed by Gryparis, a Greek engineer. He was the latest in the line of Greek inventors who worked in this field since the antiquity.[25] The 1880 trials of Gryparis' submarine were not allowed by the Piraeus Harbor Master because the ship was not watertight enough. A few years later, the Eastern Rumelian Crisis erupted and Greece and Turkey came again on the verge of war. The urgency of securing for the Greek Navy technological advantages resurfaced and Karabetsos, a young Greek engineer, produced a small scale submarine model which did not saw further development, despite its successful trials in February 1886. A better version of Gryparis submarine conducted unsuccessful trials a month later.[26] Concurrently, the Greek Navy procured the *Nordenfelt I*, a 56 tonnes, 19.5 metres long vessel, with a range of 240 kilometres, which was armed with a single torpedo and a 25.4 mm machine gun. She was manufactured by Bolinders in Stockholm in 1884–1885 and operated on the surface using a 100 HP steam engine with a maximum speed of 9 km, then she shut down her engine to dive. According to the terms of purchase, trials were conducted at the bay of Phaleron in the presence of a committee which was appointed by the Greek Ministry of Marine. On March 14 1886 the ship remained successfully submerged for six hours but later trials raised doubts about the safety of the crew and showed that she could cover only 2.5 miles submerged. In addition, her dome shut with difficulty, and she thus needed a long time to submerge, while the temperature within the submarine was unbearable. Therefore, she was never used by the Greek Navy and was eventually scrapped in 1901.[27]

Despite these early failures, the Greek Navy eventually procured a French built submarine, the Delphin, (310 tons) shortly before the First Balkan War,[28]

Dimitrios Phocas, *Chronika tou Hellenicou Nautikou, 1833–1873* (Athens 1923), 248–249, 270–272.

24 On the Eastern Crisis of 1875–1878, the Eastern Rumelian Crisis of 1885–1886 and the corresponding position of Greece see – amongst others – Evangelos Kofos, *Greece and the Eastern Crisis*, 1875–1878 (Thessaloniki 1975). Konstantinos Elianos, *He Austrougaria kae he Prosartese tes Thessalias kai tes Epirou sten Hellada*, (Thessaloniki 1988). Hekdotike Athinon, *Historia tou Hellenikou Ethnous: Neoteros Hellenismos apo 1833 os 1881* (Athens, 1977) 317–365. Hekdotike Athinon, *Historia tou Hellenikou Ethnous: Neoteros Hellenismos apo 1881 os 1913* (Athens 1977), pp. 22–30. Fotakis, Z., "O Trikoupis ke I Krisi tis Anatolikis Romilias, 1885–1886" in: *Praktika 3 Panevropaikou Sinedriou tis Heterias Neohellenikon Spoudon* (vol. A, Athens 2007) 157–163.

25 Dionisios Zepos, "He Historia ton Hypovrichion ke he Hellenes", *Nautiki Epitheorisis, no. 231* (1952) 188.

26 Timotheos Massouras & Thomas Katopodis, *Hellenic Submarines* (vol. 1, Pireaus, 2010) 86. Zepos, "*I Historia ton Ipovrichion*", 178–179.

27 Paizis-Paradellis**,** *Hellenic Warships***,** 133**.** Massouras & Katopodis, *Hellenic Submarines*, 92, 94.

28 There is a sizeable literature on the Balkan Wars and the participation of Greece in them. See,

at a time when Greece sought to regain the qualitative lead at sea vis-à-vis a big, reorganized and recently modernized Turkish Navy.[29] Delphin had a considerable effect on Turkish morale, since the Turks neither possessed nor clearly understood how to deal with this new form of naval warfare. Nevertheless, the utility of the *Delphin* had its limitations, since she was handled by an inexperienced crew, who had to rush to Greece at the outbreak of the hostilities, long before completing its training in France. It is not suggested that the crew of the Greek submarine was unprepared to perform well. Far from it, *Delphin*'s unescorted journey of 1,100 miles non-stop set a world record and had convincingly proven the ability of its crew. Nevertheless, the fact that there was no reserve submarine crew in the Greek navy meant that the only existing one had to undertake an excessive amount of duties, which naturally lessened its battle-effectiveness.[30] During the first two months of the First Balkan War, the *Delphin* patrolled the coasts of the Dardanelles and she launched an unsuccessful torpedo attack against the Turkish battleship *Mecidiye* on 9th December 1912. Although her torpedo sank because she was not water-tight enough, this was the first such attack in world naval history after the sinking of the USS Housatonic by a spar torpedo of the Confederate States Navy submarine, H.L. Hunley in 1863.

Concurrently, the effort of the contemporary Prime Minister of Greece, Eleutherios Venizelos, to achieve fiscal balance and his publicly expressed expectation of saving money by introducing air power into the Greek armed forces led to equally important developments. On 24 January 1913, the Greek hydroplane *Nautilos* flew over Nagara, the operational base of the Turkish fleet behind the Straits. Travelling in the hydroplane were Captain Moutousis and Ensign Moraitinis, whose task was to verify the state of the Turkish fleet after the naval battle of Lemnos, and bomb the Turkish naval base. The results of the flight were not all that was hoped for because of its fairly high altitude (1300 metres). The fact, however, remains that on that day the first operation of aero-nautical co-operation in world history was recorded.[31] This success was followed up by a noteworthy development of the Greek Naval Air Service under the guidance of the British Naval Mission to Greece between 1913 and 1916. According to the head of this mission,

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amongst many others, Ernst C. Helmreich, *The Diplomacy of the Balkan Wars* (Cambridge, M.A. and London 1938). Helen Gardikas-Katsiadakis, Greece and the Balkan Imbroglio (Athens, 1996).

[29] Bernd Langensiepen, & Ahmet Guleryuz, *The Ottoman Steam Navy, 1828–1923* (London, 1995)

[30] Fotakis, *Greek Naval Strategy and Policy*, 45–46

[31] Zisis Fotakis, *The Greek Navy in the Balkan Wars, 1912–1913* (Athens, 2011) August The two firsts. Massouras & Katopodis, *Hellenic Submarines*, 104–116. Hekdotike Athinon, Historia *tou Hellenikou Ethnous: Neoteros Hellenismos apo 1881 os 1913*, 326. David Brown, "Submarine" in John B. Hattendorf (ed.) *The Oxford Encyclopedia of Maritime History* (vol. 4, Oxford, 2007) 57. For a slightly different version of the same incident see *Ioannis Paloumbis, From the seas…to the skies The Naval Air Force Chronicle, 1913–1941* (Piraeus, 2009), 30

Vice-Admiral Kerr, "before the Great War commenced, the Greek navy was the only maritime service in the world which was practising, in manoeuvres, the hunting of submarines by seaplanes and destroyers in combination, and was making arrangements for catching underwater pests in steel nets".[32] This development was indicative of the increasing strength of Greek sea power that helped Greece maintain her recent, territorial gains and reinforce her alliance value in the countdown to the First World War.[33]

To sum up, Greek sea power frequently utilized new technologies before the First World War which promised an economic, qualitative way of overcoming the quantitative advantage that the Ottoman Navy usually enjoyed over its Greek opponent. The significance of doing so was hardly regional, since the Greek Navy, occasionally, set a precedent that most other navies came to follow.

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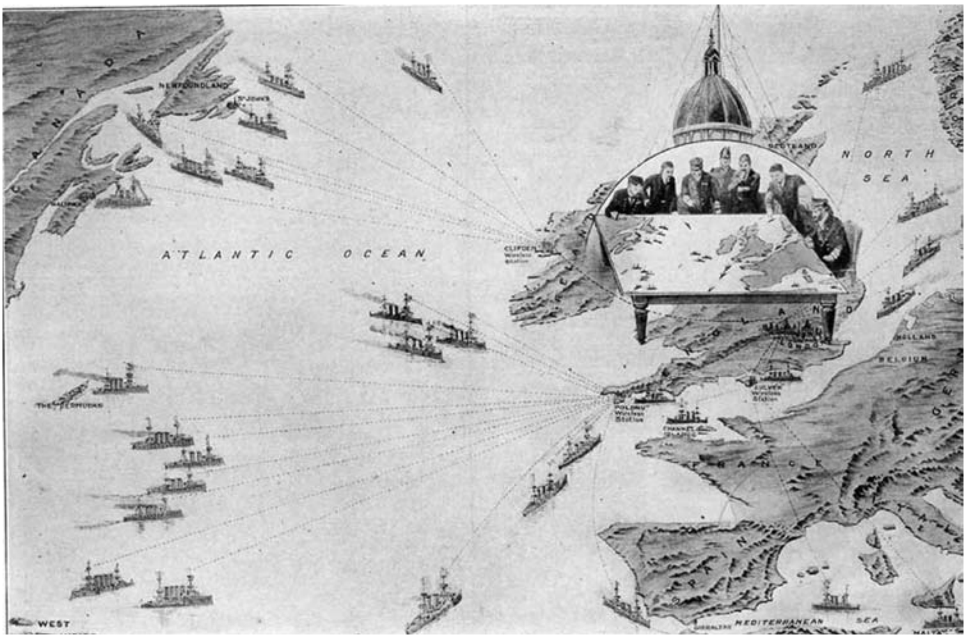
32 Fotakis, *Greek Naval Strategy and Policy*, 76.
33 Ibid., 25–119.

BG /Ret/ Michael Hesselholt Clemmesen (Denmark)
The War Room Managed North Sea Trap 1907–1916: The Substance, Roots and Fate of the Secret Fisher-Wilson "War Plan".

In 1905, when the Royal Navy fully accepted the German High Seas Fleet as its chief opponent, it was already mastering and implementing reporting and control by wireless telegraphy. The Admiralty under its new First Sea Lord, Admiral John (*'Jacky'*) Fisher, was determined to employ the new technology in support and control of operations, including those in the North Sea; now the main theatre of operations. It inspired him soon to believe that he could centralize operational control with himself in the Admiralty … as shown on this drawing.



Centralized wireless control from the Admiralty War Room (from Henry W. Ruoff: Book of the War. 1918)

A centrally controlled operational concept is developed in 1907–08
The wireless telegraph communications and control system had been developed since 1899 by Captain Henry Jackson. Using the new means of communications

and information plus the necessary basic intelligence from the planned cruiser supported destroyer patrols in the observational blockade off the German bases developed in the 1890s by Captain George Ballard the Admiralty could orchestrate the destruction of the German High Seas Fleet. Fisher also had the required superiority in battleships to divide the force without the risk of one part being defeated by a larger fleet.

This paper covers a period and field influenced by an interaction of extremely fast developments in all relevant technological areas. Naval warfare up to and during the First World War saw fast changes in propulsion, armaments and protection as well as radical ones in communication, aviation and underwater technologies. As in later periods fast development of communication technology in peace-time bred optimism about the possibility of centralized, more "scientific" control. The reality of the fog and friction of combat becomes forgotten or is deemed anachronistic.[1]

Based on new reading of the surviving planning documents, the paper underlines that the Royal Navy chiefs did have a logical North Sea campaign concept some years prior to the war, an idea that would have been called a naval strategy then and would now have been termed an operational idea. What is described here may probably have been overlooked because several historians writing about the national strategies of the period have failed to understand the fundamental difference between army and naval war planning, with the former – for good reasons – far more detailed campaign and logistics oriented and thus paper based than the latter.

The paper suggests that this "plan" came under pressure after 1911, both in the technical-operational *and* in the control mode fields:

Technical limitations of several types of ships and vessels made them unsuitable for their role, *and* it became impossible to capture the island, Borkum, identified to have an important role in that plan.

The centralistic control mode was soon considered problematic. Fleet manoeuvres in 1912 and 1913 proved them inherently far too optimistic in assumptions about the effectiveness of direct operational control from the Admiralty. It was possible to learn after the two plan "owners" had retired.

The first clear full outline of such a war plan concept followed I May 1907 immediately after the completion of the so-called Ballard Committee report. The plan had the form of a memo – "*Remarks*" – by Admiral Arthur Wilson. He had given-up command of the Channel Fleet at the end of February, and he would

1 The paper is a further development of the analysis of RN prewar discourse and planning in my new book about Denmark and Western Sweden between the great powers up to 1914 : *Det lille land før den store krig. De danske farvande, stormagtsstrategier, efterretninger og forsvarsforberedelser omkring kriserne 1911–1913*. (Odense, 2012). It is furthermore inspired by the work of Shawn T. Grimes: *Strategy and War Planning in the British Navy, 1887–1918*. (Melton, 2012).

hardly have started preparing the memorandum on his own initiative. In all descriptions of Wilson you get an impression of a very offensively, tactically and technically minded tough and taciturn naval officer. He was not conceptual thinker of intellectual nuances or flexibility. Wilson's character was mirrored by his earlier ideas about how to fight a war against Germany. In a memorandum from June 1905 repeated in a letter to Fisher from March 1906 he had proposed ambitious landing operations in North Germany as well as collecting a specialised fleet of converted obsolete battleships for coastal fortress bombardment and flat bottomed vessels for operations in the shallow waters off the German North Sea littoral. The most likely inspiration to the paper would have been a wish from Fisher who gave Wilson access to the final drafts of the committee report – followed by a discussion-brainstorming between Wilson and Fisher in April.[2] Even if the "Remarks" did include some of his previously stated opinions, it was untypically balanced in relations to the risks of the observational blockade and included a flexible operational concept.

Wilson, otherwise a difficult man to advice, would take note of the opinions of his professional boss. The always sophisticated Fisher let Wilson get and feel the intellectual ownership of the result. In the development of the paper Fisher had in reality programmed the memo author and he could be certain that Wilson would be loyal to the concept, especially as the roots of the "*Remarks*" and its operational concept were secrets that only they had in common.

The "*Remarks*" started by noting that a German-British War was likely to be extended in time because of the basic difficulties of a land power and a sea power fighting each other. The British strategy in relation to the German Navy would be "*To tempt him out and to make the best arrangements to catch him at sea*".

Wilson repeated the view he had expressed in spring 1906, when he rejected the idea that the trade blockade would be effective, as the German trade would just shift to neutral shipping and the use of harbours in neutral states bordering Germany. He had underlined that it would be impossible to observe the German bases closely enough to avoid being bypassed by destroyers or minelayers at night, however, the immediate seizure of Borkum would ease the watching of the mouth of River Ems – and flank German land offensive into Holland pressing the German Navy to react.

The battleships should carry out sweeps behind a layered observational, radio-equipped picket system of should rely on radios for control and reporting. They main force should be organised in two fleets for the sweeps, "*either* (of these) ... *capable of engaging the whole German fleet on favourable terms*". One of the

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2 For a good description of the Fisher-Wilson relationship, however without the benefit of the findings of Nicholas Lambert: *Ruddock F. Mackay: Fisher of Kilverstone*. (Oxford 1973), pp. 367–371, 374. Otherwise: Arthur J. Marder: *British Naval Policy 1880–1905. The Anatomy of British Sea Power*. (London, 1940), pp. 504–505. Grimes: *Strategy*, p.64 and note 76, and p.100.

fleets should operate from a northern port; the other should operate off the Danish coast, ready to cut of the German routes back through the Skagerrak or to the German Bight bases, "*according to the wireless information received*".

In the next phase of the Fishers war planning in spring 1908, the planners expressed agreement with Wilson's main assumptions, and stated that "*As long as there is a Fleet in British Home Waters in full commission which is equal or superior to the German High Seas Fleet, and as long as we have a second Fleet in partial reserve which is so stationed as to be able to concentrate without being molested before the principal Fleet can support it, the defeat in detail of the main British forces is provided against*".[3] The interaction of the two fleets could ensure German defeat.

The centralized control consolidated by Beresford's challenge

In June 1908, Captain Osmond De Beauvoir Brock, one of the key persons in the current stage of war plans development, dealt with the operational concept for the North Sea in part of his memo "*War with Germany*". He noted that all Royal Navy "*dispositions in peace or war is the <u>attack of the German Fleet</u>*". It meant that the Royal Navy always should have a superior force available, and that force should be "*in such a position that if the German Fleet puts to sea it will be brought to action*". As Wilson is his remarks, Brock underlined that even if it was divided into divisions the fleet should be under the command of one Fleet Commander-in-Chief. It was important that the different parts were trained to cooperate and to operate from the places they were supposed to use in war. Where Wilson had recommended that the fleets were brought out of harm's way in time of tension ("*strained relations*"), Brock proposed a forward and visible deployment to signal resolve and thus deter, cruising in the North Sea 250–300 miles off the German coast. Where Wilson had suggested a physically divided fleet, Brock proposed a concentration of the fleet and the move of its main base to Rosyth in Scotland (which he considered better than the alternatives Cromarty and Scapa Flow).[4]

Brock seems to have been out of touch with Fisher's thinking in summer 1908, a situation which may be related to him having been Admiral Lord Charles Beresford's flag captain in the Mediterranean from 1904 to 1907. The previous year had increasingly been dominated by the struggle for control of the war planning between the Admiralty and Channel Fleet Commander-in-Chief.

The Channel Fleet C-in-C, Admiral Charles Beresford's, pressure and criticism from mid-1907 to mid-1908 must be considered to have cleared the way for

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3 The National Archives of United Kingdom (TNA). ADM 116/1043B 1 & 2, pp.280–292. Most Secret. Remarks on War Plans by Admiral of the Fleet Sir A. K. Wilson, V.C., G.C.B., G.C.V.O., pp.351– 393. Very Secret 19-5-1908 War Plan. Germany. W.1. Grimes: *Strategy*, pp. 64, 99.

4 TNA. ADM 116/1043B 1 & 2, pp.649–660. War with Germany. Osmond De Beauvoir Brock, 10-6-1908.

full operational centralization to the Admiralty War room, removing any real command and control authority from the main fleet Commander-in-Chief.[5] The development was explained and justified in the printed memo "*Wireless Telegraphy in War*" from 1908. The memo argued that the development of the wireless made operational delegation to a Commander-in-Chief afloat a mistake. "*The advance of wireless telegraphy has been so great and so rapid that an entirely new development of strategic organization is imperative. With the present installation it is possible to receive information and to transmit orders over a large area from the Admiralty with certainty"*. At the same time orders were sent to one fleet in the North Sea, they would be received in the Channel. All fleets – and every ship of those fleets – would know what the other fleets were doing. With the new technical possibilities, the fleet Commanders-in-Chief should only have command of units that were close enough to the "*scene of action in time to take part in the battle*". Thus the different fleets and all cruiser squadrons and destroyer flotillas in the North Sea not screening the fleets directly could and should be controlled directly from the Admiralty. Only the Admiralty would possess the full and updated political, intelligence and operational picture. "*The recent installation of wireless telegraphy* … (meant that) … *messages can be sent directly from the Admiralty*".[6]

Early November 1908 Beresford complained a final time. He underlined that his War Orders gave detailed instructions for the use of the light forces, but little information about what bases would be used and "*the manner in which the North Sea is to be held*". Two weeks later the Admiralty underlined that the use of the forces would depend on the circumstances. There was no intention to delegate. Detailed instructions would follow in time of tension.[7]

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5 TNA. ADM 116/1037. CinC Channel No. 355/015 of 8-5-1907. CinC Channel No. 433/015 of 18-5-1907. CinC Channel No. 435/015 of 18-5-1907. CinC Channel No. 457/015 of 21-5-1907. Admiralty M-011566 of 22-12-1906 to Read Admiral F. C. B. Bridgeman, M.V.O. Admiralty M.01314 of 23-10-1906 to the Commander-in-Chief Channel Fleet. CinC Channel No. 601/015 of 14-6-1907. Admiralty Draft War Orders dated 11-6-1907. Admiralty M.0636 War Orders of 14-6-1907 to the Commander-in-Chief, H.M. Ships and Vessels, Channel Fleet. CinC Channel No. 668/015 of 27-6-1907. Admiralty M. 0731 of 3-7-1907. CinC Channel No. 801/015 of 16-7-1907. CinC Channel No. 802/015 of 18-7-1907 Admiralty M.0900 of 30-7-1907. Secret and Personel Letter (to the C-in-Cs) August 1907. CinC Channel No. 1826/015 of 9-12-1907. Admiralty M.01646 of 16-12-1907. CinC Channel No. 1051/015 of 1-6-1908 with enclosure "Second Plan of Action for British Fleet".Admiralty Secret and personal. War Orders 1-7-1908. First Sea Lord "Letters from Commander-in-Chief Channel Fleet, October 1908" of 16-10-1908. CinC Channel No. 599/015 of 21-3-1909. Grimes: *Strategy*, p. 116. For a short overview of this and other elements of the Beresford-Fisher Dispute, see: Arthur J. Marder: *From the Dreadnought to Scapa Flow. The Royal Navy in the Fisher Era, 1904–1919. Volume I. The Road to War, 1904–1914*. (London, 1961), pp.92–104.

6 TNA. ADM 116/1043B 1 & 2, pp.270–274 "Wireless Telegraphy in War".

7 TNA. ADM 116/1037, CinC Home Fleet 267A/015 of 9-10-1908 "War Orders" for the Home Fleet. CinC Channel No. 2396/015 of 6-11-1908. Admiralty M-01298 of 18-11-1908 to The C-in-C., Channel Fleet.

A basic fleet deployment for a period of tension during the period before the Channel Fleet was abolished was outlined in the planning memo "*Strained Relations. Scheme A*". It mirrored both the trap concept of Wilson's remarks and the now decided operational centralization. The modern battleships (of the Home Fleet) cruised in the North Sea off North Lincolnshire to minimize vulnerability as a "*North Sea Guard*". The manned battle ships of the Channel and Atlantic Fleets concentrated at Portland and the Mediterranean Fleet moved to Gibraltar. The Straits of Dover was ordered patrolled by a combined force of small cruisers, destroyers and submarine. The main destroyer force was kept ready at Harwich "*ready for a dash at the Elbe*" and an armoured cruiser squadron cruised in the North Sea ready to establish watch of the Skagerrak. Cruiser squadrons watched the German Bight.

When war was declared a combined force of cruisers, light cruisers and destroyers would establish a somewhat closer night watch off the German river mouths than that outlined by Wilson in May 1907. A clear problem was that the requirement for destroyers in each relay was half of the available number, leaving only enough for one more wave. In daylight the watch would be maintained by cruisers.[8] No matter if the High Seas Fleet sallied north or west, it would be observed and a battle fleet would be in position to move against its withdrawal route.

The development freezes until end 1911

When the War Plans development had lasted four years, the results were summarized by Fisher in his late 1908 memo "*War Plans and The Distribution of the Fleet*". For the very good reasons already noted, the memorandum quoted Wilson's remarks extensively, including that the purpose of dividing the battleships between two fleets "*should be to get one of these Fleets between the German Fleet and their ports if they once come out so as to prevent their return*". In brackets it noted: "*This will be the objective in the Grand Manoeuvres of next summer*", which would mean the 1909 manoeuvres, where Wilson was appointed to act as Chief Umpire.

These manoeuvres took place off Scotland with West Scotland acting as the German North Sea Coast. The exercise played a situation of "*strained relations*" and the first days of war. The mission of the *Red* fleet was to destroy the enemy *Blue* and *White* fleets, the latter being the part of the High Seas Fleet that had to use the Skagerrak to make a junction with the Blue due to the reconstruction of the Kiel Canal that would last from 1907 to 1914. *Red* should observe the strongly fortified *Blue* coast closely; if possible prevent the junction of the two enemy fleets (meaning if this had not been accomplished before the outbreak of the war). If the

[8] TNA. ADM 116/1043B 1 & 2, pp.275–290.

junction had been affected, the combined enemy fleets should be brought to action.[9]

Captain Herbert Richmond, the Commander-in-Chief's Flag Captain, wrote about the manoeuvre in his diary. The mission of the British side was to prevent "*the escape*" of the *Blue* fleet. However, faulty screening and bad weather meant that "*the enemy forced a clear passage through our line ... & drove his Battle Fleet through the gap, unseen in the thick weather*". In a second entry he complained about the detailed control of the fleet: "*... instead of signalling, as I had wished, the bare news that the Fleet was at sea, we signalled instead elaborate courses for our cruisers to steer. This I do not think possible in war. ...*"[10]

The weather during the crucial attempt to trap the *Blue* fleet had been extremely foggy and thus potentially risky for the massive fleets of with a total 374 vessels. May had requested that the *Blue* fleet was "*detained*" for 48 hours. It would "*have given the cruisers and destroyers plenty of work*". Fisher had rejected the request, because, as he wrote to McKenna on 13 July: *"Fancy asking the German Fleet to hold on a few hours till you were quite ready!"*[11]

During autumn 1909 Fisher successfully blocked the creating of an Admiralty operational war planning staff. He was certain how the battle should be controlled and conducted with minimum friction and delay and maximum flexibility. A staff could only lead to bureaucracy, argument and thereby unacceptable delay.[12] Late December 1909 Fisher described his and Wilson's co-operation and their attitude to the war plan as follows: "*We have talked a lot about the War Plan for the Navy… he told ... that only he and I knew of the War Plan, which is quite true… He would sooner die than disclose it*".[13] The authority and responsibility could and should not be delegated to a self-important subordinate such as Beresford.

During Fisher's first term as First Sea Lord he had emphasized long range heavy, scientifically controlled gunnery, and he had been close to fanatic in his demand for battleship speed. Superior speed and long range hitting power would

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9 TNA. ADM 116/1043B1, pp. 1–11. ADM 116/1109, Secret. Naval Manoeuvres, 1909. (For issue to all fleets). General Idea. Grimes: *Strategy*, p. 126. Edward Eden Bradford & Arthur Knyvet Wilson: *Life of Admiral of the Fleet Sir Arthur Knyvet Wilson*. (London 1923), pp. 124–125.

10 Arthur J. Marder: *Portrait of an Admiral. The Life and Papers of Sir Herbert Richmond*. (London 1952), pp.55–56, 59.

11 Arthur J. Marder (ed.): *Fear God and Dread Nought. The Correspondence of Admiral the Fleet Lord Fisher of Kilverstone. Volume II. Years of Power 1904–1914*. (London 1956), Letters to Reginald McKenna of 13-7-1909 and to Rear-Admiral Sir Charles Ottley of 29-8-1909, pp. 256, 262–263. The work "detained" like Richmond's "escape" could also mean breaking-out through the blockade, however due to the exercise context of Fisher's late 1908 memorandum, it is assumed that the Blue fleet escaped back to bases.

12 For a short and clear description of Fisher's successful resistance to the creation of a "Naval General Staff" see: Grimes, *Strategy*, pp. 154–157.

13 Grimes: *Strategy*, p. 158. See also: Arthur J. Marder: *From the Dreadnought to Scapa Flow. The Royal Navy in the Fisher Era, 1904–1919. Volume I*. (London, 1961), pp. 198, 244, 247.

make it theoretically possible to develop any engagement of the British and German battle fleets brought about by the war room control into a situation where the Germans were out-manoeuvred, cut off and destroyed. Wilson, who had taken a key role in supporting the fire control system development, could be trusted to understand this.[14] The same was the case with John Jellicoe, who had managed the system development, and whom Fisher successfully lobbied to have appointed fleet commander-in-chief in the coming war.

In the first – spring – part of the exercises of the combined Home and Atlantic Fleet in 1910 after Wilson's take-over, the planned observational blockade of destroyers supported by cruisers off the German coast was tested and found to be too close and risky, and the method was thereafter adjusted to the looser form already outlined by Wilson in his 1907 "*Remarks*". The second part tested fleet offensive operations.[15] On 29 May 1910, after the combined exercises, Captain Herbert Richmond had a conversation with the First Lord, Reginald McKenna. He noted in his diary that the talk had been free and wide-ranging. It had also covered the fleet war plan. Fisher and Wilson had apparently convinced McKenna that their war plan was perfect, the Germans were checkmate from the outset: "*The Fleet would be placed in such & such a place & would not move from it & the enemy could do nothing… Nothing could pass out of the Skagerrack without our knowing – and so on*."[16]

The plan under triple pressure 1912–1914

After New Year 1912 Wilson had been replaced as First Sea Lord by Admiral Francis Bridgeman and Vice-Admiral George Callaghan, the former Second Battle Division Commander, had been appointed Home Fleets Commander-in-Chief. Now the leading admirals could look at the assumptions of the War Planning with open minds nourished by updated practical experience. With the naval intellectual, Captain Ballard, who had fathered the observational blockade 15 years earlier, directing the new War Staff Department of Operations, the scene was set for change. The need for innovation was also driven by the then extremely fast development in key fields of naval technology, but it was made compulsory by the inherent weakness of the War Plan concept and the changing strategic framework.

The number and endurance of the destroyers was insufficient for maintaining the observational blockade week after week, maybe month after month – and the supporting cruisers were too weakly armed. This would be of less importance if a protected anchorage would have been available at Borkum, but the British Army

[14] For the most thorough and complete description of the development of the Royal Navy long range artillery fire control system see: John Brooks: *Dreadnought Gunnery and the Battle of Jutland. The Question of Fire Control.* (London 2005).

[15] Grimes: *Strategy*, pp.163–164.

[16] Arthur J. Marder, *Portrait of an Admiral*, p.70.

had effectively rejected the idea of being reduced to a force afloat, and the coastal defences on the German North Sea islands were being built-up to a level making a landing from hazardous to suicidal.

The constant development of the size, armament, protection and speed of the new battleships meant a fast developing gap in combat power between them and even the newest Pre-Dreadnoughts. This combined with the move of the battleship squadrons to protected bases in or off North Scotland to undermine Wilson's concept of close operational interaction of two fleets to work the trap for the High Seas Fleet. The chance to cut-off and destroy the Germans hereafter depended on the flexible use of the superior speed of Grand Fleet battle cruiser force and battleships to outmanoeuvre the High Seas Fleet in the central part of the North Sea. This made it essential to develop a fast "Super-Dreadnought", and led to the construction of the QUEEN ELIZABETH-class.

The initial concept developed by the new War Staff was meant to achieve what 80 years later would be termed *"Information Dominance*". A picket line of cruisers would be deployed north-south in middle of the North Sea. During the 1912 fleet manoeuvres this concept was tested and failed due to lack of suitable units to fill the line. Until a large number of new light cruisers were ready, the Grand Fleet strategy had to depend to the pressure of the blockade, signals intelligence and luck during its North Sea sweeps to catch and destroy the German fleet. The new and first comprehensive War Plans for the Home Fleets developed by Captain Ballard from November 1912 and valid until summer 1914 mirrored that reality.[17]

Not only had the two fleet trap concept come under pressure. The fact that the effectiveness and soundness of central operational control from the Admiralty War room was rather fictional was underlined by the chief umpire of the 1912 manoeuvres, Admiral of the Fleet Sir William May, and repeated with glee by Beresford in the Parliament. Admiral May's comments did not lead to changes, and in his umpiring of the 1913 manoeuvres; he had to repeat that the centralisation destroyed necessary tactical initiative. This year his remarks were reinforced by a senior observer from the British Army. "*Scientific*" battle management always looks far more logical from the centre than from an engagement always dominated by awkward weather, human mistakes and frailty, technical mishaps and chance.[18]

By winter 1913–14 the Berlin Admiralty Staff had finally accepted that the Royal Navy had abandoned the close blockade that the German Navy had planned to exploit in an attrition of British strength. No other conclusion was possible after the analysis of the British 1912 and 1913 fleet manoeuvres. However, the German planners did not see the economic warfare part of British strategy as the challenge.

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[17] Summarized from: Det lille land før den store krig, pp. 133–149, 248–267, 433–448. The outline of event in my book is roughly the same that Grimes: *Strategy*, pp.169–189.

[18] Summarized from: Det lille land før den store krig, pp. 133–149, 248–267, 433–448. The outline of event in my book is roughly the same that Grimes: *Strategy*, pp.169–189.

The main problem was that the High Seas Fleet had to conduct operations off Eastern Scotland and thereby risk being cut-off and destroyed on the way back to its German Bight bases. In March 1914 the Admiralty Staff war-gamed the new situation twice. In the first war game the High Seas Fleet was by-passed, cut-off and destroyed by the British party, and the game was repeated with the German party receiving early information about the approach of the Grand Fleet and thus a chance to delay it by sacrificing the German Pre-Dreadnoughts.[19] However, even in this second game, the High Seas Fleet was destroyed. No wonder that Berlin kept its fleet under close control, when the war became reality a few months later.

The reality of war 1914–1916.

On 1 August 1914, when the war approached and real pressure of central operational control was realized, the Admiralty War Room had descended into chaos. The scene was "*wild, thousands of telegrams littered about & no-one keeping a proper record of them*". However, the events of the Battle of the Heligoland Bight four weeks later underlined that the charm of direct Admiralty control was too great to be given up just because of chaos around the central plot.

The idea for the Heligoland engagement in late August engagement was to achieve a trap of German light forces employing forces from both Harwich and the Grand Fleet without any advance delegation of command authority to either. Only Grand Fleet initiative plus a combination of luck and professional restraint in the unexpected meeting with own forces compensated for the fundamental operational incompetence of Admiral Sturdee's War Staff and ensured that the outcome favoured the British. The Battle of Heligoland Bight demonstrated the friction created by centralized battle management.[20]

The Scarborough Raid that was used by the now returned Fisher to re-centralize operational control to the Admiralty War Room as outlined in his 1908 Wireless Telegraphy in War memorandum. In his new book Nicholas Lambert, the first historian to describe the war room system, notes approvingly that Fisher's reaction to the Second Battle Squadron and Beatty's battlecruisers' failure to catch the German battlecruiser squadron involved in the Scarborough raid on 16 December 1914 was to reinforce war room control, because the involved commanders showed lack of initiative, poor situation awareness and were unable to control operations from their bridge. Four days after the raid the Admiralty directed that the war room would direct the movements of the squadrons until action was imminent

[19] Bundesarchiv, Militärarchiv. RM/5/1975 Der Chef des Admiralstabes der Marine Ganz Geheim. D.1527.I of 29-10-1913: Strategische Kriegsspiel des Admiralstabes Winter 1913/14. &: Ganz Geheim! Berlin 31-3-1914, Strategische Kriegsspil des Admiralstabes Winter 1913/14. Schlussbesprechung. & Ganz Geheim! 1-4-1914. Strategische Kriegsspiel des Admiralstabes Winter 1913/14. Kritik.

[20] For details see: James Goldrick: *The King's Ships Were at Sea. The War in the North Sea August 1914–February 1915.* (Annapolis 1984), pp.83–90.

and on the next day it took direct control of the First Light Cruiser Squadron and the battlecruisers and initial control of the destroyer flotillas. The different parts of the fleet should stay in their bases until launched by the war room. It was a full return to the centralization of the 1908 wireless telegraphy memorandum.

Some days after the Battle of Jutland Fisher noted in a letter that "*Admiralty work the strategy, Jellicoe works the tactics. That's a great principle and the justification for the wireless on the roof of the Admiralty*".[21] Fisher never seemed to understand the local friction and lack of initiative that is nourished by centralist control. Where Fisher's emphasis on the control part of the 1908–11 "war plan" indicates that he understood that the technological and inter-service developments had made the original form of the "trap" anachronistic, his minister did not agree. During the month after the raid Winston Churchill still focused on getting cabinet support and three elite army brigades for capturing the trap "bait" Borkum, probably fully supported by his Arthur Wilson, now his personal advisor.[22]

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This paper gives one more example of the dominant trend in the Western military culture since the time of Enlightenment: a belief in simple technological solutions to problems that may be basically human, strategic, operational or tactical in character.

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[21] Nicholas A. Lambert: *Planning Armageddon. British Economic Warfare and the First World War.* (Cambridge, Massachusett 2012), pp. 301–302.

[22] Recently outlined in ibid., pp.307–308.

Captain Germán Segura García (Spain)
LA TECHNOLOGIE AU SERVICE DE LA TACTIQUE : évolution de l'emploi tactique de l'artillerie au siècle des Lumières

Introduction

Suite à l'utilisation généralisée de la poudre à canon, les armes à feu commencèrent à devenir communes en Europe à partir du quatorzième siècle et à s'introduire progressivement dans les armées du Bas Moyen Âge, à côté des armes blanches. La connaissance intuitive des particularités de ce composé chimique, ainsi que les améliorations dans les techniques de forgeage des métaux, permirent à la fois le développement de l'artillerie et des armes portatives, ce qui donna lieu à une première révolution militaire, résultat de la prise de conscience des avantages de ce type d'armement par rapport aux techniques de combat de l'époque. L'utilisation novatrice des arquebuses apporta à la monarchie espagnole une supériorité tactique sur le champ de bataille, qui se fit évidente lors des guerres d'Italie, au début du seizième siècle, avec la bataille de Pavie comme l'un des exemples les plus significatifs du pouvoir dévastateur de ces nouvelles armes. Néanmoins, ces performances révolutionnaires étaient nettement plus efficaces que la première artillerie, très lourde et peu précise, dont l'utilisation n'est rentable que dans les sièges de places fortes.

La révolution militaire aux XVIe et XVIIe siècles

Au cours du dix-septième siècle, l'invention de la cartouche, l'emploi de la platine à silex et, surtout, l'apparition de la baïonnette à douille modifièrent sensiblement la structure des unités d'infanterie et les tactiques de combat habituelles. La nouvelle arme à feu, le fusil, fournissait une bonne cadence de tir avec plus de sécurité, mais, surtout, elle permettait de continuer à tirer avec la baïonnette et, en conséquence, de remplacer la pique et de réduire tous les fantassins à la condition de fusilier. Ces bouleversements technologiques eurent une grande répercussion sur le domaine tactique, donnant lieu à une problématique que commandants et écrivains militaires s'efforceraient de résoudre, sans résultats concluants.

Puisqu'ils pouvaient disposer d'une plus grande puissance de feu grâce aux nouvelles armes, les commandants voulurent essayer de déployer leurs unités de sorte à optimiser au maximum cette capacité, et peu à peu ils se mirent à privilégier la formation en ligne, l'ordre mince. Le temps des formations compactes, de l'ordre profond tels que les tercios espagnols à Rocroi, touchait à sa fin.

Alors qu'en 1650 l'infanterie était traditionnellement déployée sur six rangs de profondeur, avec une proportion de deux mousquetaires par piquier, un siècle plus tard cette disposition cèderait sa place à la formation classique de trois rangs, tous fusiliers.

L'amincissement progressif des formations avait cependant des répercussions négatives sur la capacité offensive de l'infanterie, privilégiant le feu de salve, dont l'efficacité n'était pas concluante, au détriment du combat corps à corps. Le débat entre les partisans de l'ordre profond et de l'ordre mince s'étendrait sur une grande partie du dix-huitième siècle, jusqu'à ce que la réflexion française aboutisse à une solution éclectique, conjuguant efficacement les avantages des deux systèmes et donnant lieu à la Grande Tactique de l'ère napoléonienne.

Par ailleurs, les armées européennes augmentèrent considérablement leurs effectifs, atteignant des dimensions qui ne seraient dépassées qu'après la Révolution française. Alors qu'au seizième siècle, il n'était pas fréquent de voir des armées de plus de 40.000 hommes, vers 1690 la France disposait d'une armée de près de 400.000 hommes, sans compter les milices, alors que d'autres puissances comme les Pays-Bas ou l'Angleterre avaient mis sur pied des forces avoisinant les 100.000 hommes. Cette dynamique entraîna d'importantes contraintes logistiques, qui devaient être prises en considération pour le déroulement des opérations. La logistique finit ainsi par jouer un rôle déterminant au dix-huitième siècle, reléguant la stratégie à un second plan, en raison des servitudes liées à l'approvisionnement des troupes.

Afin de répondre à la double nécessité stratégique et logistique, les commandants, incapables de gérer personnellement tous les aspects qu'impliquaient des opérations de plus en plus complexes, durent créer un corps de conseillers militaires et civils, qui allaient les entourer et leur fournir les informations nécessaires à la prise de décisions. Les états-majors des armées d'opérations durent faire face aux différents facteurs qui conditionnaient le déroulement d'une campagne, et résoudre les contraintes qui en découlaient, tout en reconnaissant que les systèmes de commandement et de contrôle n'étaient pas les plus appropriés pour coordonner le déploiement d'armées aussi gigantesques, et que les tactiques n'étaient pas suffisamment confirmées par l'expérience.

Les chefs militaires n'ignoraient pas l'effort colossal mis en œuvre par les gouvernements pour former, transporter, ravitailler et commander ces forces démesurées. Écrasés sous le poids des responsabilités, obsédés par le problème logistique et incertains quant à l'application des nouvelles tactiques, ils cherchèrent à éviter le plus possible la bataille, qui pouvait s'avérer fatidique pour l'ensemble de la campagne, et préférèrent orienter leurs opérations vers des objectifs limités et des risques calculés, comme la guerre de places.

Le problème tactique de l'artillerie

Bien avancé le dix-huitième siècle, l'artillerie continuait d'être la cible des critiques : elle n'avait point d'impact réel sur la bataille rangée, son rôle se réduisait à des coups de canons peu précis et peu efficaces, le matériel était si rustique qu'il entravait la marche des armées, et, pire encore, la complexité de son utilisation et ses pauvres résultats étaient loin d'encourager la réflexion scientifique à son sujet. Pourtant, même si elle restait secondaire, aucun officier ne voulait se passer de l'artillerie au moment des combats.

Efforts pour améliorer l'efficacité de l'artillerie

En dépit des opinions peu optimistes chez les auteurs de l'époque à l'égard de l'artillerie, les efforts mis en œuvre pour améliorer ses prestations furent constants, et les problèmes rencontrés par les artilleurs dans les fonderies ou lors des opérations militaires jouèrent parfois un rôle de catalyseur en encourageant la réflexion dans certains domaines de la science. Ce fut par exemple le cas de la balistique, la discipline qui étudie la trajectoire décrite par un corps projeté dans l'espace.

Les principaux mathématiciens européens (y compris des personnalités comme Tartaglia, Galilée ou Newton) cherchèrent à résoudre analytiquement le problème balistique, mais, vers 1780, les artilleurs ne disposaient pas d'une solution exacte et, surtout, facile à utiliser, même s'ils n'avaient jamais été aussi bien préparés (grâce aux différentes écoles d'artillerie) pour assimiler les nouvelles connaissances liées à leur profession. La question était que la théorie du mouvement parabolique de Galilée, bien que défectueuse et irréaliste puisqu'elle ne prenait pas en considération la résistance de l'air, apportait une réponse très précise aux problèmes soulevés par le tir d'artillerie. Quant aux spéculations balistiques de Newton, de Leibniz et des frères Bernoulli, entre autres, elles restèrent du domaine de l'abstrait, loin, pour le moment, du champ de bataille.

Une nouvelle science, la chimie, s'intéressa pour sa part à la poudre, s'efforçant de déterminer quelle était la meilleure proportion de ses composants et de calculer ses effets précis. La proportion idéale s'avéra être celle utilisée traditionnellement par les Espagnols depuis la fin du seizième siècle, à savoir 75% de salpêtre, 12,5% de soufre et 12,5% de charbon. Outre cette découverte, et malgré les travaux de chimistes reconnus, notamment Proust et Chaptal, seuls des progrès furent faits concernant les procédés de fabrication de la poudre, mais il y avait peu de connaissances précises quant à ses effets, la quantité de force qu'elle était capable d'engendrer ou le temps que devait durer le mélange de ses composants.

La balistique et la chimie tentèrent donc d'élucider les mystères de l'artillerie, de les réduire à des valeurs quantifiables, mais la méthode scientifique ne pouvait faire plus de progrès dans ce domaine, incapable, au regard des connaissances de l'époque, d'une plus grande précision et de pouvoir énoncer des lois plus rigoureuses. Pendant ce temps, les artilleurs du dix-huitième siècle, jour après jour, travaillaient avec leurs bouches à feu et parvenaient à introduire de nouvelles améliorations techniques, qui facilitaient le maniement des matériaux et augmentaient leur précision. Avec la généralisation de l'emploi du sachet, l'adoption de la vis de pointage pour élever le canon et de la hausse afin de rectifier le tir, associées au perfectionnement des fonderies et aux progrès réalisés dans la conception des affûts, l'artillerie acquit une grande efficacité et, à une époque où la technique avançait plus vite que la science, les chefs d'armée durent redéfinir son rôle dans la bataille rangée.

Dans la foulée de l'essor technologique de l'époque, les fonderies métallurgiques transformèrent et améliorèrent les procédés de fabrication des canons, en produisant des pièces d'une meilleure qualité, plus fiables et plus légères.

Les techniques utilisées alors pour la fabrication des canons étaient principalement de deux sortes : la fonte creuse et la fonte pleine. Le premier procédé est celui qui prévalait au début du dix-huitième siècle. À grands traits, cette technique, également appelée technique du noyau, consistait à verser la coulée de bronze fondu dans un moule où on avait placé un noyau qui occupait la capacité de l'âme, et ne laissait de vide à remplir que celui qui correspondait à la forme de la bouche à feu. Une fois le métal durci, le moule était cassé, et le canon était alors extrait et poli. Cette technique était simple, mais présentait plusieurs inconvénients. En effet, une mauvaise fixation du noyau ou le moindre déplacement pouvaient entraîner une excentration de l'âme et, par conséquent, dévier le tir. En outre, l'alliage manquant d'homogénéité et certaines parties du tube étant moins épaisses, les pièces pouvaient être chambrées ou poreuses en raison d'une concentration insuffisante d'étain.

Le second procédé, ou fonte pleine, s'est implanté définitivement, mais non sans polémique, dans le courant du dix-huitième siècle. Il consistait à couler une bouche à feu massive, en se réservant de la forer ensuite pour former l'âme du canon. L'adoption de cette technique, développée notamment par le fondeur suisse Jean Maritz, constitua le progrès technologique le plus notable et le plus décisif de l'époque dans le domaine de la fabrication de matériel d'artillerie. Après avoir fait des essais avec une machine à alésage vertical, Maritz mit au point un modèle horizontal utilisant la force hydraulique. Ce procédé fut ensuite copié par toutes les puissances d'Europe. À partir de 1744, la machine à aléser créée par le Suisse fut introduite dans les fonderies espagnoles, tandis qu'en 1774, l'industriel anglais John Wilkinson faisait breveter une autre machine à aléser plus précise, utilisée aussi pour la fabrication de pièces d'artillerie en fer, domaine dans lequel la machine de Maritz n'avait pas obtenu de résultats concluants.

L'une des conséquences majeures de l'adoption de la technique d'alésage fut la construction de canons plus légers avec une puissance de feu comparable. Ce progrès technique permit à Jean-Baptiste de Gribeauval, l'accomplissement de sa réforme de l'artillerie française, en cherchant à améliorer sa mobilité. Toutefois, les partisans de l'ancienne artillerie (système de la Vallière), qui n'étaient pas convaincus de l'impérieuse nécessité d'alléger les matériaux, invoquèrent, pour défendre leur point de vue, les échecs essuyés avec les nouveaux modèles. L'artillerie moderne soulevait des doutes quant à la solidité du matériel et sa portée était jusqu'à trois fois inférieure à celle de l'artillerie ancienne. En réduisant la longueur des tubes, on causait une perte de justesse dans le tir, tandis que l'épaisseur plus fine des métaux provoquait un réchauffement plus rapide de la bouche à feu et un recul trois fois plus important au moment du tir. Par ailleurs, le fait de devoir creuser les pièces impliquait une perte d'environ 25% du métal nécessaire à la fabrication, et la réutilisation des rebuts pour de nouveaux alliages rendait la qualité finale du bronze très aléatoire. En définitive, l'ancienne artillerie, qui ne faisait pas de distinction entre canons de campagne et canons de siège, donnait de bons résultats dans les guerres de l'époque, basées principalement sur des opérations statiques. Les partisans de Gribeauval, en revanche, étaient convaincus qu'une portée de 1.000 mètres était plus que suffisante, que la mobilité de l'artillerie devait primer sur toute autre considération et que les nouveaux modèles se prêtaient parfaitement au développement de la tactique déjà adoptée par les Prussiens et les Autrichiens et qui devait donner naissance à la Grande Tactique de l'époque napoléonienne.

Intégration de la nouvelle artillerie dans la réflexion tactique

Au cours du dernier tiers du dix-huitième siècle, le rôle de l'artillerie sur le champ de bataille se transforma de façon décisive, marquant ainsi un tournant dans l'histoire des opérations militaires. Les progrès techniques finirent par avoir un impact sur certains aspects tactiques et sortirent l'artillerie d'une longue léthargie en l'intégrant efficacement dans l'ordre de bataille des différentes armées. À ce stade, les théoriciens, techniciens et militaires ne pouvaient que s'en remettre à l'expérience de la guerre, et elle montrait que la voie à suivre était celle d'une artillerie plus mobile, capable de soutenir le rythme d'une infanterie de plus en plus manœuvrière.

Pendant la guerre de Succession d'Autriche, l'armée de Frédéric le Grand surprit les observateurs de l'époque par sa grande mobilité au combat. Les Prussiens avaient adopté le canon dit « à la suédoise », dont ils avaient largement équipé leurs bataillons d'infanterie, augmentant ainsi considérablement leur puissance de feu. Outre les Prussiens, seuls les Autrichiens songèrent à les imiter, en réduisant tous leurs calibres et en utilisaient deux types de canons différents, selon qu'ils devaient servir à des opérations de siège ou à la bataille rangée. C'est ainsi que virent le jour des canons plus courts, fabriqués avec moins de métal, qui furent soumis à de nombreux essais jusqu'à atteindre la portée et la solidité souhaitées, en bref, une artillerie dont sa mobilité était comparable à celle des autres unités de l'armée.

Lors de la guerre de Sept Ans, l'Europe put à nouveau constater l'efficacité de l'artillerie légère. Cette nouvelle démonstration incita la France à se lancer dans la réforme de Gribeauval, bientôt imité par les autres puissances. Les résultats obtenus en France furent loués par les partisans des armées manœuvrières, admirateurs du grand Frédéric, dont le Français Jacques-Antoine Guibert, auteur de l'Essai général de tactique.

D'après la réflexion tactique de Guibert, l'artillerie de campagne doit servir à appuyer les troupes, à les soutenir au combat et à limiter le terrain que l'ennemi peut occuper. Un canon utilisé de manière isolée n'est pas d'une grande utilité. En revanche, lorsque des batteries sont formées, que les feux sont croisés, que les tirs se font en enfilade, en prenant pour cibles des espaces et non des points fixes, l'artillerie atteint alors son plus haut niveau d'efficacité. D'ailleurs, l'artillerie devait être capable de manœuvrer selon les caractéristiques du combat et, en tant que partie intégrante des nouvelles formations, de se déplacer là où elle était le plus utile. Enfin, cette tactique donna d'excellents résultats à l'époque napoléonienne.

La mobilité des pièces de campagne a contribué, pour la première fois dans son histoire, à une plus grande présence de l'artillerie sur le champ de bataille et à une utilisation massive et décisive de celle-ci. Tandis que les canons affectés aux différentes divisions les accompagnaient à tout moment afin de leur fournir l'appui nécessaire aux manœuvres, l'artillerie de réserve, formée d'une ou de plusieurs batteries, devait servir à créer une masse de feu puissante contre les points du dispositif ennemi auxquels on voulait porter un coup décisif. Les grandes batteries permettaient au chef d'armée de faire sentir sa volonté sur le champ de bataille, en décidant où et quand recourir à une forte concentration des feux pour percer les lignes ennemies et faciliter l'assaut de l'infanterie ou de la cavalerie. Pour ce faire, il était nécessaire de compter sur une bonne coordination interarmes, qui n'était pas toujours possible et que les anciens moyens de commandement et de contrôle ne pouvaient pas toujours garantir. Quoi qu'il en soit, les feux concentrés de plusieurs batteries pouvaient avoir un effet dévastateur sur les troupes ennemies, tant sur le plan physique que psychologique, en les obligeant à se mettre à l'abri et en les empêchant de continuer à avancer si elles voulaient éviter de subir de grosses pertes.

Pendant la guerre de Sept Ans, Frédéric le Grand introduisit une dernière innovation dans l'utilisation de l'artillerie : l'artillerie volante (ou à cheval), exemple éloquent de la mobilité que les tacticiens cherchaient à imposer sur le champ de bataille. À la fin du siècle, les principales puissances s'étaient dotées d'unités de ce type, dans leur quête permanente de l'équilibre entre mobilité et puissance de feu.

Grâce à la technologie, l'artillerie avait parachevé sa métamorphose. Les temps où l'artillerie était totalement inefficace sur le champ de bataille et entravait lourdement les manœuvres de l'armée étaient désormais révolus. Au début du dix-neuvième siècle, l'artillerie avait glissée entièrement dans la réflexion tactique, ses performances lui ayant permis de devenir un facteur décisif dans le combat. Le chemin n'avait pas été facile et l'effort technologique mis en œuvre, digne du siècle des Lumières.

APÉNDICE DOCUMENTAL

Doc. 1. **La resistencia del aire en la trayectoria de los móviles.**
Extracto de *New Principles of gunnery*, de Benjamin Robins. Noursy, London, 1771, pp. L–LI.

«That the Resistance of the Air, which acts with such prodigious Power on all swift Bodies, should be entirely unattended to by the Practitioners in Gunnery, is not the only remarkable Circumstance which occurs in this Enquiry; for after the Publication of Sir *Isaac Newton's Philosophiae Naturalis Principia Mathematica,* it might have been expected, that all Mathematicians should have been convinced of its Energy, since in that immortal Work the Law and Quantity of this Resistance to slow Motions is determined, and confirmed by many Experiments. Indeed the same Law when extended to swift Motions will be defective, and will exhibit the Resistance greatly short of what it really comes out by Experiment, (of which Sir *Isaac Newton* himself has given us warning); yet even upon his Principles it would appear, that the Action of the Air on Bullets is by far too considerable to be neglected. (…)

To sum up now at once all we here intend to observe on this Head. It appears, that the modern Writers on the Art of Gunnery have been very much deceived, in supposing the Resistance of the Air to be inconsiderable, and thence asserting, that the Track of Shot and Shells of all kinds is nearly in the Curve of a Parabola. That by this Means it has happened, that all their Determinations about the Flight of Shot discharged with considerable Degrees of Celerity are extremely erroneous, and consequently that the present Theory of Gunnery in this its most important Branch is useless and fallacious.»

Doc. 2. **Calidad del carbón para la confección de la pólvora en España**.
Extracto del *Recueil des mémoires sur la poudre à canon*, de Joseph-Louis Proust. Bachelier, Paris, 1811, pp. 114–115.

«Nous dirons d'abord, que les fabriques de cette nation [Espagne], tout en marchant sur les traces des nôtres, tant pour l'amélioration des procédés que pour la proportion des ingrédients, n'ont, malgré cela, point jugé convenable d'abandonner le charbon, dont elles avaient fait choix pour celui de la bourdeine, ou d'autres bois légers dont nous le tirons en France, et nous verrons bientôt qu'elles ont eu raison. Pourquoi les Espagnols nous auraient ils imités en ce point, eux qui pouvaient au contraire se flatter de nous donner des leçons?

Le charbon dont il va être question, est celui que fournit la chenevotte, ou la tige du chanvre, quand elle a été dépouillée de sa filasse. Il paraît que l'Espagne s'en sert depuis longtemps, peut-être même depuis l'introduction de la poudre chez elle. *Collado* et *Ufano,* auteurs de cette nation, qui écrivirent sur l'artillerie, le premier en 1592, et le second en 1614, les seuls Traités que j'aie pu consulter à Paris, n'en parlent pas; mais il faut remarquer que quoiqu'au service de l'Espagne, ils firent presque toujours la guerre hors de leur patrie, c'est-à-dire l'un dans le Milanais et l'autre en Flandre. Quoi qu'il en soit, les chenevottes donnent leur charbon encore plus facilement que nos bois blancs, et l'incinération qu'on pourrait avoir lieu de craindre pour une braise aussi combustible, ne l'est pourtant point dès qu'on est au courant d'une certaine routine qui, là comme ailleurs, assure le succès de ce qu'on pratique tous les jours dans la plupart de nos arts. Nous allons donc examiner ce charbon dans ses rapports avec la poudre, et nous nous convaincrons, j'espère, que la persévérance des fabriques espagnoles, à cet égard, ne pouvait être mieux fondée, puisque, d'une part, elle reposait sur des motifs réels d'économie, et de l'autre sur l'ensemble des qualités les plus parfaites qu'on puise désirer de trouver dans un charbon destiné à la poudre.»

Doc. 3. **Máximas generales de la artillería de campaña.**
Extracto del *Essai sur l'usage de l'artillerie*, de Edme-Jean-Antonie Dupuget. Arckstée & Merkus, Amsterdam, 1771, pp. 29–55.

«*Maximes générales, touchant l'Artillerie dans la guerre de Campagne*.

I. On ne doit employer à la guerre que des pièces de canon qui puissent emporter au moins trois ou quatre hommes de file à la distance de deux cents toises.

II. Nos pièces ordinaires dans chaque calibre sont préférables à des pièces qui seraient plus courtes qu'elles de deux pieds, ou d'un pied et demi, parce que leur tir est plus juste et leur portée plus longue en beaucoup d'occasions.

III. En campagne, le plus fort calibre doit être celui de 12 ou de 16 en petit nombre de pièces.

IV. A 400 toises les coups de canon sont peu assurés ; a 200 ils commencent à devenir certains ; ils ne sont bien meurtriers qu'à 100. Ainsi lors que les ennemis sont à la première distance il faut tirer lentement pour inquiéter leurs manœuvres en se donnant le temps de pointer ; à la seconde, vivement pour ralentir leur marche ; à la troisième, précipitamment pour les rompre.

V. Les boulets font généralement plus de mal aux ennemis que les coups tirés á mitrailles.

VI. Les grappes de raisins et les boîtes de fer blanc remplis de petits mobiles, ne sont pas d'un aussi bon usage pour tirer de près sur l'ennemi que les balles ordinaires renfermées dans des sacs d'une toile légère.

VII. La portée moyenne des grappes de raisin à petits boulets est de cent toises, et celle des balles roulantes de soixante.

VIII. Une canonnade qui n'a d'autre objet que de tuer un petit nombre, de misérables soldats, qui passent, sans déranger les projets ennemis, ne fait honneur ni à celui qui la commande, ni à celui qui l'exécute.

IX. L'on peut mener au moins des pièces de 4 partout où quatre hommes marchent de front, et en quelque lieu que ce soit, avec du temps, de la patiente et un peu de ressource dans l'imagination.

X. Il faut éviter, autant qu'il est possible, de placer les batteries immédiatement devant ses propres troupes, ou sur de médiocres élévations qui seraient derrière elles.

XI. C'est une erreur de croire que le canon doit être placé de préférence sur des hauteurs fort élevées au dessus du niveau de la campagne.

XII. Pour que l'artillerie ait un effet décisif dans une affaire, il faut que les batteries soient fortes et qu'elles se protègent réciproquement.

XIII. Ne tirez jamais en salve, mais un coup après l'autre, de façon que votre feu soit continuel.

XIV. Il est dangereux de faire voir ses batteries longtemps avant le moment de les employer.

XV. Quand le terrain est à peu près égal sur tout le front de bataille, on doit partager toute l'artillerie en quatre divisions, une pour chaque aile, la troisième pour le centre et la quatrième en réserve, tellement disposée qu'on la puisse porter aisément et sans retard partout où il sera besoin.

XVI. Il faut par tous les moyens praticables faire en sorte que les batteries prennent les ennemis en flanc, de revers, ou au moins d'écharpe.

XVII. Deux batteries placées dans des intervalles sur le front de la ligne, et qui n'auraient sous leur direction que des troupes sans profondeur, doivent plutôt croiser leur feu que de tirer simplement devant elles.

XVIII. On ne doit pas toujours tirer à pleine charge, dans les affaires de campagne, le ricochet peut y être aussi meurtrier que dans les sièges.

XIX. Ne laissez aucune partie de votre canon inutile.
XX. On doit avoir la plus grande attention un jour d'affaire à ne pas prodiguer les munitions à canon, à plus forte raison la veille, si l'on n'est à portée de les remplacer à mesure.
XXI. L'officier qui commande une batterie dans un combat, doit tirer de préférence sur les troupes ennemies, et s'inquiéter peu de leur canon, qui n'aurait le sien pour objet.
XXII. L'artillerie et les troupes auprès desquelles elle est placée, ne doivent jamais s'abandonner.
XXIII. Quand on porte de l'artillerie en avant de la ligne, il ne faut pas manquer de la faire soutenir par des compagnies de grenadiers, et même par des bataillons suivant la conjoncture.
XXIV. Les batteries particulièrement sur les ailes seront placées autant qu'il sera possible, de façon à pouvoir tirer encore lorsque les troupes en sont aux mains.
XXV. Le général de l'artillerie et son major doivent se donner beaucoup de mouvement pour bien connaître le champ de bataille.
XXVI. Un général de l'artillerie doit se connaître à toutes les manœuvres, que les troupes, cavalerie, ou infanterie, peuvent faire dans une action de campagne.
XXVII. Il faut que celui qui commande l'artillerie, soit informé, au moins en gros, des projets du général de l'armée dans le courant de la campagne, et très particulièrement pour une action importante.»

***Doc. 4.* Objeto de la artillería volante o a caballo.**
Extracto de la *Memoria sobre la artillería volante o de a caballo*, de Clemente Peñalosa, Segovia, 1796, folios 11v–14v.

«Luego que el rey de Prusia usó de la Artillería volante, conocieron sus Sajones su utilidad, la adoptaron los Rusos y los Suecos, pero con aquellas alteraciones que nacen de los diversos sistemas que influyen en los inventos. Estos no llevaban los Artilleros montados como el Monarca de Potsdam; quisieron conducirlos en Wurts o carros de municiones con asientos alrededor, y esta mudanza impidió mucha parte de la utilidad del establecimiento.

Las innovaciones en la Artillería que no se proponen por objeto primordial, la simplicidad, solidez y uniformidad, son expuestas, porque la falta de cualquiera de estos tres objetos destruye sus operaciones, hacen las máquinas complicadas y altera los principios de economía militar con dispendios enormes.

El objeto principal de la Artillería de a caballo es tener en sí una organización tan sólida y sencilla que pueda ejecutar los movimientos más súbitos y difíciles con desembarazo y prontitud. Estos movimientos para transportar donde se necesita dependerá de la simplicidad de las partes que componen las máquinas, y atalajes de su construcción.

Hasta estos últimos tiempos era el uso de la Artillería limitado y circunscripto. Únicamente servía en las batallas y en las acciones parciales colocada en puntos fijos e inmóviles, y cuando se conducían a ellos las piezas seguían a pie los artilleros, tirando de ellas en muchas ocasiones consumían las fuerzas humanas para su transporte, y se debilitaba por el cansancio y la fatiga el vigor que era necesario para la acción.

Los cañones de campaña se movían con las tropas a que estaban unidas en su orden. Como su paso era lento e incómodo resultaban movimientos tardos y gravosos, cuyo atraso causaba en las retiradas pérdidas considerables, por ser necesario que las tropas se detuviesen a cubrir la seguridad de la Artillería perecía un batallón por no abandonar cuatro cañones, y la tropa sufría la pesadez, y la complicación de los trenes de campaña.

Estos desastres que confirmó la experiencia hizo problemática la proposición de si la Artillería era útil, o gravosa en las acciones campales. La pesadez y dificultad de transportarla dieron al problema cierta apariencia de exactitud que puso en tormento los mayores ingenios militares.

La Artillería de a caballo ha trastornado estas ideas y disuelto las dudas de los tácticos. Como los Artilleros van montados sobre los caballos, conservan el vigor que desperdiciaban fatigados en marchas largas y penosas. Sin otro trabajo que desmontarse, están ágiles para el servicio de las piezas y, fuertes para las incomodidades, son más constantes en la acción y menos desobedientes en las maniobras.

(…)La agilidad, la prontitud con que la Artillería de a caballo se transporta, ofrece utilidades que no conocía la táctica del siglo pasado. Estas utilidades dependen de su pronta movilidad. Es prodigiosa; los cañones corren de unos puntos a otros como máquina flexible al impulso que la mueve; pasan del centro de la línea a sus alas súbitamente; mudan posiciones según conviene a las circunstancias de la acción; socorren los ataques contra el flanco, buscan el del enemigo con celeridad.

Esta misma agilidad hace que la Artillería de a caballo siga no solo los movimientos de la Infantería rápidos, o por terrenos escabrosos, sino las evoluciones y marchas de la Caballería. (…)La Artillería de a caballo no tiene fija localidad según los movimientos del enemigo, a quien observa, ataca, o se retira en las acciones legítimas. La experiencia ha confirmado con medio siglo de sucesos esta teoría que destruye no solo el sistema de formar líneas dilatadísimas de defensa, coronadas de cañones, y morteros, sino los usos antiguos de la Artillería de batalla.»

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Professor Allon Klebanoff (Israel)
Balloons, Rockets and Conserves Technology and Warfare during the Revolutionary and Napoleonic Wars

The French Revolution of 1789 spawned one of the most important conflicts in world history – the Revolutionary and Napoleonic wars, a multi-staged prolonged war, which lasted over 23 years in total, from 1792 to 1815. The historical, political and cultural aspects of this long war are outside the scope of this paper. The question is whether this central war in world history is also important in the history of military technology. The answer is complex and far from simple.

Warfare had changed dramatically during the transition from the Middle Ages to the Renaissance. Moreover, the technological breakthrough in military technology during this period is undoubtedly one of the most important facets of the rapidly changing reality during the 15th and 16th centuries, with dramatic political, social, economical, cultural and, naturally, military implications.

The 17th century saw continuing developments and changes in military technology. Both the scope and the pace of the changes have slowed down, even considerably, but still, warfare continued changing dramatically. A close scrutiny of the wars during the 17th century proves the rapid changes both on land and sea.

What happens, than, in the 18th century? The age of enlightenment had seen extraordinary developments and breakthroughs in many a field of science: physics, chemistry, mathematics, medicine, biology, astronomy etc. Warfare? Surprisingly, during the 18th century the development of military technology has more than slowed down: it ground to an almost complete halt. Already during the late 17th century, warfare had reached an optimal level – the flintlock mechanism for infantry and cavalry small arms, the vast improvements in gun barrels and the categorization for the artillery weapons and finally, the level of efficiency in ship planning and in naval gun carriages.

Indeed, if one compares the War of Spanish Succession, the Seven Years War and the American War of Independence, from the technological point of view, it is quite clear that there are only minor differences between the weapons employed in these conflicts. The reasons for this pause in the technological advance are complex, especially in the light of both the achievements of the previous century and the huge advance in the following one – the 19th century.

The best example is the ubiquitous issue weapon of the British Army infantry for well over a hundred years – the Land Pattern Musket, familiarly known as "Brown Bess".

This is indeed common knowledge. Major developments in military technology occur only once the industrial revolution takes hold. But is the final stage of the 18th century devoid of military developments? The answer is both negative and intriguing.

The French Revolution erupts in 1789. The year 1792 sees the beginning of the series of conflicts later becoming known as "The Revolutionary and Napoleonic Wars". This series of wars is 23 years long, from 1792-1815, and it is the backdrop to this paper.

"They came in the old way, and beaten off in the old way", famously sums up the Duke of Wellington the battle of Waterloo, the final battle of the wars. He was right, of course, but only from the tactical point of view. What about military technology? Which realm are we in?

Joseph-Michel Montgolfier and Jacques-Étienne Montgolfier were born into a family of paper manufacturers in Southern France. Of the two brothers, it was Joseph who first contemplated building machines. As early as 1777, he observed laundry drying over a fire incidentally form pockets that billowed upwards. Joseph made his first definitive experiments in November 1782 while living in the city of Avignon. He reported, some years later, that he was watching a fire one evening while contemplating one of the great military issues of the day–an assault on the fortress of Gibraltar which had proved impregnable from both sea and land. Joseph mused on the possibility of an air assault using troops lifted by the same force that was lifting the embers from the fire. He believed that contained within the smoke was a special gas, which he called Montgolfier Gas, with a special property he called levity.

A few successful experiments prompted the first full size balloon, which covered more than two kilometers in its test flight on December 1782. On 4 June 1783, they flew this craft as their first public demonstration at Annonay in front of a group of dignitaries. Word of their success quickly reached Paris. On 19 September 1783, the *Aérostat* or *globe aérostatique* was flown with the first living beings in a basket attached to the balloon: a ship, a duck and a rooster.

Étienne Montgolfier was the first human to lift off the earth, making at least one tethered flight from the yard of the Réveillon workshop in the Faubourg Saint-Antoine. It was most likely on October 15, 1783. A little while later on that same day, a friend of Étienne, Pilâtre de Rozier became the second to ascend into the air. On 21 November 1783, the first free flight by humans was made by Pilâtre, together with an army officer, the marquis d'Arlandes.

Another French army officer, the short named General Jean Baptiste Marie Charles Meusnier de la Place, who was also a brilliant mathematician and engineer. Meusnier was a pioneer of flight, and one of the first people to contemplate military uses of the balloons. Unfortunately, he was killed in 1793.

Numerous suggestions had been made for the use of balloons during the French Revolutionary Wars, and in 1793 the Committee of Public Safety began testing their potential. The first successful experiments were conducted near the Tuileries in September and October of that year. At the end of October 1793, chemist Jean-Marie-Joseph Coutelle and his assistant, the engineer Nicolas Lhomond, were sent to join the Army of the North with 50,000 livre to acquire equipment. They were given a letter from Lazare Carnot commending them to General Jean-Baptiste Jourdan, who refused to cooperate.

Back in Paris, the Committee of Public Safety ordered further tests on the balloon technology to be conducted at the Chateau de Meudon, where the Aerostatic Development Centre was founded. On April 2, 1794, and act creating an Aerostatic Corps was passed. The act creating the corps envisaged three roles: reconnaissance, signaling and the distribution of propaganda. In May 1794, the new corps joined Jourdan's troops at Mauberge, bringing one balloon, the famous *L'Entreprenant*. The first military use of the balloon was on 2 June, when it was used for reconnaissance during an enemy bombardment. On 22 June, the corps received orders to move the balloon to the plain of Fleurus, in front of the Austrian troops at Charleroi. This was achieved by twenty soldiers who dragged the inflated balloon across thirty miles of ground. For the three following days, an officer ascended to make further observations. On 26 June, the Battle of Fleurus was fought, and the balloon remained afloat for the entire engagement – over nine hours, during which notes were taken on the movements of the Austrian Army, dropping them to the ground for collection by the French Army, and also messages were signalled using semaphore. The two men crew (Coutelle and General Morlot) also received written questions from the ground by means of a cable, and the general sent his orders and observation reports down the cable in a bag.

The Ground operations were entirely directed from the air. In addition to providing a tactical advantage, the balloon also demoralized the enemy troops. The Austrians feared the balloon and looked upon it as an agent of the devil that was allied to the French Republic. The Battle of Fleurus was the first battle in history where aerial reconnaissance contributed significantly to the victory.

L'Entreprenant is the most famous balloon of the period, and probably of all times. It was used extensively throughout the campaign, gaining widespread admiration. Jourdan himself took an ascent during the action at Sombreffe. On 23 June, an Act creating a second aerostatic company had been passed, to be trained at Meudon, and provided with three new balloons, *Celeste*, *Hercule* and L'Intrépide, each with its own corps and equipment, and in March 1795 it was attached to the Army of the Rhine. The second company conducted ascensions at the Battle of Mainz, and were also active during the evacuation of Mannheim. For the winter, they established a base at Frankheim, then followed the Army north and conducted observations at Stuttgart, Rastatt and Donauwörth.

Meanwhile, in 1795, the first company was transferred to the Army of Sambre-et-Meuse, which was now led by Jourdan. They were not directly involved in any action, Jourdan, now a believer and an admirer, printed official correspondence forms depicting a balloon above his army. In September 1796, they were at the Battle of Würzburg when the French Army was defeated, and the entire company was taken captive with its balloon L'Intrépide, which is now on display at the Heeresgeschichtliches Museum in Vienna.

Following this disaster, the second company was attached to the reconstructed Army of Sambre-et-Meuse. The new General, Lazare Hoche, refused to let them participate in any action.

The officers and men of the first company were released from service in April 1797. This was not the end of the service. In 1798, they were recalled to active service and the company joined the Napoleonic Campaign in Egypt. On arrival, they decided to initially leave the ballooning equipment on their ship. This was destroyed in the Battle of the Nile, and the company was assigned to other duties. They were able to conduct a few demonstrations of more basic balloons for entertainment purposes.

This was not the first time General Bonaparte toyed with the idea of using balloons. Already in 1796 he officially requested a balloon to assist him in the siege of Mantua, a request which was not answered. On 15 January 1799, the Directory passed an act disbanding the balloon corps. The second company was immediately disbanded, but the first was still in action in Egypt and remained in existence until its return to France in 1802. In spite of the balloons remaining present both in the public imagination and in military and scientific circles – for all purposes the idea of creating an air arm was allowed to fade away. During the frantic preparations for an invasion of England during 1804 a popular print appeared in France, showing a three-dimensional approach to the forthcoming invasion – showing huge balloons, kites carrying a single soldier, ships, landing craft, and even a tunnel under the English Channel.

As late as 1808, Napoleon approached his scientific advisor, the great scientist and mathematician Gaspar Monge regarding the possibility of construction huge balloons for carrying troops across the channel. Nothing came out of this idea, and Napoleon's air force died in infancy.

(As a scientific footnote, one must add that both theoretical and practical work continued privately, on multiple issues concerning the third dimension: many experiments with hydrogen, early concepts of dirigibles, and most famously – the invention of the parachute, including many famous demonstrations, in Paris, London, St. Petersburg etc.)

A story no less dramatic, but without a success story like the battle of Fleurus, is the major development in steam propulsion during the very period. The full story is outside the scope of this paper, but in popular history one could find many references to Robert Fulton's achievements, and his famous demonstrations of his inventions in Paris and Napoleon's rejection of the idea as one of the most dramatic "might have been" stories in history.

After the rejection of the idea of employing steamships by Napoleon, Fulton switched allegiance and moved to England, where he was commissioned by Prime Minister William Pitt to build a range of weapons for use by the Royal Navy during Napoleon's invasion scare. Among his inventions were the world's first modern naval torpedoes, which were tested, along with several others of his inventions, during the 1804 Raid on Boulogne, but met with limited success. Although he continued to develop his inventions with the British until 1806, the decisive naval victory at the Battle of Trafalgar greatly reduced the risk of invasion and Fulton found himself being increasingly ignored. In 1806, Fulton returned to America, where he became involved in the construction of the first commercial steamboat, the North River Steamboat (later known as the *Clermont*), which carried passengers between New York City and Albany, New York.

Fulton's final design was Demologos, the world's first steam driven warship built for the US Navy for the war of 1812. The vessel was not completed until after his death and renamed *Fulton* in his honour.

A rocket is a tube which obtains thrust from exhaust which is formed entirely from propellants carried within the tube. Rockets for military and recreational uses date back to medieval China, and are closely linked to the invention of gunpowder. Europeans were introduced to rockets during the Mongol invasions of the 13th century, and between the 15th and 18th centuries, there was an occasional appearance of reference to rockets in theory and gunnery books.

In 1792, the first iron-cased rockets were successfully developed and used during the Anglo-Mysore Wars. The British then took an active interest in the technology. The Mysore rockets of this period were much more advanced than the British had previously seen, chiefly because of the use of iron tubes for holding the propellant; this enabled higher thrust and longer range for the missile (up to 2 km range). After the eventual defeat in the Fourth Anglo-Mysore War and the capture of the Mysore iron rockets, they were influential in British rocket development, inspiring the Congreve rocket, which was soon put into use in the Napoleonic Wars.

William Congreve, son of the Comptroller of the Royal Arsenal, Woolwich, London, became a major figure in the field. From 1801, Congreve researched on the original design of Mysore rockets and set on a vigorous development program at the Arsenal's laboratory. Congreve prepared a new propellant mixture, and developed a rocket motor with a strong iron tube with conical nose. This early Congreve rocket weighed about 32 pounds (14.5 kilograms). Congreve first demonstrated solid fuel rockets at the Royal Arsenal, Woolwich, in 1805. He considered his work sufficiently advanced to engage in two Royal Navy attacks on the French fleet at Boulogne, France, one that year and one the next.

In early September 1807, Congreve Rockets were employed during the successful and terribly destructive naval bombardment of Copenhagen, which killed more than 2,000 civilians and destroyed 30% of the buildings. The rockets were particularly effective as they caused most of the fires. Parliament authorized Congreve to form two rocket companies for the army in 1809. Congreve subsequently commanded one of these at the Battle of Leipzig in 1813. Congreve rockets were also used in the battle of Waterloo.

The use of Congreve rockets left a particular mark in the War of 1812 – At the Battle of Baltimore in 1814, the rockets fired on Fort McHenry by the rocket vessel HMS Erebus were the source of the *rockets' red glare* described by Francis Scott Key in "The Star-Spangled Banner" – the American national anthem.

Congreve, who also published three books on rocketry, was fundamental in opening the field of rocket warfare. This was the most dramatic aspect of the many technological developments in the field of artillery during this period, like the appearance of the carronade, the invention of Shrapnel shells etc.

The many technological developments in the period were not restricted to the spheres of weaponry. Napoleon, who famously referred to logistics as one of the keys for waging war ("An army marches on its stomach") ceaselessly searched for solutions, including technological solutions, for logistical problems. By Napoleon's personal initiative, a special competition was declared, with a hefty cash award of 12,000 francs to any inventor who could devise a cheap and effective method of preserving large amounts of food. The larger armies of the period required increased and regular supplies of quality food. Limited food availability was among the factors limiting military campaigns to the summer and autumn months. In 1809, a French confectioner and brewer, Nicolas Appert, observed that food cooked inside a jar did not spoil unless the seals leaked, and developed a method of sealing food in glass jars. The reason for lack of spoilage was unknown at the time, since it would be another 50 years before Louis Pasteur demonstrated the role of microbes in food spoilage. However, glass containers presented challenges for transportation. Glass jars were largely replaced in commercial canneries with cylindrical tin or wrought-iron canisters (later shortened to "cans") following the work of Peter Durand (1810).

Durand worked on preserving animal food, vegetable food and other perishable articles using various vessels made of glass, pottery, tin or other suitable metals. The preservation procedure was to fill up a vessel with food and cap it. Vegetables were to be put in raw, whereas animal substances might either be raw or half-cooked. Then the whole item was to be heated by any means, such as an oven, stove or a steam bath, but most conveniently by immersing in water and boiling it.

Cans are cheaper and quicker to make, and much less fragile than glass jars. Glass jars have remained popular for some high-value products and in home canning. Can openers were not invented for another thirty years so at first, soldiers had to cut the cans open with bayonets or smash them open with rocks. The French Army began experimenting with issuing canned foods to its soldiers, but the slow process of canning foods and the even slower development and transport stages prevented the army from shipping large amounts across the French Empire, and the war ended before the process was perfected. Unfortunately for Appert, the factory which he had built with his prize money was razed in 1814 by Allied soldiers invading France. Following the end of the Napoleonic Wars, the canning process was gradually employed in other European countries and in the US.

To conclude, in this paper, I have just touched upon some of the many important technological developments during the 23-years series of wars 1792–1815. This period holds a unique position inbv the history of warfare. While from tactical point of view it was still very much 18th century – the many technological developments serve as a fascinating prelude to the era of the industrial revolution.

Generale (r) Maurice Faivre (France)
Technologie et art militaire lors des operations exterieures de l'armee francaise

L'armée française a une expérience ancienne des guerres coloniales, des décolonisations et aujourd'hui des opérations extérieures. Il paraît donc intéressant de rappeler ce qu'ont été les technologies militaires mises en œuvre autrefois, de les comparer à celles mises en oeuvre actuellement, et de voir si certaines techniques anciennes sont encore utilisées ou ont été éliminées par le progrès scientifique. La conclusion soulignera l'influence de la technique sur la tactique et sur l'organisation des unités.

La monarchie française a possédé une Empire colonial, en particulier en Amérique du Nord, qu'elle a perdu lors du traité de Paris de 1763, et récupéré en partie en 1814 ; il n'est pas étudié dans cet exposé. Au 19°siècle, la colonisation française se réfère à l'idéologie des Lumières, exprimée par V.Hugo : « un peuple éclairé va trouver un peuple dans la nuit ».

Cet exposé se limite aux conquêtes coloniales du 19ème siècle, aux décolonisations du 20ème siècle et aux opérations extérieures qui ont commencé dans les années 1950 et se poursuivent au 21ème siècle.

Les conquêtes coloniales

La conquête de l'Algérie, de 1830 à 1849, se poursuit jusqu'en 1891 par l'occupation du Sahara. Des années 1840 aux années 1890, la colonisation française se développe en Afrique noire, en Tunisie, en Indochine et dans les océans indien et pacifique. Le protectorat du Maroc est établi en 1912, et des mandats sont confiés à la France après la guerre de 1914-18 (Togo, Cameroun, Liban et Syrie).

L'Algérien Mohammed Harbi écrit que « *l'armée d'Abd-el-Kader est vaincue par une armée supérieurement équipée* ». Contre la cavalerie algérienne, très mobile et agressive, des lignes de blockhaus sont édifiées en 1832 et 1840. Les fusils *mokhala* de fabrication locale, utilisés de façon désordonnée, sont inférieurs aux fusils français modèle 77 et surtout 1842 à percussion, et à la carabine rayée de 1837. A l'occasion de deux trêves, des accords secrets ont sans doute permis à l'émir de recevoir des armes modernes, mais il dispose de peu d'artillerie, et la poudre des munitions est de mauvaise qualité, alors que Bugeaud dispose du sytème d'artillerie Valée et des canons Gribeauval. Enfin Abd-el-Kader n'a pas de logistique organisée. Un des procédés utilisés est celui de la razzia, qui prive l'ennemi de ses ressources alimentaires. Les colonnes mobiles de Bugeaud alternent le feu et le mouvement, et ses formations en losange désorganisent l'armée marocaine à la bataille de l'Isly. « *La sauvagerie des indigènes,* selon Daniel Rivet, *rejaillit* *sur l'occupant par effet de contagion mimétique* ». Le recrutement de soldats et de supplétifs locaux, l'utilisation de mulets pour le transport, et de dromadaires pour le combat en zone saharienne, renouvellent les procédés mis en œuvre par Bonaparte en Egypte. Des Bureaux arabes initient au progrès les populations.

Sur le théâtre marocain en 1912, la supériorité de l'armement se confirme. Le fusil Lebel à tir rapide de 1886, le mousqueton de 1892, les mitrailleuses Hotchkiss, les canons de 65 et 75 mm réalisent des portées doubles de celles des armes antérieures. Lyautey, à l'école des principes de Galliéni, progresse en tache d'huile en évitant les destructions, et en multipliant le recours aux goumiers et aux officiers des Affaires indigènes ; pour lui, quatre médecins valent quatre compagnies d'infanterie. En 1925, la guerre du Rif pilotée par le maréchal Pétain met en œuvre les blindés et l'aviation qui ont été expérimentés en 1917.

En Afrique noire, les comptoirs côtiers sont protégés par des fortins en bois contre les incursions des potentats locaux, qui disposent d'armes de traite modernes. Le général Faidherbe, ayant l'expérience de l'Algérie, est le pacificateur du Sénégal de 1854 à 1863. Il construit un fort à Médine, base avancée à 600 km à l'est pour les expéditions vers le Soudan. Il forme les unités d'élite des tirailleurs sénégalais et crée pour les enfants des notables une *école des otages*, destinée à former les futurs administrateurs. Dans les années 1890, des expéditions pénètrent en profondeur jusqu'au Tchad et au Nil (Opérations Foureau-Lamy et Marchand : en 1896, le colonel Marchand traverse l'Afrique d'Ouest en Est en passant par Fachoda; avec 150 soldats, il parcourt 7.500 km en deux ans et demi) ; leur logistique repose sur le recours aux pirogues et aux porteurs. A Madagascar en 1896, Galliéni applique les procédés de pacification qu'il a mis au point en Indochine.

Lors des guerres mondiales, les troupes indigènes, et en particulier les tabors marocains, deviennent des unités classiques disposant de toute la technologie moderne des armements d'infanterie.

Contre-insurrection

Les guerres d'Indochine, d'Algérie, et les combats du Maroc et de Tunisie ont débuté par des insurrections nationalistes. Ce sont pour la France des guerres post-coloniales ou de décolonisation, pour les nationalistes des guerres de libération, d'indépendance et des révolutions politiques. Ayant duré de 7 à 9 ans, ces conflits *asymétriques*, où prédominent la guérilla et le terrorisme, sont dénommés à tort *conflits de basse intensité*, car des batailles de type classique ont été conduites sur la Route coloniale n°4, à Na San, à Dien-Bien-Phu, et sur la frontière tunisienne (bataille de Souk-Ahras)

Guerre d'Indochine

La guérilla du Vietminh débute en 1946 avec des armes livrées par les occupants japonais et par les service américains, avant d'être alimentée massivement par la Chine de Mao-tse-Tung. Grâce à ce renforcement, la guérilla généralisée se transforme en corps de bataille de 125.000 hommes, contre lequel le Corps expéditionnaire français d'Extrême-Orient, composé de soldats de métier, de légionnaires et de troupes coloniales se trouve en infériorité numérique, dans un terrain difficile, où la forêt montagneuse, la brousse dense et les marécages constituent les deux-tiers du territoire. La montée en puissance d'unités autochtones, et l'armement de maquis dans les minorités montagnardes, contribuent au contrôle en surface, tandis que l'aide américaine permet peu à peu d'assurer le recomplètement des armes et des munitions.

Dans cette guerre sans front, le commandement français réagit avec le maximum d'efficacité et résiste à la pression communiste en mettant en œuvre des moyens technologiques avancés :

– la recherche électromagnétique lui permet de suivre les grandes unités adverses et de suppléer à la carence du renseignement local,

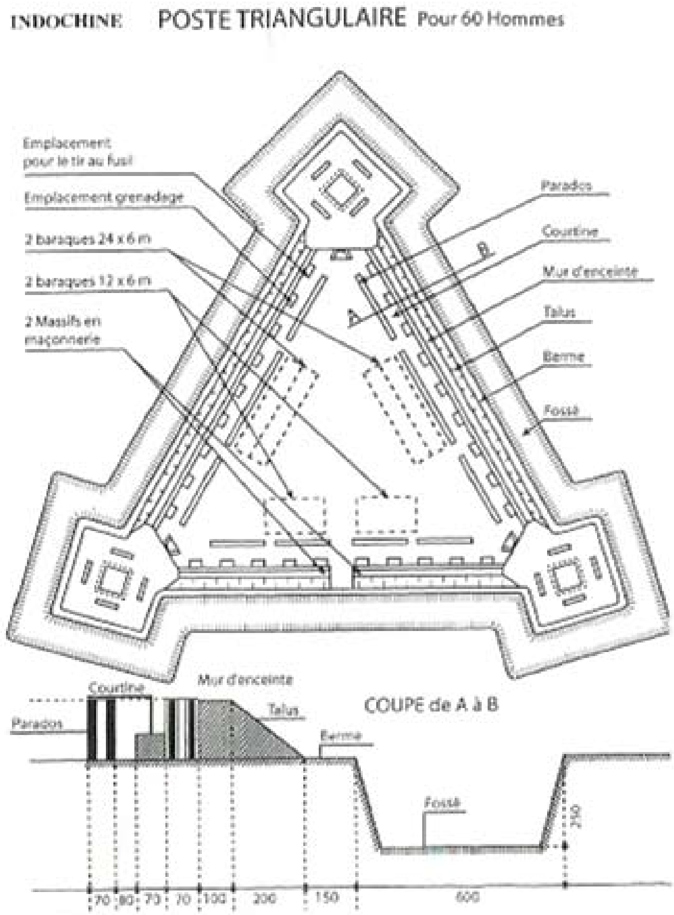
– la construction de tours et de points d'appui fortifiés assure la protection du delta tonkinois contre les incursions rebelles, grâce à l'appui d'une artillerie de position et d'intervention permanente et instantanée,

– 18 groupements mobiles interarmes (dont 7 vietnamiens) ont pour mission de casser du Viet, en bénéficiant de l'appui des blindés et de l'aviation (4 groupes de chasse et 4 de bombardement). 14 bataillons parachutistes motivés (dont 8 vietnamiens) effectuent 150 opérations aéroportées et mettent au point une doctrine d'emploi adaptée à la menace adverse,

– le regroupement des populations contribue à la pacification et à l'action psychologique. Les hiérarchies parallèles du Vietminh sont mises en évidence.

Des formes non orthodoxes de combat participent à l'action : commandos d'action en profondeur, groupements amphibies équipés de crabes M29C et alligators LVT4, dinassauts d'action côtière et fluviale (2 LCM et 4 LCVP), bataillons légers vietnamiens, aviation légère d'observation d'artillerie, escadre d'hélicoptères (25 Hiller et 25 Westland en 1952 – 9.640 évacuations soit deux tiers des blessés), lucioles d'éclairage nocturne, réseau de transmissions performant, groupe d'exploitation de l'Intendance, recours accru au personnel féminin (4.200 radios, plieuses et ambulancières).

Le système des bases de manœuvre permet de fixer et détruire les grandes unités ennemies; c'est un succès à Na San qui est évacué par surprise, mais un échec à Dien-Bien-Phu où 60.000 vietminh, ravitaillés par des milliers de coolies en bicyclette, et par camions chinois, grignotent la position tenue par 15.000 combattants, grâce à des travaux de tranchées et de sapes. Son artillerie enterrée en contre-pente (11 batteries de 105) interdit le terrain d'aviation et contrebat l'artillerie française. Les pertes sont très lourdes pour les deux camps.



Guerre d’Algérie

Après une première tentative de soulèvement, le 8 mai 1945, écrasée brutalement, les nationalistes algériens, initialement divisés et minoritaires, disposant d’armes anciennes et dépareillées (fusils Mauser et Stati, FM Bren), n’entraînent pas derrière eux la majorité du peuple algérien. Ils suppléent à cette faiblesse en employant conjointement la propagande identitaire et la brutalité du terrorisme aveugle, des mutilations corporelles, et l’organisation politico-administrative des villageois, chargés d’actions de sabotages. Ils organisent en même temps le trafic d’armes obtenues dans les pays arabes et socialistes, et acheminées par les frontières de Tunisie et du Maroc. Organisant alors leur implantation dans les campagnes (Congrès de la Soummam), ils décident en 1956 d’installer le terrorisme urbain en ville d’Alger. Ils perdent successivement trois batailles, le 20 août 1955 dans le Constantinois, en 1957 la bataille d'Alger, et en avril 1958 la bataille des frontières. Ils décident alors de transférer l'action terroriste en France, et d'agir par le canal de la diplomatie à l'ONU, dans les pays socialistes et dans le Tiers monde. Ils mettent enfin sur pied une armée des frontières en Tunisie et au Maroc, organisée de façon régulière et disposant de mitrailleuses MG 34 et 42, et d'artillerie (canons de 75 et de 105 sans recul, mortiers de 120) ; après son échec de 1958, cette armée bien équipée se contente de harceler les barrages.

Les réactions du pouvoir français sont d'abord de renforcer les effectifs en faisant appel à la conscription et au recrutement de nombreux supplétifs. Deux systèmes de forces sont alors constitués : – 75 Secteurs qui quadrillent le territoire et protègent la population (5.000 postes pas toujours confortables) – trois divisions de réserve générale, à base de parachutistes et de tirailleurs musulmans, qui, dans de grandes opérations de nomadisation, balaient le territoire d'Ouest en Est en détruisant les maquis algériens.

Simultanément, l'édification de barrages frontaliers, minés, électrifiés et surveillés par un système de radars-canons, asphyxient peu à peu la rébellion intérieure. 20 batiments de la marine surveillent la mer et saisissent les bateaux de ravitaillement. Quant à la lutte contre le terrorisme urbain, elle est conduite d'abord par l'emploi de sévices. « *Certains, pendant la bataille d'Alger en particulier, ont été confrontés à un dilemme : se salir les mains en interrogeant durement de vrais coupables, ou accepter la mort certaine d'innocents. S'il y eut des dérives, elles furent marginales »*(livre blanc de l'armée française, 2002) lors des interrogatoires, dans un deuxième temps par la pénétration des réseaux terroristes. L'intoxication des chefs rebelles se traduit par le massacre de centaines de faux traîtres (bleuïte).

Le commandement français a peu à peu réorganisé 20 divisions, qui à l'exception des unités rapatriées d'Indochine, n'étaient pas préparées à la contre-guérilla. Les matériels sont alors modernisés : fusils Garant remplacés par le Mas 36 puis le Mas 49/56 semi-automatique et lance-grenade. Sont peu à peu mis en place: le pistolet-mitrailleur Mat 49 et la mitrailleuse AA52, les mortiers de 60 et 81 au niveau compagnie et bataillon, les canons sans recul et les obusiers de 105HM2 et TF50, les postes radios TRPP8, ANGRC10 et C9, les chars Chaffee M24 puis AMX13. 300 automitrailleuses AMM8, achetées en 1956, sont complétées par les Engins blindés de reconnaissance Panhard. Les camions GMC sont blindés, puis remplacés par des Simca 4X4 et des Berliet GBC, aménagés pour un débarquement rapide. Les tenues de combat allégées favorisent la mobilité, les rations de combat sont généralisées. Le soutien logistique est porté à 13 kgs par homme-jour. Le ravitaillement en munitions est abondant (40.000 obus par mois).

L'effort le plus important concerne les moyens aériens qui comptent 900 avions et 400 hélicoptères. L'aviation légère de l'armée de terre est mise sur pied aux côtés de l'armée de l'Air et de l'Aéronavale. 25% des appareils sont des avions d'appui T6, complétés ensuite par les T28 Fennec. Les autres appareils sont des

Corsair de la marine, des chasseurs Skyraider et des bombardiers B26. L'emploi du napalm est autorisé sur les groupes armés. Les hélicoptères lourds comptent 55 Banane H21 et 120 Mammouth H34 ou HSS (certains, appelés Pirates, sont armés d'un canon de 20 ; d'autres sont équipés de missiles SS1 et spécialisés dans l'attaque des grottes). La doctrine d'emploi des Détachements d'intervention hélicoptères (DIH) est mise au point, en même temps que la coopération Air-Terre est assurée par l'organisation de 3 Groupements tactiques, de PC Air directeurs et de PC volants. En 1955, les Alouette II médicalisées sont complétées par les Vertol et les Mamouth ; on compte 30 minutes pour les évacuations sanitaires, plus 30 minutes pour l'hospitalisation.

Comme en Indochine, la source principale du renseignement est constituée par la recherche électromagnétique. Les postes radios ennemis sont localisés par goniométrie et homing, ou soumis à des intrusions. Le général Challe puis Crépin décident de supprimer les postes HF de l'ennemi. La surveillance aérienne relève les traces menant vers les postes de commandement insurgé (méthode Lanlignel). De nombreux organismes participent successivement à la centralisation des renseignements : Service des liaisons nord-africaines – Sécurité du territoire – Deuxième Bureau – Système Renseignement-Action-Protection, devenu Centre de Coordination interarmées – Centres de renseignement et d'action – Bureau études et liaisons – Service technique de recherche opérationnelle – Mission choc (en 1962).

Des formations de combat spécialisées (cavaliers, méharistes, gendarmes, supplétifs, commandos) font face à toutes les formes de menace (maxima atteints) :

– 3 régiments de cavalerie et 5 compagnies muletières (au total 2.500 chevaux et 2.000 mulets)

– 434 brigades de gendarmerie départementale et 71 Escadrons de gendarmerie mobile,

– les Services de sécurité (SSNA), dont 40 compagnies républicaines de sécurité(CRS)

– 75 commandos de chasse chargés de marquer les unités rebelles,

– 2.000 autodéfenses de villages, confiées aux anciens combattants de 1945 ;

– 4 trains blindés,

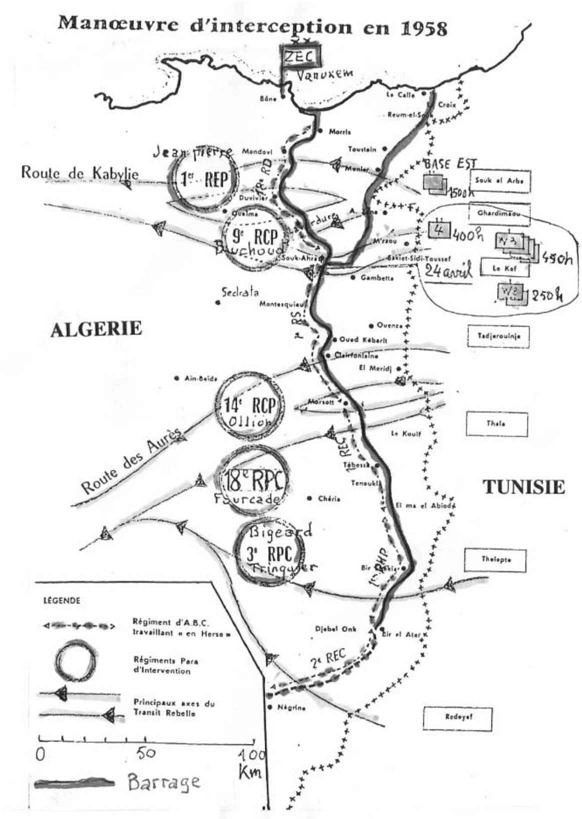
– 700 maghzens de protection des officiers SAS qui administrent les communes,

– 110 Groupes mobiles de sécurité et 800 harkas

– 5 compagnies méharistes (montées sur dromadaire), et 9 compagnies sahariennes portées,

– 2 détachements secrets d'infiltration au Maroc et en Tunisie.

L'armée conduit en même temps des actions civilo-militaires de pacification par le canal des officiers SAS, des équipes médico-sociales itinérantes, de l'assistance médicale gratuite, des instituteurs militaires, des Comités de salut public, du Service de formation de la jeunesse, des Procureurs militaires de Secteur, du regroupement des populations (2 millions de personnes), des campagnes d'action psychologique (compagnies de haut-parleurs).



Opérations extérieures

Dès 1948, l'armée française a participé à une mission d'observation en Palestine, qui a été suivie d'une quarantaine de missions de maintien de la paix ou d'interposition, réalisées avec l'accord des parties au conflit. Certaines missions sont des initiatives françaises (Cameroun, Tchad, Congo, Calédonie, Cote d'Ivoire), d'autres sont commanditées par l'ONU.

Depuis la fin de la guerre froide (1989), les OPEX se sont intensifiées et ont eu recours à des spécialistes civils et à une composante policière. L'ONU a pris en charge des Etats en décomposition en vue de les reconstruire, avant d'être relayée par l'OTAN, puis par l'Union européenne. Ce fut le cas lors de la guerre du Golfe de septembre 1990 à janvier 1991, où la division Daguet comptait 13.000 Français. Ensuite les OPEX ont engagé 8.000 h dans les années 90, elles ont atteint 13.000 soldats français en 2008, et ont été réduites à 9.500 en 2010. En novembre 2007, l'opération EUFOR au Tchad, dirigée par un général Irlandais, comprend des unités polonaises, autrichiennes, suédoises et néerlandaises.

Les OPEX conduites par la France ne peuvent pas être toutes mentionnées dans cet exposé, qui se limitera à une analyse thématique des technologies particulières mises en action. Une observation majeure réside dans le fait que l'Etat-Major américain se réfère à la doctrine mise au point par des officiers français qui ont servi en Indochine et en Algérie. Il s'agit des colonels Roger Trinquier et David Galula, et de leurs inspirateurs Galliéni et Lyautey. Considéré comme *le Clausewitz de la contre-insurrection*, le Lt-colonel Galula a observé les révolutions chinoise, grecque et algérienne. Il en tire un plan de lutte en 8 étapes, qui est essentiellement une politique de prise en main des populations, et n'aborde les conditions militaires que sous l'angle de la supériorité des forces; il préconise une progression en tache d'huile, par l'occupation progressive de tous les villages, ce qui à l'évidence n'a pas été la solution retenue en Afghanistan. Le colonel Trinquier en revanche préconise de porter la guerre chez l'ennemi en spécialisant des commandos supérieurement armés, et en regroupant les populations hors des zones-refuges des insurgés.

Parmi les procédés de supériorité militaire, l'action aérienne tient la première place. On lui doit la destruction d'unités insurgées en Mauritanie, en Cote d'Ivoire, et en Afghanistan, grâce à d'étroites liaisons Air-terre, mais au prix de dégats collatéraux sur les populations. Des succès stratégiques ont été obtenus en Serbie (1995), au Kossovo (1999) et en **Libye**.

Cette **opération de Libye**, conduite en 2011 sans engagement au sol, est tout à fait remarquable par la rapidité de l'intervention, par la coordination interarmées et interalliée, et par son soutien logistique à longue distance. Des conseillers des Services spéciaux sont intervenus en Cote d'Ivoire, Somalie, Libye, Afghanistan et Sahara. Les armements les plus modernes ont prouvé leur capacité ; c'est le cas du porte-avion nucléaire, du batiment de projection et de commandement, des avions Rafale et Mirage qui ont fait 5.600 sorties et détruit 1.000 objectifs, des hélicoptères qui en vol de nuit ont opéré 600 destructions (30 sorties de 3 à 12 hélicoptères : en général 2 Puma, 4 Gazelle et 2 Tigre), des drônes Male et Harfang, des missiles de croisière et modulaires, de la nacelle de reconnaissance aérienne, des hélicoptères Cougar et Caracal.

En **Afghanistan**, un effort particulier a été porté sur la protection des combattants au sol, qui bénéficient d'un appui aérien immédiat, se réfugient dans des bases opérationnelles avancées (FOB), et sont revêtus de l'*équipement Félin à liaisons intégrées*. La protection contre les engins explosifs improvisés (EEI ou Improvised Explosive D) est assuré par des robots de détection et des véhicules d'ouverture de route Buffalo et Arcadis ; il fait l'objet d'un plan d'action auquel participent plusieurs nations alliées. Les délais d'évacuation sanitaire vers l'hopital français de Kaboul sont estimées à deux heures (88 tués et 685 blessés depuis 2001). Après le retrait en 2012 des « unités combattantes »(sic), décidé en contradiction avec les plans alliés, il restera en Afghanistan les instructeurs et moniteurs de l'armée afghane (650 h. des opérations *Epidote et Operationnal Mentor Liaison Team*)).

Les opérations extérieures sont l'occasion de vérifier la fiabilité des équipements. Ainsi sont expérimentés les camions équipés du système d'artillerie CAESAR (155mm, portée de 40 à 50 km, rapidité de mise en batterie et du calcul de tir, mobilité et précision), les véhicules à haute mobilité, les petits véhicules protégés, les véhicules blindés de combat d'infanterie, le lance-roquette unitaire. Par rapport aux activités du temps de paix, tout cela représente un surcoût, qui est estimé de 60.000 à 100.000 euros par homme et par an selon le territoire considéré.

La participation à ces opérations ne s'improvise pas. C'est ainsi que les unités pour l'Afghanistan sont mises en condition avant projection (MCP) au cours d'un stage de 4 à 6 mois, suivi d'un exercice de vérification de 3 semaines en camp de manœuvre. Un memento du chef de section en contre-rébellion est distribué aux sous-offciers. Au retour, un SAS de décompression de 3 jours a lieu dans un hotel de Chypre. Un Groupement interarmées des affaires civilo-militaires, de 100 personnels et 400 stagiaires, a été créé à Lyon. Une cellule d'intervention et de soutien psychologique se préoccupe de sensibiliser les personnels au stress opérationnel. Enfin, une cellule d'aide aux blessés (CABAT) a été constituée, ainsi qu'une Association de Solidarité Défense présidée par l'amiral Lanxade.

Certaines missions ont un caractère humanitaire. C'est le cas de *l'Elément médical militaire d'intervention rapide* (EMMIR) qui a été dénommé *Bioforce* et est intervenu en Haïti en 2010. Ce sont aussi les unités de protection civile, engagées lors des catastrophes naturelles.

Influence des technologies sur les opérations et les formations

L'évolution des opérations évoquées permet de retenir les enseignements suivants :

– la supériorité et la modernisation des armes de contre-insurrection est une réalité, depuis les armes à percussion du 19ème siècle, aux canons et aux aéronefs du 20ème siècle, contre lesquels les insurgés réagissent par la guérilla, le terrorisme, la dispersion et les explosifs improvisés. Il leur arrive cependant d'atteindre le niveau du combat classique (Indochine, frontière tunisienne, Libye). Des armes surpuissantes sont utilisées, selon le principe de versatilité : *qui peut le plus peut le moins.*

– la fortification des bases d'opération est constante, du Sénégal à l'Indochine et à l'Afghanistan. L'exposition Eurosatory en juin 2012 a mis l'accent sur la protection. Une protection excessive (gilets pare-balles) limite cependant la mobilité et impose une motorisation accrue des unités ; le moteur a remplacé le cheval. Des véhicules adaptés sont mis au point (*Sherpa light* de *Renault Trucks Défense*).

– l'arme aérienne apporte un surcroit de puissance et de réactivité. En Indochine, elle facilite l'observation d'artillerie et contribue à la destruction des unités insurgées, mais se trouve en limite de portée. En Algérie, elle est en concurrence avec la précision et la souplesse des hélicoptères, lesquels remplacent le parachutage. En Afghanistan et en Libye, les drones de différents types (armés, logistiques, détecteurs d'IED) sont expérimentés.

– les performances des armes influent sur la tactique des unités, telles que la formation en losange de Bugeaud, la progression en tache d'huile, l'infiltration des commandos, le recours au recrutement autochtone.

– les techniques d'information provoquent une nouvelle révolution de l'art militaire. La radio est utilisée pour la propagande, les écoutes, les liaisons interarmes à longue distance et les émissions brèves. Les radars localisent les mouvements ennemis. L'informatique génère les munitions intelligentes, la numérisation de l'espace de bataille, les liaisons par internet, et la robotisation (Félin).

– les actions civilo-militaires n'ont cessé de se développer, depuis les Bureaux arabes et les SAS, l'assistance médicale gratuite, les hiérarchies parallèles et le regroupement des populations en Indochine et Algérie jusqu'aux moniteurs de formation en Afghanistan et aux cellules de soutien psychologique et de solidarité.

Il semble enfin que la technologie joue un rôle négatif sur l'opinion publique. Les frappes chirurgicales à distance de sécurité, les appareils sans pilote et le télétraitement médical persuadent l'opinion que la guerre est devenue idéale, courte et propre. Le mythe du zéro mort dévalorise la vocation militaire, il réduit le fossé entre les civils et les soldats, lesquels ne sont plus que des techniciens exerçant un métier à risque. Général Maurice Faivre

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36. Manoeuvre d›interception sur le barrage algéro-tunisien.
37. Le barrage frontalier présente les caractéristiques suivantes : – l›électrification permet de localiser immédiatement un franchissement – 5 régiments blindés patrouillent jour et nuit sur la herse – 5 régiments paras sont en attente pour intervenir sur un groupe ayant franchi le barrage.
38. Porte-avion nucléaire, avions Rafale et batiment de projection et de commandement (BPC).
39. Les avions Rafale sont prêts à décoller du porte-avion nucléaire. Les hélicoptères d›attaque sont en attente sur le BPC.
40. Memento du chef de groupe et de section en opération en Afghanistan.
41. Ce memento est distribué aux officiers et sous-officiers avant le départ en Afghanistan.

Prof. Dr. Esat Arslan and Col. Dr. F. Rezzan Ünalp (Turkey) Implications of the Technological Knowledge on the Military Field Through Case Studies From the Late Turkish History

Introduction

The future qualifications of war instruments and weapon systems are determined by technological developments, and thus operational requirements play a guiding role for these developments. Throughout the entire Turkish military history –from the ancient times to the Ottomans and to the present day–, Turkish military authorities have never ignored this fact, on the contrary, they have used new tactics and techniques peculiar to the Turks both before and during the war.

The world passed through great wars in the 20th Century. In this century, the air vehicles appeared on the scene as new elements of force in addition to the land and naval vehicles. In the early 20th century, where aircrafts did not bear any military significance, the predominant view (particularly in Germany) was that the air force should consist of dirigible airships (zeppelins). Therefore, the Ottoman State decided to purchase these dirigible airships in order to reinforce the units that were deployed very far away from the capital. Turkish Aircraft Commission, which was responsible for Turkish air activities in that period, prepared a technical contract and enumerated the specifications of the dirigible airships to be purchased as follows:

– With a range of 1,500 km at least,
– With an airlift capability of 2.5 tones,
– Having necessary equipment for wireless communication,
– Holding searchlights and,
– With a capability of throwing bombs.

Not only the purchase of zeppelins was envisaged, but also it was foreseen that the aircrafts having the capability of throwing bombs would be effective in the war theater and this criterion was also added to the specifications list.[1] As the purchase negotiations went on in different centers of Europe, a 750 m^3 zeppelin that was ordered in April 1910 was delivered to the Fortification Command in Edirne.[2]

The airplanes were firstly used for military purposes during the Turkish-Italian War where Italians threw bombs from the aircraft. This situation called the attention of the Turkish military authorities and thereafter, Turks tended to use the

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1 Süreyya İlmen; Türkiye'de Tayyarecilik ve Balonculuk Tarihi, Istanbul, 1947, pp. 56–58.

2 Fethi Kural; Kuruluş Yıllarında Türk Askeri Havacılığı Belgeleri (1909–1913), Ankara, 1974, p.117; TGS ATASE Directorate, Türk Silahlı Kuvvetler Tarihi, Osmanlı Devri, Balkan Harbi (1912–1913), Vol.II, 2nd Edition, Ankara, p.287.

aircrafts and the concepts of the air operations. But Turks were not able to use the airplanes during this war. Yet, anti-aircraft tactical methods were first developed by Turkish soldiers. For instance, Turkish units developed the anti-aircraft defense system by means of massed fire technique against the aerial targets, in which the ground forces collectively take aim at and fire on the flying target. For this purpose, they raised the field cannons on a pile of earth, kept the gun carriage behind this pile of earth, and thus fully increased the angle of the barrel. They developed the field cannons so much that these cannons became able to throw shrapnel to the air. As a result of these effective anti-aircraft fires, Captain Carlo Monti, who was wounded by a bullet on January 31, 1912, was the first airman shot during flight. Similarly, the Nieuport airplane piloted by Captain Riccardo Moizo crash-landed on the Turkish territories; he was taken the prisoner of war (PoW) and became the first air PoW in the Air History.

Therefore, the sensitivity of the military authorities in this issue would soon give the aviation a completely military character within the circumstances of that time.

The first aircraft included in the inventory of the Turkish Air Forces in March 1912, just before the Balkan Wars was a French-made REP trainer aircraft. However, when mobilization was declared in September 1912 due to the Balkan Wars, the whole air personnel except for a few airmen were sent to their previous units. Thus, the training activities were hindered and the aircrafts in the open field were damaged.

During the Balkan Wars and the World War I, aircrafts were used for reconnaissance missions. For this purpose, military authorities decided to form an aircraft observer corps and started to train air observer officers.[3] It is evaluated as the only point in which Turkish airmen were luckier than their European colleagues.[4]

Apart from the reconnaissance missions, airplanes were also used for psychological purposes before the World War I. In order to obtain the psychological support of the people in the Arab territories of the Ottoman State, a 2.500 km. flight between Istanbul and Cairo was organized on the order of Enver Pasha, the Minister of War.[5] The first flight started in February 1914 from Istanbul with two aircrafts, but they crashed in Palestine and Jaffa. Moreover, the third one had a crash near Çanakkale, and thus the flight could only be accomplished by the 4th

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3 Yavuz Kansu, Sermet Şensöz, Yılmaz Öztuna; Havacılık Tarihinde Türkler 1, Turkish Air Forces Printing House, Ankara, 1971, p.135.

4 Bülent Yılmazer, Balkan Harbinde Hava Gücü, Proceedings of the Ninth Military History Congress II, Publications of TGS ATASE Directorate, Ankara, 2006, p.233.

5 Rezzan Ünalp, İlk Havacı Şehitlerimiz, İstanbul-Kahire Seferi ve Ardındaki Tarihi Gerçek, Journal of Turkish Armed Forces, Publications of TGS ATASE Directorate, Issue: 408, April 2011, Ankara, p.76.

team with a Bleriot named "Edremit".[6] During these flights, pilots threw the postal packages and placards for propaganda.[7] For instance, a mailbag that was delivered from Jerusalem was thrown on Gaza from "Edremit" aircraft, which landed in Cairo.[8]

Within the context of the tactical and strategic developments in the first quarter of the 20th century, the Çanakkale Battles fought in between the World War I should particularly be underlined.

The First Experiences in the Çanakkale Battles

When Çanakkale Naval Battles on March 18 1915 are considered, the first thing coming to mind is Nusrat Mine Planter and its captain is Lt. Col. Tophaneli Hakkı. Nusrat was one of several mine planters. On the night of the March 8, 1915, Nusrat laid a line of 26 mines in Erenköy Bay under the guidance of Lt. Col. Geehl, a Turkish mine expert, during the Allied naval attack on the Çanakkale front. After 10 days, on March 18, British battleships 'Irresistible' and 'Ocean' and the French 'Bouvet' were all lost in this small area, and British battle cruiser 'Inflexible' was badly damaged. If any one small ship changed the course of World War I, it must be "Nusrat".

Those who come to the battle fields in Çanakkale wondering how their grandfathers fought there are narrated stories about the bullets of machine guns. If you go there one day, you can also come across several of them. Çanakkale Battles are the preeminent representative of machine gun century.[9] Therefore, on the critic days of this bloody war, more than 2.000 wounded soldiers were taken to the Division Medical Company in one day. Those wounded in head, chest and abdomen were left to death out of necessity. Since blood transfusion was known in those years, the serum saline was injected intramuscularly in order to relieve the pain of the wounded.[10] Briefly to say, the arms market changed in that war by the development of the cutting-edge technology of that century. The weapon clients at the front line were presented how those arms would serve to humankind, how they would kill people, and how many persons they would murder in a minute.

Çanakkale Battle was a destruction war, a spoiling attack for two sides. After this war, the concept of total defense came out.

At this point, the important question to ask is how soldiers were brought from

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6 TGS ATASE Archives, K:1430, D:259-196, F: 1–25.

7 Sadık Sarısaman, Birinci Dünya Savaşında Türk Cephelerinde Beyannamelerle Psikolojik Harp, Publications of TGS ATASE Directorate, Ankara, 1999, p.5.

8 Kansu-Şensöz-Öztuna, p.155.

9 TGS ATASE Directorate, Türk Silahlı Kuvvetler Tarihi, Osmanlı Devri, Birinci Dünya Harbi'nde Türk Harbi, Vol. V, 3rd Edition, Çanakkale Cephesi Harekatı, pp. 525–526.

10 TGS ATASE Archives, K.1129, D. 27, F.2.

New Zeeland, Australia, India, and Borneo and so on.[11] It is so difficult to answer that question.

The Royal Navy's first purpose was to build aircraft carriers. In this war, aircraft carrier HMS Ark Royal sailed for the first time to Çanakkale on February 1, 1915; and the aircrafts it carried were used for reconnaissance purposes before the bombardment of the Turkish forts by the Royal Navy. They landed in the Gallipoli on April 25, 1915.

Electronic Warfare technique was first used in this war. The electronic security measures (ESM), the electronic counter-measures (ECM) and electronic reconnaissance measures were applied in this campaign. On March 5, 1915, the jamming technique was used against Queen Elizabeth from Yıldız telegram and intercept station situated on the way of Kilitbahir. Therefore, the overhead fire initiative of Queen Elizabeth towards the Turkish artillery was spoilt.

The biggest gift of the Çanakkale victory to the Turkish Nation is certainly that it brought into light Mustafa Kemal ATATÜRK and his military genius. At the beginning of the war, his rank was lieutenant colonel; the defensive plans of Çanakkale Region and Strait were prepared by German high rank officers. Marshall Liman Von Sanders (his rank was lieutenant general in the German Armed Forces) commanded the 5th Turkish Army during the Çanakkale Battles. He believed in the concept of mobile defense concept. In accordance with the system founded by the 5th Army Commander General Liman Von Sanders, the coastal line had to be observed adequately and covered with security outposts. The major part of the infantry divisions would be totally kept out of the active range of the naval artillery. The basis of this system was to protect oneself from the strong naval fire, to be able to use the forces that could not arrive at every place of a large front within the free maneuver facilities, and to make the defense efficient by giving it a flexible character.

According to this concept, coastal line would be defended by weaker forces, but it should be fortified by engineering obstacles; and main forces should be deployed in the specific areas in order to make counterattack. But Mustafa Kemal ATATÜRK claimed the opposite. He believed in zonal defense doctrine. As a matter of fact, land battles proved him right. The reason for the great losses and casualties in Çanakkale Battles was General Liman Von Sanders' mobile defense doctrine.

Another failure of General Sanders was not to select the critical area. In his opinion, one of the main amphibious objects was Bolayır on the European side and the other was Kumkale on the Asian side. But Mustafa Kemal ATATÜRK maintained the opposite, because he knew well the battlefields. He walked step by step

[11] It was asked to Crown Prince Charles by New Zeeland and Australian Prime Ministries during the 90th Anniversary of the Çanakkale Battles.

the whole battlefield. He knew the main amphibious objects very well and warned his commanders. However, they didn't listen to him.

Conclusion

The heavy losses in the wars of the late Turkish history covering the first quarter of the 20^{th} Century had negative impacts on the socio political fabric of the country, and that negative impact has lasted even very recent times.

Even long after the foundation of the Turkish Republic in 1923, that gap between the two generations could not be closed, and has made itself felt in all fields.

It is a fact that thousands of educators, students of public administration, medicine, military academies, and literate and educated people were lost in these Wars.

Undoubtedly, ATATÜRK underlined this bitter fact after long years, when he said; "We buried a whole university in the Anafarta Battles." In short, ATATÜRK left us no other chance than implementing the reforms and staying firm.

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Lt. Col. Francisco J. Gómez-Ramos (Spain)

The Role of Military Factoriesand Laboratories in the Spanish Industrial Development of the 1st half of the 20th Century

Abstract

19th Century was a very convulsed one in Spain. It was covered of wars, most of them civil wars. Hence, the industrial development didn't take in Spain the same way they took in the rest of Europe. Possibly one exception was the case of the military factories.

In Spain the 20th Century began after the defeat in a war and a National stroke. Many intellectuals and scholars pointed out that, industrial, technical and scientific potential lags were really the culprits of that defeat.

Then, Crown and State used military factories and shipyards to be the engines for pushing Spanish mechanical and chemical industries development and promoted the creation of new research centres which guided these efforts. Most of the industrial pushing developed later on, mainly in the 60's wouldn't be possible without this role played.

This paper presents this role played by some of these establishments. In particular TPYCEA and La Marañosa (both currently moved and integrated in the new Spanish MoD R&D Centre named ITM, officially opened in February 2011).

Introduction. Situation before 20th century

How has been said, 19th Century was a very convulse one in Spain. Is difficult to find a peaceful period of time there and almost covered of wars and government changes. This fact aborts any continuity in national policies. Regarding wars, most of them were civil wars. Also, during the century, took place the independence of the American Colonies, which represented a tremendous national crisis. Many authors see in that the reason why the industrial revolution remains incomplete in Spain during that time.

Then, the main industrial centres of the Nation were: Catalonia, the Northern part (Asturias and Bask Country), Valencia, Seville, and the shipyards in Ferrol, Cartagena and San Fernando. The industrial presence in the rest of the country was almost reduced to minor examples of warehouses and forges. All that in front of agriculture and ranching, sectors that dominate thee Spanish economy during that century. Mining industry was also an important activity but the most part of them were in foreigner hands and their production had its destination abroad.

Regarding the Military Industry, It had a deep tradition rooted in the 15th Century and including earlier. As in most of the European and American Nations, it was under the management of the Artillery Corp.

The military factories in the end of the 19^{th} Century were: the *Fábrica de Cañones de Trubia* (Trubia National Factory) and *Fábrica de Armas Portátiles de Oviedo* (Small Arms Arsenal in Oviedo). Both in Asturias (North of Spain); *Toledo* National Factory; *Granada* and *Murcia* powder Plants for the production of propellants and explosives; and three centres in Sevillas (*Fundición de Bronces; Pirotecnia Militar y Maestranza de Artillería de Sevilla*). All these factories and production centres were complemented with more than 20, all sizes maintenance depots and warehouses. ("Parques de Artilleria").

Theoretically the *Artillery Section* of the *Ministry of War* ruled the budgets and Labour Programmes of all the factories. But in practice the role of the Section was limited to distribute the budget among them establishing the main guidelines about the production. Regarding this last, the failure in the continuity of a general policy and general budget, had the consequence of also a failure in the process of monitoring and ruling, provoking in many occasions that Colonel Directors had a free hands policy for ruling the Establishments with the only restriction of fulfilling the scarce guidelines coming from the Ministry.

Political exile was then one of the sources of feeding the technical culture in Spain. Paradigmatic was the case of Brigadier *Francisco A. Elorza*. After the victory of conservatives, He took the road to France and Belgium, taken new studies and being an engineer in Liege Foundry. After coming back to the Nation, He took the idea of the creation of Blast Furnaces with a private company in Marbella and El Pedroso. Finally He returned to the Army and with the rank of Lieutenant Colonel, was named Director of *Trubia Factory*. There he sprayed his knowledge and succeeded establishing the first blast furnace fed with coke working in Spain. During his appointment there (more than twenty years), he transformed Trubia from the total abandon to being one of the most flourishing industries of the Nation, working with modern techniques at the same level of the betters in the Continent. One important decision taken by him was the creation of a beginner's labours and technician school in the Factory.

The end of Century Crisis

Monarchy Restoration (1871) gave the Spanish Society the needed stability to reach some development level. But, in general, the Spanish Society preferred lawyers to engineers or scientists. As a data in order to confirm that, we can remember that in the course 1889 to 1890 there were 9212 students in the Law Faculties in front of only 1400 students of Science and Engineering Schools (plus 3515 in Medicine Faculties, 1370 who pretended to became pharmacists and 1444 in Literature and Philosophy). The promotion of Artillery School were in general less than 70 (five courses) and still less in the case of Engineers Corp.

In 1891 the Government decided to establish a Commission in order to select the better individual weapon to provide the Spanish troops which had to be produced in Spain. The selected weapon, after a comprehensive proof program, was the *Mauser* rifle and carbine with some changes (Among them, the change to a 7 mm calibre cartridge). From the technical point of view this carried out an important innovation in the mechanical manufacturing procedures in Spain. They include the need for reducing the tolerances of manufacturing (to 1µm), or for changing black powder by smokeless.

A curious fact took place when the production of guns and knife-bayonets began. The pages of the professional magazine "Memorial de Artilleria" were plenty of pages regarding a technical discussion involving the Directors of the two Centres, Oviedo and Toledo, were both items were produced. At the same time they claim for being very carefully in the production. The result was that, apparently at least, both Centres took correctly the values of the figures in the drawings but actually was impossible to fit all the bayonets to guns. An explanation for this fact was that the original longitude standard was not exactly (at the required level) of the same value in both centres. This was 0.001 mm, or 1 µm (a micron, µ). One time discover the source of the error, a Spanish Artillery Comandante (Major) called *Francisco Cerón*, then preparing at Toledo factory the chain for the production of 7,65 and 7 mm cartridges, and intending to avoid similar problems occurred in the fitting among cartridges and chambers, took himself over his shoulders the responsibility to obtain a solution to that problem.

Cerón wrote in 1894 in the "Memorial de Artilleria" two papers. We can now read how in them he established that the only solution was the creation of a new centre, a metrological one, in charged to select, maintain and distributing correct samples of the metric units (exactly equal up to the required level). He proposed in his papers all the instrumentation needed to provide this centre. The masterpiece was a Standard-meter to be the *mother*, "made by comparison", of the second level meters that would be guarded in every Artillery Factory in order to ensure the same measurement in all of them. The papers were published in 1895, and as was said these contains all the required information about instruments and procedures. But in 1897 no decision had been still taken about implementing it.

At the same time, the political temperature in Cuba and Phylippines was growing. The situation burst at the same time that USN *Maine* cruiser did at Havana Harbour. The history has not to be remembered. Americans considered Spanish were under the explosion cause and declared war. This was the war between a raising Power and a declining one. Many scholars in Spain thought, and said, that this was the war between modernity, steel and Science, against honour, tradition and "wooden" weapons and ships. Probably this was an exaggerated view, a partial one, but clearly established a feeling in the Spanish Society about the sources of the defeat in the Spanish-American War and the need to take same measures in order to avoid similar ends in other parts, as North Africa.

The Creation and First Years of "Taller de Precisión"

Until now was generally said that Spanish-American War for the reason for the creation of *Taller de Precision y Laboratorio de Artillería* (Both facts took place the same year, 1898). As have been said in the previous paragraph, probably this could be the main reason for formally to publish in the Official newspaper the order for the creation of the Centre, but actually a technical practical one existed behind all that, as has been demonstrated.

Later on, this new Establishment was put under the direction of Colonel *Larraya*. Also early were appointed Comandante *Cerón* (as technical assistant, but also contracting officer), and captains *Adolfo Tolosa* and *Adolfo Martínez-Jurado* as the heads for the Chemical Laboratory and Mechanical Warehouse respectively.

During 1899 took place the first meeting of the "*Junta Facultativa*" under the presidency of Col *Larraya*. During several weeks they draw all the plans for the put in working of the new Centre. Including; the selection of the location, the design of buildings, the definition of its formal objectives, and the proposal of widening them with new ones. In the metrological side. They intended that the new Centre was a very modern one, including using new building technologies (as the use of reinforced concrete in big span covers). We can see today as *Cerón* retook his published notes and put them in practice. Entered in contact with several Metrology Companies, and looking for the advising of the *International Bureau of Weights and Measures* (*Bureau International du Poids et Mesures*), he charged, under strict specifications, the construction of an meter-etalon to the Swiss *Societé Genevoise*. Also other metrology instruments were bought to the same company, joint with others to French companies. An amount of 100.000 FF were put under the responsibility of the Centre in a Bank in Paris, for paying all these equipment.

But in the meanwhile an important problem raised, and the new Centre was given the mission of studying its solution. It was related with the apparition of early corrosion and cracks of Mauser metallic cartridges after a short magazine time. After Several months, *Cerón* presented his conclusions to the Joint. The source of the problem was the incorrect selection of the percentages of copper and zinc in the brass alloy. In this case, when attacked by humidity and smokeless powder, the brass was highly corroded. This was a tremendous success for *Cerón* and for the "*Taller de Precisión*". Not only for encountering the reason for that, also for the way in which the problem was methodologically attacked in a chain of tests and trials. The Centre gained a tremendous technical fame and prestigious, and we can say that from that moment it was permitted to be in the edge of the technological advances in Spain, not only in mechanical or chemical matters. Also the Centre took the task, ordered by the Artillery Section of the War Ministry, for writing the technical specifications for the acceptance of brass cartridges. Being confirmed its position of primacy above the other Artillery factories.

In 1902 was received in Madrid the charged Standard-meter and a team of the

Establishment (Lieutenants *González-Hontoria* and *Fernández-Longoria*) took the task of doing the determination of its exact measure until the 1µm level. Also was noticeable the publication of the first technical book about Metrology written in Spanish. The author was *Cerón*.

After the opening of the Chemical Laboratory, the Mechanical Workshop, began its works. Both received the mission of doing the analysis and test for the acceptance of raw materials bought for the manufacturing of ordnance and materiel in military factories, But also, due to the knowledge and experience acquired, the TPLA (*Taller de Precisión y Laboratorio de Artillería*) began to receive order for doing evaluations of new systems to be supplied to the Spanish Armed Forces.

Un 1905 colonel Larraya went to retirement, and was selected to be his successor a very prestigious colonel, *Enrique Losada y del Corral*. Very famous, also in the civilian Society. He was a partner of General *Marvá* in the foundation of the *Spanish Society for the Advancement of the Sciences* (1907), which played a relevant official role in the development of the Spanish industrialisation. It also supposed a flow of technical knowledge from the military to the civilian sides.

The TPLA received also the mission to evaluate and to do the acceptance tests of new technological developments, as electricity and telecommunications (1904), for using them in war. All that contributed to offer a relevant technical role to this centre in the Artillery organization.

In this sense, can be registered, as the direction of TPLA was converted in an important step in brilliants military careers. As examples, the successor of Col *Losada* (later on General) was Col *Aranaz*, other important figure of the Spanish Science and Engineering, not only military. He was a prominent member of the *Spanish Academy of Exact and Physical Sciences*, being later its Director. He had previously been one of the responsibles of mounting the smokeless powder plant in Granada (1902), and an author of important technical books related with Mechanism Dynamics, Explosives, ... Both, *Losada* and *Aranaz*, had a relevant presence in technical civilian Societies and they contribute to open the military technical advances to the civilian industries. Also they offered to open the military metrological chain to the civilian industries, as it was done (and remained in that way, being in the top of mechanical metrological chain until the 80's).

Also they contribute to the visits of important masters of Science, as *Albert Einstein* and *Pierre Curie*, to the *Artillery Laboratory* in Madrid. All these are clear proofs of the influencing role played by military Centres, and in particular the TPLA, in the development of Spanish science and industries during the first decade of 20th Century.

We have also to say that during those years they recognised as most clever and intelligent young officers had been appointed to TPLA, that at the same time began to be also a high level technical educational centre. There they received new knowledge in Metallurgy, Mechanical Properties of Materials, Mechanics, high precision manufacture... and other matters, then in the edge of technology.

One important fact also proofs the role played. In 1913 was decided that 'Taller de Precisión' built an airplane designed by the Spanish engineer *Carlos Mendizabal*. For doing that, a new warehouse was raised. Although the project failed after three years of works, the building remains yet, as well part of the machinery supplied for doing it.

The TPLA after the Big War

Spain did not participate in the First WW, but obviously, the Spanish militaries took continuously their eyes over the battlefields of Europe, intending to gain knowledge about the new forms of war fighting growing in this. Also at the same time Spanish troops fought in North Africa defending the presence in the Spanish Protectorate in Morocco.

One important fact to analyse was the use of chemical agents as chloride, phosgene or iperite. TPLA received the charge of the design and manufacturing of a protective mask. Also were established plans for the creation of a gas production plant in *La Marañosa* (founded in 1922 and called later '*Fábrica Alfonso XIII*' due to the personal push received in the project by *King Alfonso*)

But other of the main facts raised in the Big War was the involvement of all Nation in War Efforts. The static trench form of fighting in the West Front demanded an enormous amount of armaments, ammunitions and supplies. The military industries of the Nations were until then almost the only involved in the manufacturing of these items to procure the Armies. But they were not able to produce all demanded at a rhythm so high at it was. Hence, civilian industries had to be used to compensate the figures. There was born the Military Involvement of civilian industries in the War effort.

A lot of pages of Spanish military literature and professional magazines were fulfilled with papers about how to obtain this involvement of the Spanish industry in the Nation's War Efforts and how to elaborate plans to optimise it. '*Taller de Precisión*' took an important role in all this process. This probably was due to the fact of its interaction with the civilian side. TPLA received the responsibility to organise courses to Artillery captains who were charged of doing the inspection tasks in the civilian factories, as well as civilian engineers. Also, as in other laboratories in Europe, the *Artillery Laboratory* of the TPLA was very worried about how to produce synthetic petrol and protective gases masks, among others matters.

But in that time appeared a catalyser of all these effort who ends definitively opening the TPLA to the Spanish civilian industries world. He was a very young Artillery captain called *Agustin Plana*. First in his class in the Artillery School, his cleverness took the attention of his professors. The Artillery School Directors offered him a chair as auxiliary teacher of Chemistry in the School. But after a while he was offered a post in TPLA. There, during several months, He took the patient work of taking micro photographs of cast iron and steel samples, classifying them, and fulfilling a sort of catalogue.

His boss in the laboratory saw his work and spoke about it to the TPLA Director, colonel *Urrutia*. Quickly He asked *Plana* to show him the work. In front of the tremendous quantity of the work developed by Plana, and its quality, He offered him all the support, changing his private work in an institutional one. In addition, the Director showed the work to the Artillery Director (a former officer in the TPLA) demanding the support of all the Corp to the Plana's task, as it was reached.

At the same time the Plana`s work was growing, also was growing his personal technical credit. Not only in the Military context. Helping that, not only, the publication of all his classification work, but also, the first papers written about the mechanical properties of Steels and Cast Irons. He developed a machine which intended to develop all needed test regarding metallic alloys. *Plana* was named Head of the metallurgical Laboratory of TPLA en 1923.

But the most important task developed by *Agustin Plana* during that period of time, was the systematisation of his works in a sampler containing different samples of steels and cast irons. With this he intended, an obtained, the unification of all the identification processes. His methods were quickly translated to the civilian metallurgical industries and these samplers were profusely sprayed in all the Spanish metallurgical industries. They were presented also in International Symposium and some of them were sent abroad.

The Primo's Dictatorship. Intention to Rise the Level of Industrialisation

The growing influence of *Plana* in the industrial life of Spain was favoured by an external fact. The raising of Dictatorship of General *Primo de Rivera* in 1923. With a peaceful putch and after the pacification of North African Conflict with a combined action, with France, in Alhucemas, General *Primo* decided to push the modernization of Spain, obviously including its industrial sector. During five years this efforts were very fruitful.

Logically, at the beginning, General *Primo de Rivera* looked for the support of military officers and engineers in this magnum enterprise. In the case of mechanical and metallurgical sectors he named Lt Col *Serrano,* appointing him as a sort of coordinator of the National policy in those sectors. *Serrano* was a proud sponsor of *Plana* and very quickly asked him for helping (but without Plana had to abandon his post as Head of the Metallurgical Laboratory in the "Taller"). This efforts were cut after a conflict between General Primo de Rivera and Corp of Artillery.

At the same time the deep world Economic crisis reached also Spain. Then was decided to begin the production of civilian products in military factories, as the unique possible measure for they to survive. In TPLA was studied the production of rolling bearings for aeronautical and automotive industries and other products and components for the use of mechanical industries. Plans for implementing that were produced and we can read today about them. This plans were studied jointly which other civilian industries, as `*La Maquinista Terrestre y Maritima*', an important metallurgical one in Barcelona.

One important fact to be considered in that time was the decision of buying a complete new Coastal Artillery System for defending the Spanish coast. The development of Firing Control Systems for that was done in TPLA by then Lt Col *Juan Costilla*, considered today as one of the *fathers* of computation technology in Spain.

Other importing measure which helped to push ahead the role of TPLA and the interaction of this Centre with the civilian industries, was the decision of to nationalise the production of optical instrumentation needed by the Army and Navy. Several Officers were sent to be educated in 'modern' Optics to the 'Institute Superieur d'Optique de Paris'. Among them the Captain *Pedro Méndez Parada*. He, being a Lieutenant Colonel, was named Director of the 'Taller' after the Spanish Civil War, as we will see and he had an important political influence in that time.

The 'Taller de Precisión' and 'La Marañosa', in the 2nd Republic

When General Primo's Dictatorship felt in 1930, part of the Artillery Corp decided to put out all of them who served in the Military Official Corporation created by General Primo de Rivera. At the same time, when Republic was established in Spain in 1931, one of the first measures taken by the new Government was to reduce the Armed Forces number of officers. Many artillerist, who easily could obtain jobs in the civilian industries asked for that. In the positive sense they, with their experiences, deeply influenced the private sector of the Spanish industries.

Also the 2nd Republic took early other decisions which affected directly to *Taller de Precisión*. The most important was not to integrate the former TPLA in *the Consorcio de Industrias Militares*. This was converted in the "*Fábrica Central y Taller de Precisión*", or 'Central' Factory for the Army. This was charged of maintaining the standards for the acceptance tests (many of them done in its facilities). Additionally, it was a control organism of the production made by the Consorcio's factories and other civilian industries.

It is obvious that in both cases, all this supposed a strong interaction with the civilians. This mainly devoted to automotive and aeronautical sectors. Can be said, only as a matter of example, that the first use of interferometers for industrial use, in Spain took place there, in the Central Factory of the Army, in 1934.

Also, at the same time, research works using radiographic techniques took place in TPLA. In co-operation with the civilian research institutions, as the *Rockefeller Institute* in Madrid, Captain *de las Cuevas* researched the structure of metallic materials using these techniques.

Meanwhile, *Méndez* continued his also passionate pushing for defending the need for implementing a national Optical Industry. He created a plan, in four steps, which was presented to the Minister of War, *Manuel Azaña*, as he left referred in his written memories. Azaña promised to help to *Méndez* in the implementation process, which was supposed to take 5 years, for reaching the all technology for production of military optical apparatus, including the manufacture of glass for the lenses. This plan can be seen in several papers presented in the '*Memorial de Artillería*' between 1932 and 1934.

Situation after the Spanish Civil War

All these progress and plans were stopped when Civil War burst. Not only because the activities necessarily changed with War. Many of the main actors in the developments were killed, injured or had to take the way to exile. Facilities, as *La Marañosa*, located in the hearth of famous *Jarama Battle*, were totally destroyed.

At the beginning of War, Major Méndez, who was in Toledo as the teacher of 17 lieutenants in the course end travel, took 800.000 cartridges 7,92 mm from the National Factory and went with into the Alcazar just before the beginning of the famous siege. This action, and being the second in command of Colonel *Moscardó*, converted him in a Hero for the Nationalists. And he used his influence given him by this act, after the War, for raising the new TPYCEA (*Taller de Precisión y Centro Electrotécnico de Artillería*).

Also, during the war, in 1937, the government decided to move the 'Taller de Precisión' to Valencia, to the facilities of the new Artillery Arsenal. Machinery and employees were sent there, but the process took almost one year. During long time has been believed that the new 'Taller' in Valencia was the named '*Fábrica nº 14*' de la *Subsecretaría de Armamento de la República*. The result of the study had confirmed this is not true. In fact, Fábrica nº14 and 'Taller de Precision' were two different facilities, related but different.

Factory 14th was established at the beginning of the War in *Almacera* (14 Km far from Valencia). In a porcelain production factory, taken out of the famous *Lladró* family. The technical direction was given to *Cristobal Garrigosa*, a Spanish optical engineer (who had met Mendez in Paris). The move of 'Taller' to Valencia was not completed until October 1938 (and probably in a not efficient way). This information can be confirmed by that contained in all the end of war trial files of officers and employees of the 'Taller de Precision', now deposited in the IHM (Military History Institute) in Madrid.

Close the finishing of the War, LtCol Méndez used al his political influence to be named second in Command of the column which was going to take Valencia. What did him to do that?. Only his passionate view of Optics and its future in Spain can explain it. His movements reveal that his main interest was to save the employees and as much as possible of the machinery of the 'Taller' (also from Fabrica nº 14 and to *Garrigosa*).

This passionate view was further more after the War end. Appointed Director of the TPYCEA he devoted all of his efforts to put in order and retake the works in the Centre as soon as possible. This was not an easy task. Spain infrastructures were destroyed in high degree, and the economical situation was worst than bad. Without forgetting that, the rest of the World was quickly running to go into a bigger conflict, never seen before.

But Lt Col *Mendez* owned the main characteristics to fight all these circumstances: technical competence, passionate soul, a clear view where he want to reach, personal prestigious and political influence. Perhaps none of those alone, would have permit him to retake working TPYCEA. But he owned all. In no other way can be thought in his success in the task.

But other important measure taken by LtCol *Mendez* was the creation of a Technician School in TPYCEA for education in Optics, Electricity and Metrology (later on Electronics). This idea was not exactly new. What then can be then considered new?. Well, if not totally new, it was true that personnel with mechanical and electrical expertise was scarce for the needs in Spain in the 40's. Hence the idea was to form more people that Army ned. At the beginning, each course had 40 pupils. More or less 10 of each went to work to the Army. But the prestigious of the education they received was so high, that early the rest obtained work in INI's (State owned industrial consortium) factories or other warehouses.

Conclusion

This study have been carried out in order to preserve the history of Centres which they are going to disappear after the creation of the new R&D Establishment ITM at La Marañosa. It has permitted clarify several points (for example the nature of the original idea for the creation of TPYCEA or the distinction between TPA and Fabrica nº 14 in the Spanish Civil War). But above all, it confirms the big influence of military factories and laboratories in the industrial development of Spain during the first half of 20th Century, being an engine in this development, providing them with metrological chains and a flow of technological knowledge and technical personnel.

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The forgotten Inventions of Italian Military Technology

Introduction

The relationship among the social progress of a nation, the level of its scientific development, and its military power is one of the constants of 19th and 20th century history. In the past, a technologically more advanced country was not necessarily also more efficient from the military point of view, nor was there a necessary relationship between the complexity of its social structure and the level of scientific research[1]. The Manchus who subjugated China in the 16th Century certainly did not possessed the refined cultural level of those they conquered, nor can Great Britain be said to have been more advanced than Holland or France, countries which were however defeated in the fight for colonial supremacy in Asia and America[2]. Napoleon himself, despite his familiarity with scientific culture, was not interested in applying to military science the discoveries made during his time, as in the case of the steam engine which Fulton offered him.

It was only as late as the 19th century that progress applied to military science became the key factor in all conflicts.

In parallel with an ever-faster technical progress stimulated by unprecedented industrial expansion, military science was able to take advantage of an increasingly larger number of tools to expand the size of armies, multiply the effectiveness of weapons, and provide supplies to large number of soldiers at unheard-of distances, thus making it possible to conquer areas which, up until then, were made impregnable by their vastness and dryness[3].

In the face of the huge expansion of the military capabilities of the European powers and of the United States, various nations, particularly Asian ones, attempted to bridge the technical and military gap by importing elements of foreign technology and by hiring large numbers of military instructors to modernize their armies[4].

With the exception of Japan, all these experiments failed. Both the Ottoman and Chinese Empires, just as Siam and Persia, were forced to accept the fact that the introduction of modern military technology in a less advanced social and eco-

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1 MICHAEL HOWARD, *La guerra e le armi nella storia d'Europa*, Bari, Laterza, 1978, pp. 230–231.

2 GEOFFREY PARKER, *La rivoluzione militare*, Bologna, Il Mulino, 1999, pp. 238–239.

3 RUPERT SMITH, *L'arte della guerra nel mondo contemporaneo*, Bologna, Il Mulino, 2009, p. 122.

4 GEOFFREY PARKER, *La rivoluzione militare*, cit., pp. 211–248; BERNARD LEWIS, *I musulmani alla scoperta dell'Europa*, Milano, Rizzoli, 2004, pp. 298–304.

nomic context yielded disappointing results, unless the said introduction was integrated, as it occurred in Japan, by a programme of economic and social reforms capable of revolutionizing the Country's structure, taking, in just a short period of time, a 200-year leap forward.

Hence, in the industrial age, war was in very close relation with society and the economy which fed it. Military technology often intermingled with scientific research; on occasion, as in the case of the creation of new metal alloys, it was civilian research that was given momentum by the needs emerging in the military world; in other circumstances, as in the case of industrial explosives, it was military technology that benefitted from the discoveries made by civilian technology[5].

In this context of Faustian dependence between the creative power of economic and scientific progress and the destructive power of war, what was the situation of a young and essentially backward nation as Italy in the period between the 19th and 20th centuries? Italy had been born already overburdened with a sizeable public debt, and was based on an essentially agricultural economy which made use, with few exceptions, of old-fashioned methods[6]. The industrial sector, which was not irrelevant in terms of the number of people it employed, was also rather backward in terms of systems and machinery, and focused on the manufacturing of semi-finished goods or on the processing of textiles, both imported from abroad. What were lacking were mainly the following industrial sectors: mining, chemistry, and, most importantly, the iron and steel industry, i.e. the real engine behind the economies of the great powers of the time[7].

The feat accomplished by Italy was huge: turn into a modern country by exploiting the few resources available, trying, at the same time, to play a role as relevant as possible in the international balance of power. During the subsequent decades, the young Kingdom's economy became gradually stronger, and, despite contradictions and inequalities, its society was partially modernized. However, the gap between Italy and the other powers of the Western world was never fully bridged, as it became evident starting from 1915, when Italy, after entering the Great War, played an increasingly prominent role in world politics, until its defeat in the Second World War[8].

During this period of time, hardly ever was the modernity of Italian weaponry on the same level as that of its foreign competitors, and this despite a lively and time-honoured engineering and scientific tradition which had often been successful in a number of scientific research sectors. Nor were those who thought of exploit-

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5 PIETRO MARAVIGNA, *Dalla «guerra convenzionale» alla «guerra totale»*, in *Questioni di Storia contemporanea*, Milano, Marzorati, 1952, vol I, p. 681.

6 RAIMONDO LURAGHI, *Problemi economici dell'Italia unita (1860–1918)*, p. 391; in: AA. VV., *Nuove questioni di storia del Risorgimento e dell'Unità d'Italia*, Milano, Marzorati, 1961.

7 Ivi, p. 390.

8 Ivi, p. 396.

ing these discoveries for military purposes absent; what was on the contrary lacking was that essential synergy among the economy, politics, and technological research, that intangible element allowing a discovery, the result of the capability of an individual, to tread that pathway that would turn it into a common resource[9].

The history of the missed opportunities of Italian military technology spans approximately over a century, and the reasons which caused various inventions to fail represent each time a different side of the incomplete "progress" of this Country.

The "Cavalli" Cannon

The first opportunity which was partially missed is related to one of the fundamental sectors of industrial economy, the iron and steel industry, and to one which is equally fundamental to the military world: artillery.

The second half of the 19th century was a time of great changes in military technology, just as it was the case in the field of civilian technical and scientific progress.

While Western Europe and the United Sates were gradually increasing their industrial activities, they were also experimenting on how to significantly reduce distances thanks to the use of steam-powered vehicles, and exploiting telegraphy to make news travel previously unheard-of distances; armaments, means of transport and military equipment, in their turn, were also undergoing an evolution which, as the size of armies increased, would grant armed conflicts exceptional destructiveness.

In the field of technical innovation, a special role was played by rifled cannons, which, by imparting a rotating movement to the projectile, could boast a much greater precision and penetration capacity compared with traditional smoothbore pieces of artillery. In Europe, and particularly in Sweden and Germany, as early as the end of the Napoleonic wars experiments aimed at extending to cannons the principle of rifling, already used in some rifles, were carried out extensively.

Cannon manufacturing is a sector traditionally linked to the iron and steel industry, and the great traditions in the making of pieces of ordnance were almost invariably rooted in those countries, such as Germany, Sweden, Great Britain, and, to a lesser extent, France and Bohemia, which possessed deposits of good quality iron ore and coal to smelt it.

However, it was in the small Kingdom of Sardinia, almost entirely lacking mineral resources, that a young artillery officer, Captain Giovanni Cavalli, who had already invented an effective breech loading system for artillery, in 1832 de-

9 A good analysis of defects of the italian military and economic policy during the World War II is in: FERRUCCIO BOTTI, *La logistica dei poveri: organizzazione dei rifornimenti e amministrazione dell'esercito nel 1940*, in: Studi Storico Militari, Roma, USSME, 1992, pp. 407–443

veloped a device capable of casting spiralling lines in the barrel of pieces of ordnance[10].

Receiving little encouragement from Piedmontese military leaders with reference to breech loading system development, Cavalli refrained from presenting his new project. However, the officer enjoyed the favour of King Charles Albert, who sent him to Sweden to check a batch of cannon that had been ordered from the steelworks of Baron Wahrendorf. Thanks to the excellent personal relations established with Wahrendorf, Cavalli was able to carry out the experimental rifling of a piece of artillery, which was greatly successful. The soundness of Cavalli's solution was finally accepted in Turin, and, thanks to his example, since then artillery would traditionally become one of the most successful sectors in what would be the future Italian Army[11].

At the time, however, occasional scepticism was expressed with reference to Cavalli's invention. Indeed, while the Sardinian Army was able to equip itself with a good park of artillery, the Piedmontese military leaders prevented all the smoothbore artillery in use from being rifled, and only accepted to send the new equipment to Crimea with great delay, when operations had already been concluded. Indeed, in 1859 the French were the first to use rifled artillery in the battlefield of Solferino. The Italian artillery employed successfully the new gun only at the siege of Gaeta in 1860[12].

It may be ventured that so much diffidence on the part of the Piedmontese Generals was generated by the specific nature of the Artillery Corps, traditionally considered with suspicion in Ancienne Regime armies. In fact, Artillery was the only corps in which the majority of the officers did not come from aristocratic families, and in which the circulation of ideas, also coming from abroad, and interest for scientific progress were frequent.

Hence, once again, the main problem was represented by a certain backwardness in the Italian educational system, which, during the mid nineteenth century, was in need of radical reforms.

Education and society

Pre-unification governments had failed to encourage scientific research and university education, which almost all over Italy suffered from the backwardness of curricula and the paucity of professorships[13].

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10 *Il tenente generale Ettore Cavalli*, Rivista Militare, 1959, pp. 874–875.

11 *I cent'anni del cannone rigato*, Nazione Militare, Novembre-dicembre 1935, pp. 829–830.

12 "Purtroppo l'Italia, patria di Cavalli e realizzatrice delle prime artiglierie sperimentali a retrocarica, non proseguì subito su quella strada". EZIO CECCHINI, *Tecnologia e arte militare*, Roma, USSME, 1997, pp. 146–147.

13 ADRIANO CARUGO, FELICE MONDELLA, *Lo sviluppo delle scienze e delle tecniche in Italia dalla metà del XIX secolo alla Prima guerra Mondiale*; in: AA. VV., *Nuove questioni di storia del Risorgimento e dell'Unità d'Italia*, Milano, Marzorati, 1961, p. 431.

Thanks to a group of academics which included Minister Terenzio Mamiani and the young mathematician Luigi Cremona, a number of educational branches improved over the first decades after Unification, and the mathematical and philosophical sciences underwent great development, which also involved pure physics. Mechanics, biology, chemistry and medicine, which were more tied to the stage of development of the economy and society, lagged behind[14].

In sum, in Italy the Newtonian separation between "rational mechanics" and "technical mechanics" continued, causing a hierarchical separation between scientific and technical studies, to the detriment of research development. Technical studies were the prerogative of "Schools of Application", which also the Army artillery school belonged to, separated from universities, and that also included the "School of Application for Engineering", which only as late as the twentieth century would be renamed Polytechnics. To access these schools, which were not always placed under the authority of the Ministry of Education, students did not need a high-school diploma, but were only required to have a *Middle school bachelor* diploma, the former being the equivalent of junior-high school. The secondary role played by technical studies was caused by and reinforced the belief that that only pure and speculative sciences would grant "true" knowledge, i.e. understanding of the functioning of things as inscribed in the natural order. Technology would then be responsible for exploiting the advantages of the said knowledge. This approach had the main advantage of hiding the scarcity of the means made available to technical education, and left to the devices of individuals, as amply shown, the task of linking theory to practice[15].

The "Barsanti" engine

A unique example of the said inventiveness is that of the teacher of one "technical school" of the Scolopi Fathers, the Florence-born Father Eugenio Barsanti who, in 1853, with engineer Felice Matteucci, invented a revolutionary machine: an internal combustion engine.

The principle behind this new machine was, as in the case of the Fulton steam engine, the expansion of the volume of a heated gas: a vertical piston would be pushed upwards by the combustion of a mixture of hydrogen and air, ignited by an electrical spark. In its downwards stroke, the piston would impart motion to a flywheel connected to the crankshaft.

The idea of the internal combustion engine had already emerged some years earlier, in 1832, when the British Samuel Brown had experimented with a similar engine, fuelled by mixture of naphta vapour and air, which, despite working, was

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[14] ADRIANO CARUGO, FELICE MONDELLA, *Lo sviluppo delle scienze e delle tecniche in Italia dalla metà del XIX secolo alla Prima guerra Mondiale*, cit., p. 432.

[15] Ivi, p. 495.

rather impractical owing to its size and great energy dispersion. In addition to small size, the advantage of the Barsanti-Matteucci engine was represented by the possibility to initiate the mixture's combustion at will, repeat it when necessary, and to rapidly stop and start anew the engine.

Because in the Grand Duchy of Tuscany there was no Patent Office, the engine was registered at the Accademia dei Georgofili, and, in 1856, was used by the workshops of the Florence Railway Station to power machine tools; a version of the engine manufactured by the Swiss company Wyss was exhibited at the Esposizione Nazionale of 1861. During the first half of the 19th century, however, the Italian industrial sector was in no condition to exploit this discovery in a fruitful manner, nor did the Grand Duchy feel a pressing need for powerful means of transport, given the small extension of its territory. The death of Barsanti in 1864 prevented these studies from continuing in Italy in the direction of the development of an engine that could be used for small means of transport, and that would be produced in 1870 by the German Daimler[16].

Also after the Unification of Italy, the authorities showed little interest for this invention: the Italian road network was in fact rather inefficient, and was only fit for animal-drawn vehicles, which were very common, while the railway network still had a very limited extension. Under these conditions, it was more than natural that only a country possessing an economic structure such as that of Germany, capable of projecting onto the future the needs of the national economy looking beyond steam and animal-draught power, would support the development of the internal combustion engine.

The "Tiberio" vaccine

A sector which was particularly affected by the scant development of the applied sciences in Italy was the medical one. Despite an ancient and well-established medical tradition, particularly rooted in the universities of Naples and Bologna, Italian medicine was hindered by the lack of a modern pharmaceutical industry, the result of the backwardness of Italian chemistry, which did not go further than the production agricultural fertilizers[17]. An additional limitation was represented by the objective scarcity of resources in universities, which would not allow important research centres to survive. Indeed, it commonly occurred that medical doctors would enrol in the armed forces in order to be able to avail themselves of instruments and opportunities allowing them to continue their studies. A well-known case is that of the physician Cesare Lombroso, the father of physiognomy, who was an army surgeon during the campaigns aimed at suppressing banditry. A lesser known, albeit more meritorious example, was set by Vincenzo Tiberio,

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16 EZIO CECCHINI, *Tecnologia e arte militare*, cit., p. 185.
17 RAIMONDO LURAGHI, *Problemi economici dell'Italia unita*, cit., p. 394.

whose uncommon skills as an immunologist he applied to the study of epidemic diseases.

One of the features of industrial-age wars, compared with those which preceded them, was represented by the decrease in disease-caused mortality, and by the parallel increase in combat casualties.

To date, it is difficult to say whether this was the result of improvements in the sanitary and nutritional conditions of soldiers, or simply of the greater destructiveness of military instruments; however, it cannot be denied that, no later than the end of the 19th century, European armies started adopting some effective measures, at least in the field of epidemic and venereal disease prevention.

As in the case of other modern warfare aspects, also paved the way for the military application of modern inventions.

During the Italo-Turkish War, Italian troops had suffered several casualties due to typhoid fever and cholera contagion, which were endemic in many areas of Tripolitania and Cyrenaica. As a consequence, several equipped military hospitals had been set up in the entire colony. It was precisely in the military hospital of Tobruk that the Regia Marina Medical Officer Major Vincenzo Tiberio was appointed Director of the Medical Laboratory.

Several years before, when still a student, Tiberio had observed that in the presence of a specific type of mould which grew on the rim of a well, the latter's water was drinkable. On the other hand, in the drinking troughs where this mould did not grow, although water came from the same water table, the former caused serious gastroenteric disorders. The problem, or, rather, the solution, lied in the *penicillium* mould, whose antibacterial properties were identified by Tiberio, who then concentrated his studies on it. Having been welcomed with great diffidence by the Italian medical establishment, after publishing a first carefully documented account of his discovery in 1895 Tiberio gave up on the idea of continuing his studies in the academic sector[18].

After enrolling in the Navy, despite not having great means at his disposal, he had the opportunity to obtain a first set of results that would no doubt have led to the mass production of hat anti-bacterial vaccine which in 1913 proved so effective that during that year in Tobruk only two minor cases of the above mentioned disease occurred[19].

Unfortunately, the officer died two years later, putting an end to a promising research strand which, according to the account of Alexander Fleming, the latter would quite accidentally bring to a successful outcome in 1928, and which dur-

[18] VINCENZO TIBERIO, *Sugli estratti di alcune muffe*, Annali di igiene sperimentale, Regia Università di Napoli, Gennaio 1895.

[19] VINCENZO MARTINES, *Henri Dunant, la nascita dell'idea della Croce Rossa internazionale. Il Nuovo Stato 1861–1871*, Atti del congresso CISM *Il 150° anniversario della Seconda guerra di Indipendenza*, Roma novembre 2009, Roma, CISM, 2010, p. 149.

ing the Second World War would allow the allied armies to virtually eradicate the scourge of endemic diseases.

Tiberio's death, which occurred shortly before the beginning of the Great War, probably had huge consequences because it deprived Italy, and therefore the Entente, of the opportunity to fight effectively against the spread of endemic diseases among soldiers.

Indeed, the First World War revealed how diseases were still one of the major causes of death at war. The presence of millions of men cramming trenches all over Europe for very long periods of time, under very poor hygienic conditions, could not but lead to the spread of diseases, whose dangerousness was compounded by the poor physical conditions of soldiers.

Limited to the Italian front, according to some, mortality due to disease involved almost 200 thousand people, for the most part killed by typhoid fever, cholera and meningitis.

A hypothesis may be put forward on the reason why studies on *penicillium* were discontinued in Italy: they ended with Vincenzo Tiberio's death, as being the result of a single exceptional mind, who was unable to set up a "school" or to train students because he was an outsider to the academic world.

Villar-Perosa Submachine Gun

After the Italo-turkish and the balkanics wars, the World War I was the acid test for almost all the technology branches which, in the previous years, had made such amazing progress. If its anti-cholera and typhus vaccines had been Italy's lost chances, the country had an even greater opportunity to reap significant results in the field of automatic weapons, despite its gap there was even greater than the one in medical sciences.

Machine guns, initially met with suspicion by the European military top brass because of their bulk and very high ammunition consumption rate, had served the British Armed Forces quite well for a few decades before World War I, during the colonial wars. On the contrary, the French had only got minor advantages from using them during the Franco-Prussian war, where these new weapons, rather than being employed by the Infantry in the first line, had been used only in the second line, thus ending up by being neutralized by enemy artillery[20].

Machine guns were employed for the first time in a non-colonial conflict during the Russo-Japanese war in 1905. A light machine gun, the *Madsen*, which could be operated by a single person, was used for the first time by the Czar's artillery[21].

In the following decade similar weapons, such as the French *Chauchat* or the

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20 EZIO CECCHINI, *Tecnologia e arte militare terrestre*, cit. p. 144–145.

21 FILIPPO CAPPELLANO, *Le prime armi automatiche leggere italiane*, Storia Militare n. 58, 2002, p. 20.

American *Lewis*, made their first appearance, but in general the idea of using automatic weapons with reduced power as compared to field weapons, but easier to handle, was not very successful with Defense Staffs.

Only after the first months of WWI, when a few automatic weapons proved to be sufficient to stop the advance of a whole battalion, the effectiveness of such weapons became clear to all.

The Italian Army, entering the Great War ten months after all other belligerents, had already provided itself with a few hundreds machine guns *Maxim Vickers*, procured in 1910 from Great Britain. In the months before entering the war, Italy unsuccessfully tried to expand its automatic weapons' stock, so much so that it entered the war campaign with an availability of only two pieces for each regiment.

In the meantime, however, Italy had also started to manufacture its own automatic weapons in the FIAT-Società Metallurgica Bresciana premises. The first FIAT-*Revelli* 6,5 mm machine guns, which would be part of the Italian Infantry equipment for the whole war, were delivered to the Italian Army in 1914[22].

In 1915 where also developed a second, quite original weapon, the *Villar Perosa*, a 9 mm double barreled blow-back submachine gun. The new, very light weapon, equipped initially with a tripod and metal shield for operator's protection, was chosen to equip infantry units while they advanced under enemy fire, replacing the bulkier FIAT *Revelli*.

Due to various delays the *Villar Perosa* submachine guns were distributed starting from the middle of April, 1916. They were immediately very successful: and a new model, without the shield and with a bipod was distributed in the following months.

The submachine gun was very popular especially among the assault units of the Arditi, who, by personal initiative, often separated the two barrels, thus obtaining a rudimental individual weapon, very useful in close clashes, which could serve both as a defensive and offensive weapon.

The Italian Supreme Command took note of these encouraging signals and, in September 1916, the *Instructions on the Employment of Machine Guns* were published, thus formalizing the rules of employment of the new weapons, which were assigned to the forward combat units who would use them during attacks, blitzkrieg situations or in outflanking enemy fixed emplacements[23].

Initially 4-weapon sets were assigned to a few experimental battalions. Later on, starting from june 1917, a set was assigned to every infantry company.

It is indicative that, besides improvements in the number of available weapons, sub-machine guns continued to be distributed in separate sets instead of being provided as individual weapons[24].

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22 Ibidem.

23 FILIPPO CAPPELLANO, *La genesi del moschetto automatico italiano*, Storia Militare n. 194, 2009, pp. 40–50.

24 Idem, *Le prime armi automatiche leggere italiane*, Storia Militare n. 58, 2002, p. 24.

The weapon was so successful that the Austrians decided, having seized some specimen, to develop their own model which, manufactured by Steyr, proved to be quite mediocre.

In the meantime, the Italians decided to develop the sub-machine gun into a proper individual weapon, assembling the mechanical parts of the *Villar Perosa* with the barrel of the *Model 91* infantry musket. The new musket machine gun, produced by Beretta, could be operated while walking and fire single bullets too.

Arrived in combat in the march 1918, the MAB18 (Moschetto Automatico Beretta 1918) was judged to be extremely effective but, as it usually happens in the military context when innovations are introduced, it was also met with skepticism[25]. The first great lot of 3.000 weapons was delivered only a few time before the war finished, at a time when the Germans had already equipped some of their units with MP 18s, the submachine gun that would originate the individual automatic weapons employed in World War II.

The individual automatic weapon concept was abandoned by Italy immediately after the war, as it happened for many other new concepts which had originated from the precious experience accrued during three years of combat. Even the Arditi, the first to experiment the new individual submachine gun, were dissolved in 1920.

Even if it had been the first country to experiment the new individual submachine gun, Italy was the last among the great powers to develop its own production of such weapons, to the point that it entered World War II equipped only with the very bad FIAT 38 machine guns. This, despite the availability of the extremely effective MAB38, assigned only to parachute troops and police forces, and judged by many experts the best automatic musket of the World War II.

The innovations introduced by the submachine gun and automatic musket were probably the cause of this backward step.

Both weapons had dramatically upset the automatic weapons' employment concept: they were no longer a rear support for the advancing infantry, but offensive weapons employed by forward units, used to conquering enemy emplacements, provide cover for advancing rifle units, and, if needed, contrast the enemy's counter offensive, with no delays caused by the need to dismantle and transport heavy machine guns.

In September 1918 the 9th Army had even tested a new infantry battalion model, where the proportion between rifles and automatic weapons was 2/3 to the latter's advantage; moreover, it could avail itself of support weapons such as light cannons, flamethrowers and light mortars[26].

The Italian Army, had it been restructured on the basis of this model also from

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[25] Ivi, p. 26.
[26] Ivi, p. 28.

a training perspective, may possibly have been turned into a modern and very effective instrument. However, to achieve this goal, a structural reform of the Royal Army, a review of its doctrine of employment based on experience accrued during the war, and a rational organization of the Italian military industry research and production facilities were needed[27].

In other words, a real revolution, requiring a strong commitment and high financial costs. Italy, during the post-war years and, subsequently, under the Fascist regime, chose to avoid this line of action, turning back to models that favored quantity (in terms of number of troops) rather than paying greater care to equipment and training of officers and soldiers, according to the principle that victory had to be "payed" by the sheer number of troops rather than "conquered" by the ability to employ them.

In the end, this choice were proved ineffective, by military and economic a point of view.

Drone Raffaelli-Montuschi

Italy can boast quite a number of important discoveries in the field of research on electricity and electro-magnetic waves. From the moment when electricity could be used as an energy source, that is the last decade of the XIX century, Italy, which-thanks to the discoveries made by Ferraris and Pacinotti- had acquired significant experience in this field, was swept through by a wave of enthusiasm which attracted big investments. In fact, the possibility had emerged of freeing the country from the burden of coal import by exploiting the great number or its water courses to provide energy to the national industry[28]. Actually, this proved to be feasible only for textile factories, while metal working plants had to rely on coal fusion at least up to the middle of the XX c.

Studies on electro-magnetism continued well into the XX c., involving various fields of action such as electro-magnetic waves, researched by Righi and, above all, Marconi[29].

The last "missed" invention of the Italian military technology was, in fact, a further application of the properties of radio waves in the field of air force.

After the Great War the Italian air force had significantly expanded its capabilities, and further advancements followed during World War II. At that time, trying to contrast economic restraints, the Regia Aeronautica was carrying out studies on various experimental resources, in the attempt of filling the gap which

[27] "[…] il nuovo ha sempre torto negli eserciti che non siano essi stessi concettualmente nuovi". FILIPPO STEFANI, *La storia della dottrina e degli ordinamenti dell'esercito italiano*. Roma, USSME, 1984, p. 168.

[28] ADRIANO CARUGO, FELICE MONDELLA, *Lo sviluppo delle scienze e delle tecniche in Italia*, cit. pp. 452–454.

[29] Ivi, pp. 456–462.

divided it from its antagonists. One of the most promising projects was aimed at developing an aircraft remote control system, exploiting radio waves as a source of control. The Italian pilot Mario De Bernardi in the 1931 developed a control system defined “joint control”, in which all aircraft instrument panel and rudder pedal controls were installed on a joystick[30].

The Regia Aeronautica did not appreciate the De Bernardi system; however Leandro Cerini, an engineer, thought he could connect the system to an “automated horizon” he had invented, with the aim to maintain aircraft planned flight attitude even in the absence of a pilot[31].

In 1940, when lack of accuracy in the aiming systems of Italian bombers was apparent and an alternative system was being studied, especially for naval targets, the Royal Air Force Staff decided to use the De Bernardi- Cerini system within the framework of an innovative project, supported by Gen Fernando Raffaelli.

The concept, whose implementation had been entrusted by the general to a brilliant officer, Captain Montuschi, provided for the integration of the De Bernardi- Cerini system with a radio receiver, by which a “remote” pilot could direct aircraft exploiting radio waves, appropriately transformed into mechanical impulses by an actuator, directing aircraft, with their explosive load, towards their target.

The system was successfully tested in the summer of 1941 even if assigned resources were quite scant, consisting of two old SM27 that, at the end of the tests, had to be replaced by a CANT 1007 due to structural wear and tear. It is worth adding, in order to appreciate the problems connected with testing, that during each testing round the crew of the remote controlled bomber, once they had reached the airplane flight attitude, had to rely completely on remote control, without interfering even when the plane plunged nose-down[32].

The ARP (remote control airplane) was not judged ready to be employed during the “Mid-June Battle” in 1942; it was employed during the following “Mid-August Battle”, targeting a carrier which was escorting an enemy convoy.

Unfortunately the bad quality of the radio system electrical components, made up of material produced by the national industry, caused a technical problem that compromised the mission. Styroflex, a substitute of mica, had been used for insulating the airplane condensers. One of the latter short-circuited, resulting in lower voltage not sufficient to transmit control impulses. The airplane continued his flight until it crashed on Algerian territory, luckily in an uninhabited area[33].

Only at the point the decision was made to support the project with adequate funding. A new bomb vehicle was equipped with double safety controls, while two

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30 RICCARDO NASIGH, *Le armi speciali della Regia Aeronautica per la guerra navale 1940-43*, RID n. 7–8 (Luglio-Agosto), pp. 84–85.

31 GIUSEPPE PESCE, *Aeroplani bomba radio guidati*, RID n. 7-8 (Luglio-Agosto), p. 89.

32 FLAVIO MUCIA, *1942: il volo radiocomandato in Italia*, Storia Militare n. 20, 1995, p. 16

33 Ivi, p. 17.

instead of one planes, chosen among the MC 202 fast fighter planes, were assigned a leading role, so they could alternate in this role and defend each other against enemy attacks. At the same time, it was decided to build a new, appropriately designed bomb-vehicle, smaller than the SM 79 manufactured by Aeronautica Lombarda.

The second mission of the remote control vehicle, which should have taken place in Salerno, targeting the Allied Fleet, was however cancelled because of the Armistice. Once again, lack of trust in innovation and the scant resources assigned to the project, also due to the wretched autarky, or national self-sufficiency, policy, compromised an extremely interesting project.

As it had happened with the assault vessels of the Royal Navy which, with little financial commitment, were extremely successful, the experimental projects of the Air Force, besides the great commitment of individual experts, would have deserved a big, dedicated structure.

This would have most probably led to great results.

Tuesday, 28 August 2012

Mardi, le 28 Août

Dr. Lasse Laaksonen (Finland)
Trial and error – the Finnish air force and technological developments 1918–1939

The Finnish Air Force is one of the oldest in the world. It was formed as an independent branch of the Finnish Defense Forces at the time of the civil war in the winter of 1918. Only a few months earlier, the country gained its independence from Russia, where a number of Finnish pilots and observers had been trained. Some of these had flown their planes to Finland, for monetary consideration.[1]

The Finnish White Army received its first donation of a private plane from Sweden. Count Eric von Rosen wanted to support Commander Mannerheim, who understood the growing importance of air power in the theater of war. Von Rosen flew a Thulin Morane-Saulnier plane to Finland. Later, a Swedish court of law the sentenced Von Rosen for illegal exports and unauthorized flying![2]

Prior to the collapse of the Russian Empire and during the First World War, Finland had built military airfields and airports. This had a significant influence in the early stages and influenced the direction of fleet selection and the shaping of the technical solutions. The biggest challenge at this time was non-existent training of personnel and weak organization skills. The Air Force was compelled to recruit personnel from abroad which caused many problems.

An almost sad but comical example is of the Swedish "pilot", who was appointed to the Engineering Command Staff of the Whites Air Force:

"Aha, another new pilot. Did you sign the contract in Stockholm? Are you sure you are a pilot and that you can handle aircraft?

The answer was 'I do not know'.

'Then what can you do?'

'I am not a pilot, I'm a waiter. However, I once was on a flight that lasted an hour'.[3]

The Finnish Civil War ended in a Whites victory late in the spring of 1918. At the same time the early cooperation with the Swedes ended. The Finns, however, needed assistance to develop their Air Force. The Germans had militarily sup-

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1 Hugo Jungstedt, *Flygvapnets uppkomst och utveckling* (Stockholm 1925) 33–34, 40–42 ja 94–123; *Aero* 11/12 1923: 205–213; Arne Bremer, *Ilmavoimien osallistuminen Suomen vapaussotaan 1918* (Helsinki 1934) 8–15; Kuno Waldemar Janarmo, *Varhaisilmailumme 1953–1919 (*Helsinki 1963) 73–74.

2 Lasse Laaksonen, *Taivaan vartiat – Ilmasotakoulun historia 1918–2008 (the History of the Air Force Academy of Finland*) (Jyväskylä 2008) 16.

3 Bremer, *Ilmavoimien osallistuminen Suomen vapaussotaan 1918,* 22–25*;* Janarmo, *Varhaisilmailumme 1953–1919,* 86–91; Lasse Laaksonen, *Taivaan vartiat – Ilmasotakoulun historia 1918–2008* (*the History of the Military Academy of Finland*), 16.

ported the white army, and this link remained unbroken. Co-operation with Germany progressed due to both countries' Leadership and military/political interests although for different reasons and from different perspectives.

The Finnish Air Force soon received a German master. A distinguished World War 1 fighter pilot – Capt. Carl Seber – under whose leadership and military organization skills training was developed and technical know-how was advanced. The technical staff focused on technical matters which included responsibility for all repairs and maintenance.[4] Generally the pilots had lower engineering qualifications, which considerably eased technical development work.

Captain Seber believed that Finland's military geography was a crucial factor in the choice of aircraft types. Limitations on take-off and landing led to a preference for sea planes instead of land based planes. The range of different aircraft types was extremely limited. This resulted in the simplest possible maintenance and renewal demands with supplies from the large factories and workshops not available. This situation still did not remove the maintenance problems. The aircraft types increased and involved 14 types of plane within six months. Most of the planes were constantly out of operation.[5] This disturbed vital Air Force training activities so much that operations were often completely suspended.

The collapse of the German Empire and Germany's defeat in World War 1 led to a hasty exit of German officers and experts from Finland. This dealt a heavy blow to the development of the Finnish Air Force. Efforts by the Finns to build the Air Force on their own did not succeed. A notable feature at this time was the appointment of a former Cavalry Officer who had already been in civilian life for almost twenty years to the position of Air Force Commander. He had never even seen an airplane. He was astonished how they could even fly through the air!

Finland's political leadership quickly nurtured contacts with the Western powers. As a result, the Air Force organization again sought outside help. French specialist officers and technical experts had already started work in Finland by the early spring of 1919. The Finns had high expectations for the success of co-operation, especially in the light of training having been suspended for the entire winter.

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4 Bremer, *Ilmavoimien osallistuminen Suomen vapaussotaan 1918,* 108–111 and 152–156; Janarmo, *Varhaisilmailumme 1953–1919,* 99–100; Mikko Uola, *Suomen ilmapuolustuskysymys maailmansotien välisenä aika vuosina 1918–1939*. (Turun ylipisto 1972) 12–13; Lasse Laaksonen, *Taivaan vartiat – Ilmasotakoulun historia 1918–2008* (*the History of the Military Academy of Finland*), 19–24.

5 For example Lentopäällikkö(Commander-in-Chief of Finnish Air Forces) N:o (number) 1323/18.5/18 5.8.1918. II Lento-osaston (Flying-dettacment) kirjeenvaihtoa (Correspondence). National Archives. Sark 690/5 and Lentopataljoonan päiväkäsky (order of the day) N:o 1 1.10.1918. Lentoasema/Lentopataljoona/Ilmailupataljoona. Omat päiväkäskyt (order of the day). National Archives. De 1.

The biggest challenges however concerned the Finnish Air Force strategy, tactics and organization. Contrary to the views of the Germans, the French were in favor of land based aircraft. The Finnish Air Force came under the pressure of an intelligence offensive. The acquisition of new aircraft types created a good deal of conflict between the Finns and the French. Even the General Staff was not in accord with the choice of aircraft. Eventually, Brequet land based planes and George Levy sea planes were sourced from France

The Finns were as disappointed with the aircraft purchases as they were with the cooperation with the French. It was felt that the French pushed through the purchasing of French creations and products. The Finns were satisfied with the land based planes but the sea planes resulted in in a number of fatalities, including that of an Air Force Commander. The technical side of things went just as badly. The Finns accused the French mechanics of laziness and downright vandalism.

The view of the Finnish Air Force Command was that the French were of little benefit and represented only an unnecessary cost. Their work culture and operational procedures were alien to the Finns. The co-operation with the Germans had been clearly more systematic and more effective. Cooperation with the French ended in disagreement. They left the country in the spring of 1920.[6]

The Finns began to re-organize the Air Force functions independently. Most important were management, training and procurement. A special State Administration Committee created in 1923 established a ten year development program for the Air Force. This required expert assistance from abroad and a British Commission arrived in the country in 1924. Their input contributed significantly to the approved development program. The great power's perspective was reflected in the Commission's report on offensive air operations, where the role of bomber aircraft was given a lot of weight. Even sea planes were proposed as bomber craft.[7] Despite some excesses, the English input guided the views of the Finnish Air Force through to the 1930s.

One unhappy aspect was military leadership and the selection of the Air Force Commander. Artillery Colonel Väinö Vuori had no experience of the air force. He was accused of errors of judgment and weak leadership. Finally Vuori's high level

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6 For example Aero 2–3/1933, page 36; Aero 8/1931, page 254–259; Suomalaisten lentäjien komennuskunta Ranskassa 1919. Ulkomaanopintoraportteja 1918–1919. Saap. kert. ja selost. Ilmavoimien esikunta, koulutuststo (Tsto I). National Archives. Ilmavoimien esikunta 4:273c/Ec3; Aero 8/1931: s. 254–259; Aero 9/1931: s. 288–294; Aero 10/1931: s. 317–321; Aero 11/1931: s. 356–360; Mikko Uola, Suomen ilmapuolustuskysymys maailmansotien välisenä aika vuosina 1918–1939, 42–43; Ilmailupataljoona.Ib N:o 1403/19 28.11.1919. Salaista kirjeistöä. Ilmavoimien esikunta, järjestely- ja lkptoimisto (Tsto II) Ilmavoimien esikunta. National Archives 4:275/F2; Arne Somersalo, *Ilmailuvoimiemme kehitys* (selvityskäsikirjoitus v. 1925). Sotaministeriö-Puolustusministeriö. National Archives T 19636.

7 Lasse Laaksonen, *Taivaan vartiat – Ilmasotakoulun historia 1918–2008* (*the History of the Military Academy of Finland*), 26–35.

of alcohol consumption led to his dismissal. As the only other qualified candidate to succeed him also had an alcohol problem it was decided to look for a new commander from outside.[8]

Artillery Colonel Jarl Lundqvist, was selected as the new Air Force Commander in the autumn of 1932. He was as ill-informed and inexperienced as his predecessors. Immediately on his appointment he said that he understood nothing of aircraft and technical matters, that's what engineers were for!

Interest in developing the Finnish Air Force grew stronger in the early 1930s, with the appointment of a new commander who turned out to be innovative and firm of purpose. Around the same time the President-appointed committee – the Defense Council – took a strong stand on behalf of the Air Force. The Committee chairman, Marshal Mannerheim was personally interested in the modernization of the air force. In his opinion, this important branch of the national defense had had an "orphan child" status. This influenced the perceptions at the time of the Air Force's strategic role in the future. War was to go "clean", which would be made possible from command of the air in the spirit of Douhet. What had been learned, however, was not being put to practical use. Technology was not well enough developed.

Prior to the war, there was continuous wrestling for scarce resources between the military's top leadership within an unclear and indecisive organization framework. There were differing opinions as to the strategy of the Finnish Air Force. This included disagreement on the nature of the aircraft. The options were either bombers or fighters. In addition, the location of bases on the eastern border caused discord. The President of the Council of Defense and the Army Chief of Staff also could not agree on the fleet location. Mannerheim did not accept the position of the army Lieutenant General Aarne Sihvo to place unarmed aircraft in the vicinity of the national border. He noted caustically that the army chief wanted to place "pigeons in a place where eagles were unsafe".[9]

A scarcity of resources strongly influenced the choice of the significantly lower-priced bomber instead of fighter craft. Then it needed to be decided if the planes were acquired from abroad or manufactured domestically. Finland had one aircraft factory and some of its own prototypes. Domestic production would not

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8 Aarne Sihvon pääministeri J. E. Sunilalle kirjoittama muistio (5.6.1932), Sotaväen päällikön kokoelma. National Archives. T 21644/2; lmavoimien oloja tutkimaan asetetun toimikunnan mietintö liitteineen 18.6.1932. National Archives Puolustusneuvoston arkisto, Mappi 12; Ilmavoimien komentaja puolustusministerille 7.9.1932, National Archives; Lasse Laaksonen, *Eripuraa ja arvovaltaa – Mannerheimi n henkilösuhteet ja johtaminen* (*Discord and Authority – The Personal Relationships of Mannerheim and his Generals and their Effect on Leadership)(Jyväskylä 2004) 257–259.*

9 Puolustusneuvosto 1931–1939.Mannerheimin arkisto. National Archives Kotelo 75; Puolustusneuvoston pöytäkirja 14.5.1932. Mappi 4.*Where the War Generals come from? The Road to the Mannerheim's Command 1918–1939* (Keuruu 2011) 255–257.

have been able to respond to the demands and the aircraft technology was hopelessly outdated.[10] In the event of war, domestic production would need to increase tenfold. The Air Force Workshops were servicing as many as 16 to 17 different types of aircraft.

Another factor was that planes marketed by the major powers had not taken into account the winter conditions in Finland. The changes needed were cumbersome and expensive. Fokker remained as one of the only viable options. Mannerheim however was skeptical of this Dutch fighter. He asked rhetorically how his generals could expect a Fokker to effectively chase bombers, when they could not keep up with them!

Lively debate on the selection of domestic and foreign fighters continued through the autumn of 1939. The solution arrived at was a compromise. The result was that fighters would be purchased both from abroad and manufactured domestically, which called for the establishment of an aircraft factory. Foreign aircraft prices had gone through the roof. With many states preparing for war, it was next to impossible to buy aircraft. Domestic production was not able to meet demand, and technology was outdated. Finland's ability to engage the Soviet Union with a strong air force when the Winter War started was non-existent. Russian air superiority in the Winter War 1939–1940 was undeniable.

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[10] Puolustusneuvoston pöytäkirja 6.6.1939. National Archives Mappi 5; Tasavallan presidentille", Puolustusneuvoston puh.joht. kirjelmä 5.6.1939. National Archives Mappi 6; Lasse Laaksonen, *Eripuraa ja arvovaltaa – Mannerheimin henkilösuhteet ja johtaminen* (*Discord and Authority – The Personal Relationships of Mannerheim and his Generals and their Effect on Leadership, 319–320, 322–323.*

Lt Colonel Shizue Okada (Japan)
The Three Falcons
– The Succession of Prewar Aviation Technology in Japan after World War II –

Introduction

At the end of the war on August 15th, 1945, followed by the occupation of Japan by the Allied Forces, all aircraft ofthe Imperial Japanese Army and Navy (IJA and IJN) were demolished or handed over to the occupying forces. Therefore any kind of aircraft production, research and development, or even flying, was prohibited in Japan for seven years until the peace treaty was formed in 1952. During that time, the engineers of the Japanese military applied for new professions in private enterprise, public office, and universities and therefore dispersed. In this report, I will study how the aviation technology which had developed in the war had a great influence on postwar Japanese society and its technology, especially in the case of the railway industry. I will also examine the reconstruction of the postwar aviation industry.

The development of aviation technology in the IJA and IJN (1910–1945)

In 1910, 35 years before the end of WWII the first airplane flight in Japan had been a success. The IJA dispatched their officers to France and Germany and ordered them to purchase airplanes and study how to fly them. The first flight was attempted and succeeded at Yoyogi drill field in Tokyo in December, 1910. During the 1920s, after WWI, there were two large-scale disarmaments in Japan, which was also true of other great powers in the world. However, the air forces were preserved or strengthened under the policy of modernization of weapons[1].

Especially the period between the outbreak of the Sino-Japanese War (in July, 1937) and the end of the Pacific War (in August, 1945), the IJA and IJN advanced the development and the production of a variety of aircraft. Some of them were state-of-the-art, such as the first Japanese jet plane "Kikka," which had a successful experimental flight toward the end of the war but was too late to be of operational use.

The development of a jet engine for "*Kikka*" (Ne 20) was an interesting and curious case. The IJN formally started the research and development of the jet engine in January, 1942. Thereafter, during two and a half years, the research

[1] The IJA especially implemented the large-scale disarmament and reduced 90,000 officers and men by the two disarmaments, "Yamanashi Gunshuku (disarmament)" in 1922 and "Ugaki Gunshuku" in 1925. However, the air unit was independent as an arm and fostering the aviation industry was encouraged as a modernization of the IJA.

group had developed the theoretical principles for jet propulsion and successfully conducted preliminary experiments. However, the high-ranking air officers of the IJN didn't adequately understand or evaluate the accomplishment at that time[2]. It was in 1944 that the IJN obtained the information that the research on jet engines in Germany had continued to develop, which led to a growing tendency to develop the jet engine by the leaders of the IJN. At around the same time, Germany provided Japan with the plans, rocket-fuel manuals and materials for the rocket-powered fighter aircraft Messerschmitt Me 163 and the jet-powered fighter aircraft Messerschmitt Me 262 and stowed them into two submarines. One of the two submarines was a Japanese submarine (I-29) and another one was a German submarine which was handed over to Japan (Japanese name, Ro-501). On their way home, however, the German submarine (Ro-501) was attacked and sunk in the Atlantic Ocean, and the Japanese submarine (I-29) arrived at Singapore and then was sunk in Bashi Channel (south of Taiwan) by Allied Forces. One of the occupants of the Japanese submarine, Eiichi Iwaya, who was a Japanese technical commander, disembarked in Singapore. He flew to Japan with very little data on the Messerschmitt Me 163 and Me 262. At the end of July, in 1944, the jet engine research group in the IJN only managed to obtain a single cabinet photo (Four by Six Photo) of a general design view of the German BMW-003A jet engine. However, when the leader of jet engine research group, TokiyasuTanegashima (1902–1987), saw this cabinet photo, he thought "the German jet-engine was quite similar to ours in principle," and it opened the way for resolving the technical problems which had been preventing the implementation of the Japanese jet engine. In June of the following year, that group brought their jet engine to completion (Ne20: "Ne" means Nensho, or combustion) and subsequently succeeded with the experimental flight of the first Japanese jet plane "Kikka" on August 6th, 1945, just before the end of the war[3].

Until the end of the war, the aviation industry in Japan employed approximately 1,000,000 workers and produced 25,000 aircraft per year at its peak, and the cumulative numbers of production was 100,000 aircraft by 1945. However, most of the aircraft developed and produced in Japan were warplanes and there were very few commercial planes[4].

The dispersion of the ex-military engineers and civilian use of aviation technologies

Japan was occupied by the Allied Forces after the surrender on September2nd, 1945, and shortly afterward, the disarmament of the IJA and IJN and the dissolution of

2 Tokiyasu Tanegashima, "Wagakuni ni okeru jetto engin kaihatsu no keika (1)," Science of Machine, 21(11) (November 1969), 46–49.

3 Tokiyasu Tanegashima, "Wagakuni ni okeru jetto engin kaihatsu no keika (2)," Science of Machine, 21(12) (December 1969), 46–48.

4 Nihon Koku Utyu Kogyokai, *Nihon no Koku Utyu Kogyo 50nen no Ayumi*, (Nihon Koku Utyu Kogyokai, 2003) 3, 7.

"zaibatsu" (the financial combine groups; some of them were parents of aircraft manufacturing companies) were carried out. All aircraft which belonged to Japan were forbidden to fly above Japanese territorial air and all air bases and their facilities were handed over to the Allied Forces. The sweeping destruction of military and civilian aircraft followed. The prohibition that followed continued for seven years.

It was not only aircraft that were prohibited but also the production, research and development of weapons. It wasn't only the machines and facilities relating to these plants that were demolished and burned, but also the research centers and their documents. Consequently, the ex-military engineers and civilian engineers working in the military field dispersed, seeking out new professions. This was especially true in reference to the Railway Technology Research Laboratory (RTRL: currently the Railway Technical Research Institute), which was an institute of the Japanese National Railways (JNR), as they had accepted many of these engineers. The number of engineers in RTRL was 400 by the end of the war; and it increased to 1,500 soon after the war. Some of them had been purged from public office later and the number diminished to 500 again in 1951. However many ex-military engineers continued in RTRL and conducted research on railway technology, such as cars, and signal systems[5].

The most famous engineers among them, for example Tadanao Miki (1909–2005) and Tadashi Matsudaira (1910–2000), had been at the former Naval Institute of Aeronautical Technology (NIAT: "KaigunKokuGijutsusho" [later called "KaigunKugisho"] in Japanese). Matsudaira was one of the development project engineers of the well-known navy carrier fighter plane, the "Zero," which was developed just before the Pacific War. Later the "Zero" became one of the most prominent airplanes in the Navy; however, it had experienced two midair disintegration accidents during the test flights. At that time, Matsudaira resolved this problem by practical methods, such as ground vibration tests, wind-tunnel tests and model tests[6]. Later this study played a great role when JNR struggled to find the cause of the passenger cars' derailing accident in 1947. Until then, it had been speculated that this kind of accident was due to the strain of rails. However, Matudaira proved that the cause of these accidents was the vibrations of the train itself and this idea came from his experience when he had developed the "Zero."[7]

Tadanao Miki was also an ex-engineer at the former NIAT and well-known for his work on the designs for the land-based bomber "Ginga" and the suicide rocket plane "Ohka". At RTRL, he took an active role as a train engineer making

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[5] Tetsudo Gijutsu Kenkyusyo 50nenshi Kanko Henshu Iinkai, *Nihon Kokuyu Tetsudo Tetsudo Gijutsu Kenkyusyo 50nenshi*, (Kenyusha, 1957), 41–43.

[6] Jiro Horikoshi, Masatake Okumiya, *Zerosen-Nihonkaigun Koku Shoshi*, (Nihon Shuppan Kyodo Kabushikigaisya, 1953) 123–127, 142–147.

[7] Naoki Kodachi, *Zerosen Saigo no Shogen*, (Koujinsha, 1999) 262–263.

full use of his aeronautical technology and knowledge obtained at NIAT. He contributed to the lightness of a railway car by implementing a design that followed the Monocoque (French for “single shell”) structure of airplanes, for example[8]. Before he designed the “Shinkansen” (also known as the “Bullet Train”), he had already designed a new type of railway car called the “Super Express” for a private railway company in1957. Thus his works greatly influenced the design of postwar high-speed railway cars. When Japanese air forces began to rebuild around 1954, he was asked to be a chief of the technology division. However, he never undertook this position. It is said that main cause of his refusal was his role during the war; he had designed the suicide rocket plane “Ohka,” which had been a manned bomb, and it kept him away from military matters after the war[9]. Another example of how ex-military technology had been applied to railway cars was “7075 aluminum alloy (so-called extra-super duralumin).” This material contributed to the lightness of railway cars, such as the “Shinkansen.” This material was originally developed by the Japanese company “Sumitomo Material Industry” in 1936, which was ordered by NIAT. This is also another example of how the technologies and materials which had been developed and used for Japanese military airplanes, including the “Zero,” during the war, was utilized for civilian products in the postwar era.

In May, 1957, RTRL reported in the lecture meeting commemorating the 50th anniversary of the laboratory that it would be possible to operate a super-express train which would shorten the time between Tokyo and Osaka (550km) from seven and a half hours to three[10] There were four engineers as the representatives of JNR on the stage, including Matsudaira (in charge of “railway cars”) and Miki (in charge of “riding quality and safety”), and another representative Hajime Kawabe (in charge of “signals”), who was also an ex-military engineer. He had researched electrical signals at the Army Scientific Institute during the war. Later he developed ATC (which stands for “Automatic Train Control,” however, its concept is “Automatic Traffic Control” in English) and established the safety operation of high-speed railway cars. The scheme for building a new high-speed railway line and super-express railway cars for it, which was called “Shinkansen,” was approved in October, 1958 and its service commenced on October 1st, 1964, in time for the Tokyo Olympics in Japan.

However, the ex-military engineers brought to JNR not only the technologies that they had acquired in the military institutes but also the new technological cultures. During the war, the research and development was not permitted a moment’s delay. An example is the previously mentioned case of flutter (a self-feeding and

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[8] After 1950s, Monocoque structure was frequently adapted to Japanese motor vehicles as the unemployed aeronautical engineers had got jobs with automobile industry.

[9] Yoshiro Ikari, *Chokosoku ni Idomu – Shinkansen ni Kaketa Otokotachi*, (Bungeishunju, 1993) 104–107.

[10] Asahi Shinbun (26 May 1957).

potentially destructive vibration of the Navy's airplanes.) The engineers had to mobilize every kind of theoretical and tentative method to resolve the problem in a short time. The succession of practical and creative technological cultures which had been fostered in the IJA and IJN institutes during the war was another side of the succession of technology[11]. During the Pacific War there were about 7,400 engineer officers who played an active part in the IJN with 5,940 positions occupied by students of science and technology[12]. Many of them were still in their 20s and 30s when the war ended and had experience and executive ability which they would never get during peace time. As the Japanese military was disarmed and the engineer officers dispersed to other fields, it had a great effect on the development on postwar industry in Japan. When RTRL accepted them, the acting president at the time made a resolute decision and stated that it would inflict a loss on our state if we dispersed the competent ex-military engineers and that, therefore, we would receive them. If viewed from the military side, it was a fortune that there was someone who met the expectation of the president of RTRL. The Chief of Naval Technical Department responded by calling for the young and truly competent engineers. Consequently their vision played a great role for the succession of ex-military technologies[13].

After approximately a half century passed, in March, 2011, the newest Shinkansen "HAYABUSA" (in English "falcon") began its service connecting the distance of 700km between Tokyo and Shin–Aomori (the northeastern region of the mainland in Japan) in about 3 hours. It was just one week before the devastating earthquake and tsunami on March 11th, 2011. During the disaster, all 27 "HAYABUSA"s which were operating in that area, stopped their service through the use of earthquake detection systems and brought their passengers to their destinations safely. However, there are only a few people today who know that ex-military technologies and its experience were utilized for the aerodynamic characteristics and seismic control systems, etc. when the first "Shinkansen" was manufactured. It is also an irony of history that ex-military aeronautical engineers opened the new era of super high speed railway with their technologies and the spirit of challenge when automobiles and airplanes were taking the place of rail transport in the 1960s.

The seven lost years of the aviation industry and its restoration

During the war, many of the major manufacturers of aircraft were part of the financial cliques known as "zaibatsu" and they were dismantled by the order of

[11] Yasushi Sato, "Dainiji Sekaitaisen Zengo no Kokutetsu Gijutsu Bunka-Tetsudosyaryoyodaisya Shindokenkyushi no Saikento wo Tsujite-, "*Journal of History of Science, Japan*, Vol.46 (No. 244) (Winter 2007) 215.

[12] Yasuzo Nakagawa, *Kagaku Gijutsu Kenkyusyo*, (Nihon Keizai Shinbunsya, 1987) 17.

[13] Yoshiro Ikari, *Chokosoku ni Idomu*, 130, 137–138.

General Headquarters of the Allied Powers (GHQ) after the war. The aviation division of "Mitsubishi Heavy Industries" ("Mitsubishi Juko" in Japanese) that had manufactured the navy carrier fighter plane "Zero," for example, were divided into three companies and "Nakajima Aircraft" that had manufactured the first Japanese jet plane "Kikka" was divided into twelve companies likewise. The aeronautical engineers in those companies also lost their jobs and dispersed, and the divided companies produced and sold whatever they could. For example, bodies and parts for vehicles, agricultural machines and implements, and other items like scooters and fire-extinguishers[14]. However, the ex-military engineers who gained the highest level technologies scattered through the private enterprise and as a result, it delivered the ripple effect on the creation of major products that would become the pillars of the Japanese export industry, which was not only the railway industry previously mentioned, but also precision machinery industry (electronic microscope, camera, watch, radio, etc.) or compact car industry.

On the other hand, the occasion of the restoration of the aviation industry was the Korean War in June, 1950; and the conclusion of the San Francisco Peace Treaty and Japan's recovery of its independence in 1952. According to the peace treaty which came into effect, it became possible to produce, research and develop aircraft and fly aircraft under the Japanese flag. The former manufacturers of aircraft, which had survived by producing consumer products, took orders of overhauls and the maintenance of US military aircraft by war-time special procurement. Therefore, they were introduced to the latest aviation technologies which had made rapid strides during the seven lost years in Japan. The research and development of aircraft by its own effort had begun; however, the large step of the resumption and the development of the aviation industry was made by advancing the license production for the Japan Air Self Defense Force (JASDF; JapaneseAir force) when it was built in 1954. Even though the experimental flight of the first Japanese jet plane "Kikka" had succeeded before the end of the war, the Japanese aviation industry was left behind the global progress in that field. Therefore the introduction of aviation technologies from the United States and the raising of the nationalization index were the golden opportunities to learn new technologies[15].

If we examine the characteristic point of the resumption of the Japanese aviation industry at that time, we will see that all aviation manufacturers, along with the government, united and established a new company to cope with the redevelopment of the aviation industry. For the development of jet engines, four (later

[14] Nihon Koku Utyu Kogyokai, Nihon no Koku Utyu Kogyo Sengoshi, (Nihon Koku Utyu Kogyokai, 1987) 15–17.

[15] The number of the JASDF jet airplanes manufactured by joint development between Japan and the United States was 300 F-86Fs and 210 T-33As. The domestic production rate was over 60% ultimately.

Ibid., 23–24).

five) aviation manufacturers invested together and established “Nihon Jet Engine” (NJE; 1953–1974). To create the demand for civilian airplanes, publicly and privately funded “Nihon Aircraft Manufacturing Corporation (NAMC; 1959–1982) was established likewise. The former developed the jet engine ”J3” which was used for the first Japanese practical jet airplane “T-1B” for JASDF (T-1B had succeeded in its test flight as T1F1 in 1960). The latter researched and developed a medium-sized transport airplane YS-11 in 1962 which was the first Japanese passenger plane after the war and it was expected that there would be a demand from various fields – domestic and foreign airlines as well as reborn Japanese military. The predecessor of NAMC was “Carrier Airplane Design and Research Association” (“Yusoki SekkeiKenkyuKyoukai” in Japanese; 1957–1959) established by six airframe manufactures and other associated parts suppliers[16]. Many of the engineers who played key roles in this association were ex-military engineers, including JiroHorikoshi, who was famous as a chief engineer of the navy carrier fighter plane “Zero.”

Conclusion

Despite the title of this paper, “The Three Falcons,” you may have noticed that only one falcon (“HAYABUSA” in Japanese) was mentioned. It appeared as the name of the newest bullet train “Shinkansen.” Therefore, I will make two other falcons appear on the stage as a closing part of this paper.

In June, 2010, sixty-five years after the end of the war, one steel falcon landed on the Australian desert region, Woomera. It was the asteroid explorer “HAYABUSA” (the original code name was MUSES-C) which returned to the Earth after a lonely seven year voyage to an asteroid. It landed onthe asteroid, acquired the samples on its surface and returned them to the Earth. The asteroid which “HAYABUSA” headed for is the near-Earth asteroid 251143 Itokawa (1998 SF36), which was named after the Japanese rocket engineer, Hideo Itokawa (1912–1999) who was called “the father of Japanese rocketry.” Itokawa was an ex-military engineer of the IJA in his youth and was coincidently one of the engineers of the fighter plane “HAYABUSA” (Ki-43, which the Allies code named the “Oscar”) that was the most largely manufactured IJA plane during the Pacific War. After the war, he urged the research and development of rocket systems at the University of Tokyo. He had been involved in the development of sounding rockets (K (Kappa) rocket, L (Lambda) rocket), launch vehicle to launch satellites (M (Mu)), and the first Japanese satellite “OHSUMI.” His emphasis was on the development of rockets and satellite systems for civilian use rather than military use.

Aside from the merit and demerits of warfare, there are astounding technological innovations too numerous to mention which have been developed through

[16] Ibid., 21–26.

warfare. However, the postwar experiences in Japan, which span nearly seventy years, suggests that it is not impossible to build and sustain the technologies which develop our society and improve our lives. Despite the technological advancements brought by warfare, the current use of these technologies has no connection with warfare.

Colonel João Vicente (Portugal)
Technophilic images of Remote Air Warfare: the ´event horizon´ of Unmanned Aircraft Systems

The Unmanned Aircraft Systems (UAS) challenge the dominant paradigm of manned aircraft, changing the form and lethality of combat, the identity of the fighter and the experience of war itself. The introduction of a capability in war which allows a future where the fight is dehumanized and conducted remotely and autonomously has profound impacts on the phenomenon of hostile conflict. The Remote Warfare translates the double moral implications of the increase of distance and removal of human risk of the duel. Even though it confirms the historical trend of the increasing physical distance between the combatants, accompanies it with a psychological disconnection. On the other hand, there is an expansion of freedom of political maneuver, increasing the propensity to wage war and changing the relationship between the state and society. Judging by the accelerating pace of technology, the expansion of UAS to other activities and their proliferation in the battle space, leads us to accept that we are facing a revolution in military affairs with epic proportions, across the spectrum of conflict.

Airpower concerns the military exploration of air and space by man, not necessarily with man[1]. Within this framework, unmanned air capabilities comprise a transformational change in the operational application of airpower.

However, contrary to what occurs with other critical areas such as climate change, migration and globalization, the phenomenon of war does not seem to muster the same attention from the research community of International Relations. Moreover, this discussion is even more necessary as we go through periods of revolution in the art and science of war. As a matter of fact, we are just living one of those periods in which the introduction of a capability in war unveils a future where the fight is dehumanized and conducted remotely and autonomously, with profound impacts on the phenomenon of war.

It is precisely this observation, that we are witnessing a tendency for a risk free, unilateral war, aseptic for the offensive, lethal to the enemy, and with reduced collateral damage, that must be examined. This trend may be an indication that Remote Air Warfare is leading us to an event horizon. In general relativity an event horizon is a point at which the gravitational pull becomes as great as to make escape impossible. Within the context of this study, it means we have reached a point of no return, with profound impacts to International Relations.

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1 R. A. Mason, "Unmanned Aerial Vehicles: Progress and Challenge", in: Owen Barnes (ed.), *Air Power: UAVs – The Wider Context* (London 2009) 123.

In order to demonstrate this argument we will start with a conceptual approach of Revolution in Military Affairs (RMA), establishing afterwards a connection with the technological developments. Next we will do an empirical analysis of the operational impact of Unmanned Aircraft Systems (UAS) in recent conflicts, which will set the background for some of the political, ethical, and cultural implications of this new paradigm. Before closing, we will present a synthesis of the highlights discussed.

When talking about Remote Air Warfare we are considering the concept of UAS. This systems approach translates various components of equipment and network connections, operators and support personnel and the aerial platform, commonly known as Unmanned Aerial Vehicle (UAV) or drone.

For the purposes of this study, we will follow Richard Hundley´s characterization of RMA, as a paradigm shift that leads to the obsolescence of traditional skills of military organizations.[2] This relationship between paradigm and competence is important. Paradigms are standard military operational templates. The arrangements of the infantry units of the Napoleonic Wars, or the positioning of naval units in parallel routes, are just some examples which survived until the First World War. On the other hand, core competencies are specific features of military capabilities. For example, the ability to identify a target and attack it with precision is a key skill of modern air forces. Therefore, the idea that we should retain, and which is common to the majority of RMA, is that they induce changes at three levels: in force structure, in their character, and in their nature or function. That is, a disruption of values and processes of waging war and their organizations, based on technological advances, have fundamentally changed the face of war, and with it, the balance of global power in each era.

According with Geoffrey Parker, the contemporary RMA is characterized by a synergic interaction between systems that collect, process, and disseminate information with those who apply lethal force, allowing the use of "precision violence" as an essential feature of modern military forces.[3] For example, one of the dominant competences of a modern air force will be to detect and attack, accurately and quickly, adversary targets in the air or on the surface. To accomplish this, air forces depend on a structure based on manned aircraft. However, it is this paradigm that is being challenged with the introduction of new technologies, including unmanned aircraft.

If we read through Dohuet´s or Mitchell´s writings it is possible to verify that theory sometimes precedes technology. For example, Billy Mitchell, in 1925, argued for the remote control of a fleet of bombers to attack urban targets.[4] Fur-

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2 Richard Hundley, *Past Revolutions, Future Transformations: What Can the History of Revolutions in Military Affairs Tell Us About Transforming the U.S. Military?* (Santa Monica 1999) 9.

3 Geofrey Parker, "The Future of Western Warfare", in: Geofrey Parker (ed.) *The Cambridge History of Warfare* (New York 2005) 419.

4 William Mitchell, *Winged Defense: The Development and Possibilities of Modern Air Power-Eco-*

thermore, for every technological advance there is a matching military application with increased lethality and effectiveness. This relationship leads Van Creveld to point out the technology´s determining factor in war´s transformation.[5] Nevertheless, the more or less linear progression which has accompanied the history of war and technology threatens to disappear. That´s because we are currently living in exponential times, where the scientific and technological progress accelerates at a non-proportional historical rate. Futurists like Ray Kurzweil, even speculate that we are approaching a moment of "singularity" in which the speed and depth of technological change makes it impossible to predict how life will be in the coming decades.[6]

The GRIN technologies (Genetics, Robotics, Information and Nanotechnology) reveal the exponential nature of the technological change in which we live. They also reveal that this is a process of interdisciplinary synergies and intra-disciplinary innovation.[7] That is, the interaction between these branches of knowledge will unveil radical new applications, enabling in the short term performances of the machines similar to the human brain.[8] This exponential acceleration of technology creates new paradigms for the development and use of drones. From its proliferation, miniaturization, weaponization, and above all, the autonomously use of lethal force.

The operational use of drones is maximized in environments described as "dull, dirty, dangerous" in which the human factor becomes the main limitation. Such are the cases of long flights, in contaminated environments (nuclear agents, biological and chemical), highly defended and risky for the pilot. Currently there are two main roles that are performed by UAS. One type, with emphasis on payload capacity and persistence, and the other type, with an interest in autonomy, survival and weapons employment. Therefore, the dividing line between the two is the use of lethal force.

The human variable in the equation of Airpower has constrained some of the operational capabilities of this instrument of power. The fact that an aircraft is manned entails high costs in the performance of the platform, causing less maneuverability, less persistence, and higher risk. Therefore, the search for greater efficiency and effectiveness of the air component has led to the development of solutions which increase the distance between the combatants, while reducing the risk of physical combat. Such is the case of long range missiles and ammunition, stealth aircraft, etc. But no technology has offered to date such a satisfying and accessible answer to this quest as the UAS.

The acceleration of the development of military capabilities during periods of

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nomic and Military (Mineola 1988) 165.

5 Martin Van Creveld, *Technology and War: from 2000 B.C. to the Present* (New York 1991).

6 Ray Kurzweil, *The Singularity is near: when humans transcend biology* (New York 2005).

7 Michio Kaku, *Visions: How Science Will Revolutionize the 21st Century* (New York 1997) 5.

8 Ray Kurzweil, *The Age of Spiritual Machines* (New York 1999).

conflict is a fact well known to the history of War. This may be a possible explanation for the explosion in the development of UAS over the last decade, since the United States had the world's largest laboratory for experimenting with new technologies: Afghanistan and Iraq. Like the evolutionary path of its manned relatives, the UAS have been progressing from a function of observation towards attack roles, as instruments of strategic bombing, interdiction or close air support.

As a result of the urgent operational requirements, the budget for development and acquisition of UAS has skyrocket. Just in the United States alone, it increased from 667 million dollars in 2001 to 3.9 billion dollars in 2012. Likewise, the number of UAS has risen in the same period from 167 to more than 7,500.[9] By the same token, although it took 14 years for the United States Air Force (USAF) to perform 1 million UAV hours, it is expected that this number will double in the next 2 and a half years.

This trend has created a strong operational dependence but not without costs and challenges. Among the most insidious challenges, there is the reduced reliability and interoperability of systems, the proliferation of equipment and logistical support.[10] Furthermore, many of the programs exceeded costs, had delays and performance failures.[11] In addition to these challenges, the operational dependence, reflected by the UAS proliferation in the battle space, has caused imbalances in other systems, such as the saturation of airspace, the difficulties of command and control to orchestrate different platforms, or the avalanche of data to analyze. Despite these operational challenges and judging by the investments made and planned by the US Department of Defense, it is possible to envision that we are reaching a point of no return. Actually, from an operational perspective, we have already crossed that point. In addition to the increase in the budget, there are plans to expand the number and sizes of systems, and towards missions until now reserved for manned aircraft. In short, the basic ingredients for a revolution have been assembled: the operational need, adequate funding for adaptation and the introduction of new capabilities in combat, through the development of new concepts of employment.

After having seen the operational impact of UAS, let us now turn to the dilemma of human interference in war. From the fundamental perspective of command and control, and without going into too much technical detail, the drones are either controlled remotely or based in previously programmed instructions, will act autonomously. The positive control over the system has its disadvantages. The human influence on machine´s efficiency can be negative, because of cognitive failures, emotions or fatigue. Also, the remote control option requires con-

9 Jeremiah Gertler, *U.S. Unmanned Aerial Systems* (Washington DC 2012) 14.

10 Zachary Tumin et al., *Unmanned and Robotic Warfare: Issues, Options and Futures*. (Cambridge 2008) 3.

11 Michael Sullivan, *Defense Acquisitions: DOD Could Achieve Greater Commonality and Efficiencies among Its Unmanned Aircraft Systems* (Washington DC 2010).

stant communications between the platform and the control station. Furthermore, the need for real-time video exponentially increases the bandwidth requirements. Therefore, the current and future operational requirements indicate a trend towards the transition to autonomous systems.

In a purely technical level, the military advantages of autonomous systems are obvious. However, this change of human interference has profound impacts. The objections to the use of autonomous systems in war stem from their lack of ability to comply with universal ethical standards. Namely, the ability to distinguish between combatants and unlawful targets, or the compliance with the requirements of proportionality and necessity. Moreover, the attribution of responsibility for lethal acts, and above all, for the errors.

Nonetheless, history demonstrates that the operational effectiveness of a weapon system contributes to ignore and overcome the barriers imposed by moral principles, making acceptable the use of weapons that increase the distance and decrease the risk to combatants. Therefore it´s possible to envision that the transition to autonomous systems is conditioned by two main factors: the technological ability and the human acceptance that machines can make lethal force decisions. This discussion unveils the profound impact that the UAS will have in the coming decades of Air Warfare.

It is easy to see that this technology is extremely attractive, both politically and militarily. However, it conveys a false impression that the war has ceased to have costs. By reducing the shedding of our "blood", we are making war less harsh, less demanding and more socially acceptable, limiting its burden to the spending of "treasure." In this sense, UAS provide increased political control that extends to three levels.[12] First, the control of timing and tempo of operations, in that it minimizes external interference. Second, the control over the political debate regarding the use of force. And finally, the perceived precise control from the strategic level to the tactical employment of forces, prompting major interferences in all the details of the conduct of war. Thus, Remote Air Warfare helps expanding the freedom of political maneuver by providing a greater number of strategic options and flexible employment of the military instrument, even when employed by civilian operators. At the same time, it reduces the need for forward bases, decreases the strategic value of regional partnerships and minimizes political interference. Therefore, war becomes a political solution even more prominent because less demanding, easily justifiable and acceptable.

This trend of worldwide proliferation is revealed today by the use of UAS by more than 50 countries, of which more than a dozen develops and employs armed drones. One example of the drone proliferation could be witnessed last year by the

[12] James Dawkins, *Unmanned Combat Aerial Vehicles: Examining the Political, Moral, and Social Implications* (SAASS 2005) 21–24.

simultaneous and discrete employment of American armed drones in six different theatres.

Mankind´s seduction for Remote Warfare is not new. Since the beginning of hostile conflicts that man seeks to increase the distance between him and the opponent, trying to kill with greater precision and less risk. Therefore, the search for relative invulnerability, although ephemeral, is a human aspiration throughout history. However, it is well known the historical opposition to weapons which are deemed inhumane, sometimes leading to their elimination of arsenals. Despite the fact that Remote Warfare could raise doubts about the historical values of combat, the truth is that the laws of war do not require the mutual risk exposure of opponents. Thus, for democratic states, with a mandate to ensure the safety of its citizens, the demand for greater efficiency and effectiveness in war is a moral imperative.[13]

When asking about the morality of Remote Air Warfare we are faced with the transformation of the individual's relationship with War. The new interface of the air war is an image on a computer monitor, somewhere in a bunker thousands of miles away from the impact of the bomb.[14] Consequently, the physical and emotional disconnection could alter the dynamics of decision making. This argument rests on the assumption that when we do not have to physically face the opponent, it becomes easier to kill.[15] Moreover, recent studies demonstrate the impact that UAS operations may have concerning chronic fatigue problems. The sight, almost microscopic and at high resolution of targets and destruction seems to contribute to aggravate this symptom. The video console displays not only the destruction imposed but also the pattern of life of targets, as opposed to a combat pilot which leaves the target area after dropping its bombs. Also, for UAS operators, the daily transition between "combat operations" shifts and family routine increases the psychological strain.

On the other hand, the implications of the individual´s relationship with war are reflected on war´s experience itself. "Going to War" has become a ritualized process with the assumption of the risk of own lives. It meant separation from loved ones and exposure to the horrors of combat.[16] This has changed irreversibly with the remote operation of UAS. Therefore, General Charles Dunlap questions if this new generation of military, aka "*Playstation Warriors*", that wages war without ever having been exposed to deadly consequences, can share the traditional military values that restrict illegal and immoral conduct in war.[17] As Peter Singer puts

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[13] Edward Barrett, *Rise of the Drones: Unmanned Systems and the Future of War* (Washington DC 2010).

[14] William Bernhard, *Autonomous Unmanned Systems and Impacts to Moral Decision-Making in Future Warfare* (ACSC 2008) 9.

[15] Dave Grossman, *On Killing* (New York 1996).

[16] Peter Singer, *Wired for War* (**New York 2009)** 327.

[17] Charles Dunlap, *Technology and the 21st Century Battlfield: Recomplicating Moral Life for the*

it, when you protect the combatants from danger and sacrifice, the UAS transform the conflict in a kind of "War without Virtue" free of courage and heroism.[18]

Before concluding it´s important to notice the cultural factors which may prevent the expected progression and full adoption of UAS. This resistance can be attributed to two fundamental causes: technological risk aversion and an organizational culture focused on pilots.

Several authors stress that the reluctance to embrace new weapon systems has been tied to the distrust of the effectiveness of these systems to perform the functions assigned to manned aircraft, instead of favoritism in favor of the pilots.[19] From this perspective, the late emergence of UAS had more to do with their relative ability compared to other weapon systems rather than cultural skepticism.[20] For instance, the technological developments following the Vietnam War, such as precision weaponry and stealth aircraft, displayed their ability to neutralize Iraq´s integrated air defense systems, leading to a landslide victory in 1991. Regardless of the cultural predisposition to choose these systems to the detriment of the UAS, the reality is that their operational effectiveness was much higher. Furthermore, the effectiveness of contemporary UAS is only possible because current wars exacerbate their capabilities. That is, their vulnerabilities are no hindrance to employment in the current context. In a conflict where air supremacy is not achieved, it is difficult to expect such proliferation of systems and missions. Therefore, a more capable adversary may severely restrain the use of UAS.

The second resistance factor has to do with the fact that most air forces have developed cultural norms focused on the nourishment of pilots as future leaders. Thus, the professional aviator is so intimately connected to the instrument that provided the independence of air forces: the airplane. Therefore, the introduction of UAS challenges this dominant paradigm. The institutional identity of the air forces is based on a central theme: the role of technology as a facilitator of the strategy of employment of Airpower.[21] Hence, the introduction of UAS has accelerated the transition of competences. Initially from the pilots to the operators, and in a not so distant future, from them to computers capable of autonomous operations. As the Vietnam War opened the way for the rise of the fighter pilots, in detriment of the status of nuclear bomber pilots, the current wars have new cultural challenges, to the point of introducing a new technology which threatens the very identity and independence of the Air Force.

In conclusion, the technophilic images of Remote Air Warfare encompass a

Statesman and the Soldier (Strategic Studies Institute 1999) 30.

[18] Singer, *Wired for War*, 332.

[19] James Sweeney, *The Wave of the present: Remotely-Piloted Aircraft in Air Force culture* (SAASS 2010) 52.

[20] Thomas Ehrhard, *Air Force UAVs: The Secret History* (Arlington 2010) 43.

[21] Carl Builder, *The Icarus Syndrome: The Role of Air Power Theory in the Evolution and Fate of the U.S. Air Force* (Transaction Publishers 1994).

trend towards a vertical, horizontal, and qualitative UAS proliferation. First, in a diversity of shapes and sizes, from few centimeters to tens of meters of wing span. Second, by expanding the spectrum of missions and users, from the military to the civilian dimensions. Finally, gaining increasing levels of autonomy. This proliferation trinity, compounded by the growing weaponization of platforms, confirms the magnitude of the UAS ´event horizon´, which will have disproportionate consequences that go beyond simple operational effectiveness, threatening to spread transversely to all dimensions of human interaction.

In addition to changes in force structure, the UAS have brought profound alterations in its character, in its lethality, in the identity of the soldier and even in the experience of war. Judging by the acceleration of technology, the expansion of UAS to other air activities, the growing levels of autonomy, and their proliferation in the battle space, we are led to accept that we are facing the dawn of a RMA with epic implications, across the nature of conflict.

The UAS extend the freedom of political maneuver, offering more flexible strategic options for the use of the military instrument without the heavy burden of "blood and treasure," as would be expected when deploying troops into hostile territory. By reducing the need for forward bases to support military deployments, the strategic value of certain regional partnerships is also reduced. This decrease of political costs could lead to less public dialogue about the use of force while encouraging preventive measures. In short, this will make it easier to wage war, therefore changing the relationship between the state and society. On the other hand, war continues to depend on the use of violence to coerce the adversary to accept our will. As a result of the disparity of risk in war there is the possibility of a transfer of risk from the warrior to the society, expanding ways, means, and targets. The lack of ability to deal with a Remote Air Warfare threat may prompt the adversary to employ more destructive and inhumane methods, causing to overflow the limited nature of war.

Remote Air Warfare translates the double moral implications of increased distance and risk removal of human duel. UAS continue the historic tradition of increasing the physical distance between the combatants, but accompanying it with a psychological disconnection. Also, the demographics of War are hereby amended to include a new *Playstation* generation, but with completely different military attributes from traditional warriors. It is precisely this distance of human interaction and a qualitative change of human interference, from operator to supervisor, which pose new challenges to the ancient art of war. Not by its novelty, but by the magnitude of their effects.

Nonetheless, as an Air Force pilot, I am still convinced that man will continue, in the medium term, to reserve for himself the final decision regarding the lethal issues of War.

Dr. Efpraxia S. Paschalidou (Greece)
Strategic and operational innovations at the Hellenic Armed Forces, as parameter of the Balkan Wars, 1912–1913

The Balkan Wars took place in 1912 through 1913; the first involving an alliance of Christian states, namely Greece, Serbia, Bulgaria and Montenegro against the Ottoman Empire so as to liberate their still enslaved Christian compatriots, and the second one involving Greece and Serbia against Bulgaria.

Establishment of the Joint General Staff

In Greece, the military coup of 1909, contributed towards the victories won in the Balkan Wars, because it gave a new and proper impulse to reform the Armed Forces and implement new and well thought-out armament programs. The political and military leadership, foreseeing the upcoming changes in the Balkans and in order to put Greece in a position to liberate the occupied territories undertook coordinated action for the country's complete preparation. The collaboration of the land and naval forces constituted the fundamental precondition for achieving Greece's national objectives[1]. The *Higher Joint Staff of the Land Army and Navy*[2] was formed on 17 April 1910. Its task was the drafting of a common plan of operations for the army and the navy, the research in the required military and naval organization and preparations, as well as the ensuring for the complete implementation of that plan, at a given time. Also the gradual reinforcement of the country's ground defence with the proper defensive works and transportation means, the gradual substitution, repair and selling off the outdated ships and every sort of useless war material whether being for use on land, or sea, the country's dowry with a complete naval base, perfect industrial factories for manufacturing weapons and gun powder and in general the implementation of every project that could render the country self sufficient at time of war.

The Army's Organization

In the 1909–1912 period, the Army was significantly modernized. New mobilized formations were organized, large-scale exercises were carried out under the immediate direction of the French Organizing Military Mission and several officers were trained further in Greece and abroad. The Army's organization was significantly improved; the materials and the mobilization supplies were completed, while modern weapons and guns were purchased. The most important

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1 Efpraxia S. Paschalidou, *Joint warfare across time; case studies from the Hellenic military history* (Hellenic National Defence General Staff 2010) 87–108

2 Army History Directorate, *History of the Organization of the Hellenic Army 1821−1954* (Hellenic Army General Staff 2005) 238.

reforms and changes involved the formation of large units of uniform composition, the reorganization of the Staff Service, the partitioning of the Artillery according to its use and the improvement of the logistics. The Hellenic Army was organized, staffed and equipped in a way as to be considered one of the most modern of its time, worthy to face up the challenges, a fact that was confirmed when it was called to fulfill its mission in the Balkan Wars of 1912–1913.

Fortifications and Armament[3]

Since 1910, the Army Staff Service had started examining the fortifications of Thessaly and Arta. The construction of the respective projects started immediately with partial funding from the National Defence Fund. Supervision of the projects' implementation was assigned to specialist officers, who reported regularly on the progress of works. For the implementation of the projects workers and men from the Engineer Battalions were used. In August 1912 the Army Ministry, which monitored the fortifications, ordered the acceleration of the projects' completion and their equipping. Thus, by the mobilisation of 1912, four fort complexes had been completed in Thessaly, which had been constructed according to the current fortification engineering of the time and included Infantry entrenchments, from which the men could shoot standing, pillboxes, gun boxes, intercepting obstacles, ammunition warehouses, barracks, shelters, outposts, communications trenches and other facilities. Packaged fixed guns and their ammunition had been set in place. Furthermore, bridges were constructed on Pinios River, as well as roads to connect the projects with the rear. Remarkable fortifications projects were also implemented In Epirus, though incomplete at the beginning of the war.

In February 1907, the issues regarding the Army's small arms were regulated. For this reason new Mannlicher 1903 standard 6.5 mm cal. repeating rifles and carbines were introduced. From 10 July 1907 the Infantry, Evzone and Engineers Units started to be equipped with a repeating 1903 standard rifle and the Cavalry, Artillery, Nurse and Transport Units with a repeating 1903 standard carbine. In October 1910, the armament of nurses was modified and it was defined that they bear a revolver instead of a carbine. Moreover, the Field and Mountain Artillery were fully renewed in 1910. The old slow firing guns were replaced by new quick firing guns of the most perfect for their kind at that time[4]. The Artillery Units were supplied with new equipment; for the Field Artillery the Schneider system 1908

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3 Army History Directorate, *History of the Organization of the Hellenic Army, 1821−1954* (Hellenic Army General Staff 2005)265–267.

4 The Hellenic Army's armament in the end of the period in question comprised of the following:

– Schneider field guns	144
– Schneider-Danglis mountain guns	36
– Maxim machine guns	60
– Mannlicher-Schoenauer rifles	100,000
– Mannlicher carbines	15,000
– Gras rifles	112,000
– Revolvers-Pistols of various types	7,640

standard 75 mm field gun was provisioned, while for the Mountain Artillery the *Schneider-Danglis* 1908 standard 75 mm disassembled quick firing mountain gun was provisioned.

Schneider-Danglis mountain gun: The 75mm *Schneider-Danglis* 06/09 was Greek-designed and French-manufactured. The invention of a mountain gun that could easily be broken down to pieces for transport and reassembled into a highly efficient weapon is claimed by two Greek army engineers, (then) Engineering Corps Major P. Lykoudis, who made such a design in 1891, and then Artillery Major Panagiotis Danglis who made his own design in 1893. Danglis' proposal to the Greek Army Ministry caused an immediate reaction by Lykoudis, who claimed that his designs had been copied. Surprisingly, at the time no particular interest was shown, neither by the Greek military, nor by foreign weapon manufacturers; the rivalry between the two men would continue, though, for several years. Danglis devoted personal effort into developing his design, and eventually convinced French *Schneider* armaments company to construct and test his design. Prototype development, construction and testing were completed between November 1905 and June 1906. Meanwhile, Lykoudis had arranged with the German manufacturer *Krupp* to develop his design. The final "victory" for Danglis came in 1907. In that year, after testing, the Greek Army determined that the *Schneider-Danglis* weapon was superior to the *Krupp-Lykoudis* and placed an order for the gun with the French manufacturer. Other nations followed with orders, and this mountain gun proved its merits in action (it was used by Greece in the Balkan Wars, World War I and World War II), while *Schneider* developed the technology further in later models. Danglis' efforts came to a successful conclusion altogether, when a fair financial settlement was made with the French manufacturer concerning the rights to use his design.

The Reinforcement of the Hellenic Navy

The Hellenic Navy constituted the only naval force of the Balkan coalition and thus, it decisively contributed to the victory. The Navy General Staff was established in 1907 and as the need for the coordinated action with the army became ever more demanding, the Navy's needs were also included in the new and well thought-out armament programs. Their aim was to achieve naval supremacy again, as soon as possible, since the Ottoman Empire had already acquired two German battleships, two new light cruisers and reinforced its torpedo flotilla. A program to construct new units for the Hellenic Navy was realized, based on a combination of large and small ships, and these were to be the ships that actually brought victory in the 1912–13 War. Greece's financial condition did not allow the building of a naval force comparable to that of the Great Powers. However, the constitution of a naval force that would succeed in meeting the requirements of the likely confrontation with the Ottoman fleet was within the Greek state's capacity. Given that Bulgaria possessed only land space but at that time did not share a common border with Greece and the Ottoman Empire occupied both land and sea space bordering with the Greek state, the reinforcement of the army was certainly necessary; the Navy's armouring was though a non-negotiable and demanding need.

The Ottoman fleet was speedier and even more, possessed an excellent port behind the Dardanelles[5]. The Hellenic Navy possessed only two comparative advantages; the first was the possession of the armored-cruiser *Averof*, which was more modern and faster than any other battle-ship in either fleet and the second was the possession of the small submarine *Delfin,* whose presence had a considerable effect on morale, since the Turks neither possessed nor clearly understood how to deal with this new form of naval warfare. Without a doubt, the appearance of the submarine as a war ship, was catalytic in the conduction of naval operations, mainly confirmed during the following World Wars.

Delfin**,** was commissioned in 1912 and took part in the 1st Balkan War, the first ever worldwide, offensive submarine patrol, on 21 November 1912 and the first torpedo attack, submerged on 9 December 1912, with Commanding Officer (C.O.) Lieutenant Commander Stephanos Paparigopoulos RHN, against the enemy Ottoman cruiser *Medjitieh*, out of the straights of Dardanelles and north of the island of Tenedos[6].

Greece decided to purchase submarines (submersibles) for the first time, so in September 1910 the submarines *Delfin* and *Xifias* were ordered from France. The construction of *Delfin* had begun at the beginning of 1909, long before the order was placed by the Hellenic Government. It was completed by November 1911 and an intense training program of the crew and equipment trials followed. Soon after, urgent actions that forewarn for serious preparations to deal with an imminent war, began, so she arrived at Piraeus, on 5 October 1912, on the day when the war was declared, and the Hellenic *Aegean Fleet* sailed from Phaleron bay[7]. The imperative operational demands of the Hellenic Navy, due to the declaration of the Balkan Wars, enforced the hasty preparations of the submersible in an environment, at the Salamis Naval Base, unprepared and unable to technically support this new unit of the Navy. The whole burden for the preparation of *Delfin*, for her participation in naval war operations lay in the submersible's crew, who achieved to fulfill this difficult task with superhuman efforts and continuous work.

Nevertheless, the utility of the *Delfin* had its limitations, since she was handled by an inexperienced crew, who had to rush to Greece at the outbreak of the hostilities long before completing its training in France. It is not suggested that the crew of the Greek submarine was unprepared to perform well. Far from it. *Delfin's*

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5 Zisis Fotakis, *Greek Naval Strategy and Policy, 1010–1919* (Routledge 2005) 45–46.

6 Timotheos G. Masouras – Thomas S. Katopodis, *Hellenic Submarines* (Hellenic Maritime Museum, Piraeus 2010) vol.I, 96

7 Ibid, Masouras-Katopodis, *Hellenic Submarines*, 102.

unescorted journey of 1,100 miles non-stop set a world record and had convincingly proven the ability of its crew. However the fact that there was no reserve submarine crew in the Greek navy meant that the only existing one had to undertake an excessive amount of duties, which naturally lessened its battle-effectiveness[8].

Since its departure on 19 October, she began war patrols daily[9]. In the morning of 9 December 1912, *Delfin* was heading towards the port of the town of Tenedos, to charge her batteries and replace electrical power spent during the night. As soon as the submersible arrived at the port, she asked the destroyer *Leon*, there, if they could charge her batteries, to receive the reply *Medjitieh* – the Ottoman cruiser – with five destroyers is outside the Straights". *Delfin* did not hesitate, the batteries only half charged, but the remaining capacity probably sufficient for one attack. The Ottoman ships could not be seen, but soon after a Hellenic destroyer informed *Delfin* that the enemy ships were at the west end of the island of Imvros. Despite the problems she faced, *Delfin* went into diving order. At 10.30, on 9 December 1912, at the right moment and from a distance of 500 meters, the C.O. Lieutenant Commander Stephanos Paparigopoulos RHN, ordered firing of the bow torpedo[10] against the first ship in the line of the cruiser *Medjitieh*. The torpedo was fired normally, but immediately executed some jumps on the surface of the sea and then disappeared. The impression formed was that it had sunk. The attack was unsuccessful. In a short while, the second ship in the enemy line was in a good position for firing by the submersible. However, the splash of the ejection and the torpedo on the surface of the sea were detected by the Ottoman ships and the destroyers moved towards *Delfin* at full speed. The Hellenic fleet was not in the area and an offensive return of the enemy destroyer was probable[11]. Almost twenty years after *Delfins'* attack, the magazine *Naval Review* stated: "*Nevertheless, she will remain as one of the finest pages in the Hellenic Navy and her memory and the excellent example of the pioneers in submarine navigation in Greece, will inspire*

8 Ibid, Fotakis, *Greek Naval Strategy*, 46.

9 Dimitrios G. Fokas, *O Stolos tou Aegeou (The Aegean Fleet) 1912–1913* (Nereus, Athens 1972) vol. B,158–161. Petros Protopapas, "The first submarine attack", in: *Naval Review* (vol. 118, September 1932) 54–67, and *Naval Review* (vol. 412, November–December 1981) 469–477.

10 This is the first, worldwide, submerged torpedo attack, because in international bibliography (Michael Gunton, *Submarines at War... to The Cold War* (Carroll & Graf Publishers, New York 2003) 25–27, Clay Blair Jr., *Silent Victory. The U.S. Submarine War against Japan* (First Naval Institute Press edition, Annapolis 2001) 36–37, Antony Preston, *Submarine Warfare. An illustrated History* (Thunder Bay Press, San Diego CA 1999) 22–24 and Spencer Dunmore, *Lost Subs. From the3 Hunley to the Kursk, the greatest submarines ever lost-and found* (Da Capo Press, Toronto Ontario Canada 2002) 45–51, the first submerged torpedo attack is considered to be the attack made on 22 September 1914, by the German submarine U9, with C.O. Lieutenant Otto Weddigen and the sinking of three old British cruisers, 12,000 tons, the *Aboukir*, *Cressy* and *Hogue*, in the North Sea near the cost of Denmark.

11 Ibid, Masouras-Katopodis, *Hellenic Submarines*, 113.

the new commanding officers and the crews of submarines, if fate holds new wars for the Nation".[12]

The Hellenic Air Force

The air force fleet decisively contributed to the war's outcome, despite its small size and its limited operational capability, mainly by diminishing the enemy's morale. The first aviators undertook and carried out reconnaissance missions as well as strikes against the land enemy targets to the benefit of the army in Macedonia and Epirus. On 24 January 1913, a Hellenic hydroplane carried out the first ever mission of naval support cooperation by identifying the Ottoman fleet in the Dardanelles.

The Greek Government early realized the utility of the airplane in the military operations[13]. Prime Minister Eleftherios Venizelos had expressed his conviction to General Eydoux, who was head of the French Military Mission in Greece that the airplane can constitute a significant tool of war. Lower rank officers of the Army were already being trained in France as aviators, already from December 1911. Venizelos did not hesitate to fly as a passenger in the first trial flights, in February 1912, as he sought to convince himself and to assure the people that not only the airplane was a safe means of flight, but it could be used in the war operations against the Turks – as the confrontation with them seemed inevitable. The air fleet was composed of four *Henri Farman* biplanes fitted with a 50 horse power engine. The operations illustrated the weakness of this particular model to meet the war requirements. Thus the more modern and improved *Maurice Farman* were ordered. Those were fitted with an 80 horse power engine and they could carry an observer as well. The initial role of the Aviators Company in the theater of operations was limited to carrying out reconnaissance and elementary bombardment missions. The pilot – having simultaneously the duty of an observer – could fly above the enemy's positions and watch the maneuvers of the enemy troops, spanning a reconnaissance field extending in his range of action and without being in danger from the powerless anti-aircraft means of that era.

During the Balkan Wars, the fronts' wars and the wars of the trenches, the opponent sides used to occupy and defended a certain region expanse where the bulk of the troops lied. Every single maneuver in the front and every information on the adversary's maneuvers were of critical importance, in measure with the reconnaissance of the forts and the trenches that constituted the greatest bulk of the war. On 5 October 1912, as the Army of Thessaly proceeded to the first offensive actions, heading to Sarandaporo, the Larissa General Headquarters issued the order *"for carrying out the first military air reconnaissance mission"*. The mission was met with absolute success; it caused excitement to the soldiers and succeeded in car-

[12] Ibid, Protopapas, "The first submarine attack", 67.
[13] Ibid, Paschalidou, *Joint warfare*, 95–96.

rying out the reconnaissance of the broader front region. The information that was collected proved valuable to the Command, in the Army's general offensive that followed at Elassona. The daily reconnaissance flights continued to be carried out from Sarandaporo to Servia to survey the manoeuvres and the defence tactics of the adversary that was already retreating. The reconnaissance was followed by the light bombardment that mainly had an impact in the enemy's morale while raising that of the allies. Those missions served to detect the withdrawal and the hasty retreat of the adversary after the first battles and as a consequence the land troops decided to swiftly chase after them and to fast advance.

The situation in the front with the army's constant advance necessitated the advance of the Aviators Company to the Kozani airfield. From there, they carried out daily reconnaissance missions. Following the liberation of Thessaloniki, the main focus of the Greek struggle was transferred to Epirus. Therefore, the Air Company was moved there to continue its action in the new front, along with the II Division. Materiel and personnel were advanced on board ships from Piraeus to Preveza. The Air Company's first mission on 5 December 1912, concerned the reconnaissance of the enemy positions up to Ioannina and the enemy's bombardment. The new *Maurice Farman* aircrafts allowed and provided for a co-passenger, who carried out the observer's and the bomber's duty. The missions continued throughout the duration of the operations until the final liberation of Ioannina, on 21 February 1913. The airplanes provided reliable information for the enemy fortifications –particularly at the Bizani fort– the positions of the artillery batteries, the trench lines and the locations of the enemy's inventories. The army made effective of that information, particularly in drafting the artillery's firing plan. Efforts to bring down the planes were not fulfilled. In the contrary, the dropped bombs spread the panic in the Ottoman lines. Also the pilots applied the supply from air in a secluded region and they dropped food and newspapers in the residents of the besieged city of Ioannina.

The Air Force in the Sea Struggle

After the hydroplane's successful flights, the Hellenic Government considered necessary the planning and the organization apart of the existing Army Air Force and of a naval one. The Air Force of Naval Cooperation, having the advantage of the hydroplane that could land on the sea could reinforce the fleet as to maintain its dominance at the Aegean sea. Lieutenant D. Kamberos with the aid of men from the Engineering Corps converted the first military plane into a hydroplane. Deadalus flied successfully on 22 June 1912. However the outbreak of the first Balkan War did not permit the completion of the planned organization of the Naval Air Force, which acquired its first hydroplane in November 1912.

The Greek fleet after the victorious naval battles of Elli (3 December 1912) and Lemnos (2 January 1912) and while the islands of northern and eastern Aegean had been liberated, was anchored in the Moudros harbour. On 24 January 1913 a Maurice Farman hydroplane carried out a successful flight up to Tenedos[14]. Immediately the Chief of the Fleet Admiral Pavlos Koundouriotis asked for an air reconnaissance to be informed of the position of the Ottoman fleet that had been blocked in the Dardanelles Straits. The first military mission to the benefit of the navy was carried out and it constituted a milestone in the history of the sea operations. The hydroplane's pilot was Lieutenant (Army) Michael Moutousis and Ensign Aristides Moraitinis was the observer. The flight lasted 2 hours and 20 minutes and covered a distance of 180 kms by the way of Samothrace and Imvros. The pilot with maneuvers managed to escape the firing of the coastal Ottoman artillery while the observer was drafting a detailed plan of the enemy ships positions. At the same time, they bombed an Ottoman transport ship. On its return, the hydroplane, which had been riddled by enemy light gun-fire, was forced to land on the sea at the Dardanelles exit and it was towed by the warship *Velos* that was watching the flight and was waiting five miles far of the Straits, in the Moudros harbour.[15]. The military observers branded the mission as the first in world operation of air force and naval cooperation while the Greek and the foreign press praised the fact. The Ottoman press comments gave a clear picture of the impression of the Greek aviators' achievements. As Wilson stated, "for the first time in history, the Hellenic fleet used an airplane to identify an enemy fleet and bomb it. This incident became a special characteristic turning point in the development of naval operations since then and the use of airplanes in identifying and bombing enemy fleets."

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[14] Air Historical Branch, *Hellenic Wings. An Illustrated History of the Hellenic Air Force and its Precursors, 1908–1944* (Hellenic Air Force General Staff 1999) 26–31.

[15] Ioannis Paloubis, *From the seas to the skies; The Naval Air Force Chronicle 1913–1941* (Hellenic Maritime Museum, Piraeus 2009) 30–33.

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Dr Alan Lemmers (The Netherland)
Dutch Technology Transfer to Awakening Japan

There is hardly a country in the World where technology is as manifest as in present-day Japan. This is all the more striking when one realizes that until the middle of the nineteenth century Japan was a feudal society shut off from the rest of the world for more than two hundred years, its technological level at that moment medieval, by Western standards. The only Western country it had (strictly commercial) dealings with, was the Netherlands. The forced opening of Japan by the American commodore Perry in 1853–1854 found the country completely unprepared and defenceless against foreign aggression.[1] But by the end of the First World War Japan was recognized as the fifth most powerful state in the world.

At the heart of Japan's extraordinary rise as an industrial and military giant lies the transfer of Western technology. The need thereof was perceived immediately in 1853: after Perry's first appearance the Japanese government directly turned to the Netherlands for help to build a modern navy. However, the real turning point only came after two military conflicts between Japanese factions and Western forces: the bombing of Kagoshima in 1863 and the Shimonoseki crisis in 1863–1864. The civil war that ensued (Boshin War, 1868–1869) signified the end of the Tokugawa era and a radical shift in Japan's attitude towards the Western world. By then British, American, French and German influences overshadowed the Dutch presence in Japan, which naturally saw more profit in dealing with the greater industrial powers.

The underlying paper describes Dutch technology transfer to Japan in the 1850s and 1860s and its impact on the national defence and early industrialisation of Japan, an episode that is often underexposed in histories of Japan, even though its echoes remained noticeable for many decades.

Japanese Experiments 1845–1855

In 1639 the Tokugawa shogunate sealed off Japan from the rest of the world (the so-called *sakoku* or "locked country"), a measure both against destabilizing foreign influence and to prevent rivalling domestic clans from obtaining too much wealth or foreign support. For more than two hundred years Japan's international trade was directed exclusively through the Dutch and Chinese settlements in Nagasaki harbour and through the Ryu-Kyu islands. The Dutch presence on Deshima island was allowed solely for trade and as long as a tribute of luxury presents and

[1] Richard Sims, *Japanese Political History since the Meiji Renovation 1868–2000* (London, 2001), 1–12, discusses various historical perspectives on the opening of Japan.

scientific marvels was yearly presented to the Edo court, along with Western news. No Japanese citizen was allowed to venture abroad.

The prologue to the reopening of Japan set in with the first Opium War (1839–1842) of Great Britain against China, of which the Japanese government received news through the Dutch and Chinese trading representatives. In 1844 the Dutch king Willem II even sent a friendly warning to the shogun that the West expected Japan to open its frontiers, but he was rebuked.[2] However, the threat of a forced opening by a militarily advanced colonial power was indeed perceived by the Tokugawa *bakufu* (government), which subsequently granted permission to some of its vassals to experiment with western gun technology and shipbuilding. These were specifically the *daimyo* (lords) of the domains entrusted with the defence of the entrance port of Japan, Nagasaki, a responsibility that rotated yearly between the Shimazu clan of the Satsuma domain (today Kagoshima prefecture) and the Nabeshima clan of the Saga domain (Hizen province). From the mid-1840s a sudden and drastic increase can be observed in the demand for western military, technological and scientific textbooks to be sent with the annual tribute from the Netherlands.[3] One of the most influential books was the two volume work on gun founding by the Dutch general-major Ulrich Huguenin (1755–1833), of which hundreds of copies were imported in Japan. Armed with no more than their knowledge of the Dutch language and these textbooks the *daimyo* of Saga and of Satsuma in the early 1850s both set up their own blasting and reverberatory furnaces (1850–1853 and 1851 respectively), where they cast highly sophisticated ordnance. At the machine shop of Satsuma, called Shuseikan, Dutch officers in 1858 also observed a boring machine and finishing lathe, a large smithy for iron and steel, a workshop for rifles, a glassworks, a workshop for crystal grinding, a porcelain factory, air pumps and many minor workshops, all driven by water power. Satsuma had also built several ships, one based on a seventeenth-century Dutch textbook, another a small paddle-steamer based on a mid-nineteenth-century Dutch manual. It is unclear whether the Saga or Satsuma foundry managed to cast iron guns, but their bronze pieces are stunning.

The experiments carried out in Saga-city, at Kagoshima and Nirayama – far away from foreign observers, who only saw the sites in 1858 at the earliest – underline the urge of the Japanese at the time to industrialize their defences as independently as possible, completely on their own steam and in secret. Even the

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2 Nationaal Archief, The Hague, Collectie Uhlenbeck, 37–38; Scheepvaartmuseum, Amsterdam, S.1845(2) (B-II-350), *Stukken afkomstig van H.H.T. Coops* (ca. 1850); J.A. van der Chijs, *Neêrlands streven tot openstelling van Japan voor den wereldhandel* (Amsterdam, 1867), pp. 20–66; A. Korthals Altes, 'Koning Willem II schrijft de keizer van Japan', in *Spiegel Historiael* (13/2, 1978), 66–72.

3 Nationaal Archief, The Hague, Archief van de Nederlandse factorij in Japan 1609–1860, 1739–1758: Opgegeven nieuws, facturen en monsterollen 1844–1855.

batteries they built in Nagasaki harbour, armed with Saga guns, were erected out of sight from foreign observers. The underlying motivation was clear: to preserve the *sakoku* and to defend Japan's sovereignty at all cost. But they were too late: on July 8, 1853, Commodore Matthew Perry (1794–1858) of the US Navy steamed into the Bay of Edo (Tokyo) with four warships, threatening to bomb the city with his shell guns unless Japan agree to open to trade with the West. As the bewildered Japanese authorities could not respond to his demands immediately, he promised to return the next year, when he expected a treaty to be signed. Then his *kurofune* or Black Ships, as they became known, raised anchor and left.

Dutch Naval Academy 1855–1859 and Akunoura 1857–1861

Very much shocked by Perry's sudden appearance and threat, the Tokugawa government immediately increased its efforts with gun foundries erected by Saga and Satsuma engineers at Nirayama near Edo and Nakaminato further north, but also turned to the Dutch trade representative in Nagasaki with an urgent request for direct Dutch assistance in organizing Japan's defences. The Dutch government was willing to comply in return for a solid trade treaty and as long as it would not actively be supplying Japan with arms, as this would not be taken kindly by its allies, the United States for one.[4] In 1854 a Dutch naval captain, Gerard Fabius (1806–1888), heard the Japanese requests and gave advice on how to found a navy. The Japanese feverishly began to order hundreds of textbooks but, on Fabius' advice, also machinery for a construction shop, mining equipment and three screw schooners.[5] Fabius then sailed to the Netherlands to relay the Japanese requests to the Dutch government. Not all Japanese purchases were immediately available – most of the equipment still had to be manufactured – but given the haste Fabius swiftly returned to Japan with the Dutch promise of cooperation and with an encouraging present from the Dutch king to the Tokugawa shogun: the brand new 4 gun paddle-steamer Zr.Ms. *Soembing*, which could be used as a naval training vessel.[6] The date of the transfer of the *Soembing* to the Japanese authorities, 5 October 1855, is widely accepted as the founding date of the Japanese navy. The ship was immediately rechristened *Kanko Maru*.

And most important of all: Fabius brought with him a team of fourteen naval officers and petty officers to form a naval academy or training centre for Japanese

4 Van der Chijs, *Neêrlands streven*, 453–454.

5 Nationaal Archief, The Hague, Ministerie van Koloniën 1850–1900 (1932), Geheim Verbaal nr. 5868, 14 March 1855 N106; 22 March 1855 N34; 29 March 1855 N136.

6 Ch.F. Pahud, 'Rapport aan Z.M. de Koning betrekkelijk de Nederlandsche bemoeijingen en handelingen in Japan', in *Verhandelingen en berigten betrekkelijk het zeewezen* 1855/II, 75; J. Stellingwerf, *Zijne Majesteits Raderstoomschip Soembing overgedragen aan Japan*, (*Werken van de Linschoten Vereeniging* LXXXVIII, Zutphen, 1988), passim; Herman Stapelkamp, *Gerhardus Fabius (1806–1888). Een leven voor de marine* (Amsterdam, 1999), 87–112.

naval cadets. The school, housed in the former palace of the governor of Nagasaki, was directed by Japanese, but the entirely Dutch teaching staff was commanded by naval lieutenant G.C.C. Pels Rycken (1810–1889). One additional teacher was the physician of the Dutch trading post on Deshima island in Nagasaki, Jan Karel van den Broek (1814–1865), who was to inspire his students in a wide range of subjects.[7] Besides naval and military subjects such as navigation, naval architecture, steam engineering and fortification, the cadets received practical training in sailing, steam navigation, artillery, infantry and cavalry, and general schooling in the Dutch language, geography, mathematics, physics, chemistry, anatomy and wound-dressing. The drumming lessons were exceedingly popular.[8]

Classes had already started on 5 August 1855, well before the transfer of the *Soembing*, but meanwhile the diplomatic negotiations were slowing down. Fabius now threatened to cut short the naval training program if the Dutch demand for free trade was not met. Pels Rijcken and his teaching staff were to return to Batavia if an official treaty was not reached. Only five days before they were to set sail, a preliminary agreement was finally signed.

The students, from forty to two hundred a year, were mainly of the samurai class, some former Dutch interpreters. Most of them had been appointed by the *bakufu* in Edo, but quite a number belonged to the retinues of the *daimyo* of Satsuma, Saga and other domains. Most of them were young and quick of learning, but some were older and less pliant, and for them the western languages, the abstract sciences, the social implications and the sheer novelty of the subject-matter formed serious obstacles. Nevertheless the overall success rate astonished the Dutch instructors. Then in March 1857 the Japanese academy director Nagai Naoyuki (1816–1896) and 103 of the students was called to Edo to found a naval academy in the capital (Tsukiji Naval Training Centre), where the students would pass on their knowledge as instructors. To the horror of Pels Rijcken, the passage was to be made with the *Kwanko Maru* manned exclusively with Japanese; although not without difficulty, commander Jataboeri safely sailed the steamer to Edo in tewnty three days.[9]

By mid-1857 the diplomatic relations between Holland and Japan were becoming somewhat strained. Continuous Japanese stalling of the diplomatic negotiations made the Dutch government increasingly wary lest Japan suddenly change

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7 J. MacLean, 'De betekenis van Jan Karel van den Broek (1814–1865) t.a.v. de introductie van de Westerse technologie in Japan', in *De ingenieur* (30/31, 24 juli 1975), 594–604; Herman J. Moeshart, *Een miskend geneesheer. Dr. J.K. van dn Broek en de overdracht van kennis van westerse technologie in Japan 1853–1857* (Amsterdam, 2003), passim.

8 Scheepvaartmuseum, Amsterdam, S.639 (B-II-312), W.J.C. Ridder Huyssen van Kattendijke, *Journaal gehouden gedurende het verblijf op Desima in Japan, door –, kommandant van het Detachement* (manuscript 1857–1859); Idem, *Uitreksel uit het dagboek van W.J.C. Ridder Huyssen van Kattendijke gedurende zijn verblijf in Japan in 1857, 1858 en 1859* (Den Haag, 1860).

9 G. Nypels, *Japan-Nederland in Oost-Azië. Eene militaire studie* (Haarlem, 1899), 38.

its course. After all the military support was not intended to enable Japan to frustrate the opening process and to once again seal off the country from the rest of the world, this time with modern military means. The Dutch authorities therefore refused to augment the number of gunnery instructors and artillery engineers for the Nagasaki naval academy, and turned down requests for a canon foundry and a naval arsenal.[10]

Meanwhile in Holland the Japanese orders were being fulfilled. On the one hand they concerned large numbers of technical books – on naval architecture, engineering, steam technology and international law – some titles were ordered by the hundreds and the Dutch authorities would deliver whatever they had in stock.[11] Naval engineer and Inspector of Steam Navigation Hendrik Huijgens (1810–1867) was charged with the supervision of the Japanese purchases. Both the Amsterdam steam works *Paul van Vlissingen en Dudok van Heel* and the *Nederlandsche Stoomboot Maatschappij* (Fijenoord) in Rotterdam, which were the country's biggest and most modern firms in iron construction and steam engineering, were to supply the mining equipment and the machinery for the construction workshop. Considering the total absence of industrial development in Japan, Huijgens feared it would be impossible for Japan to found a modern navy. On the other hand the Dutch navy and the *Nederlandsche Stoomboot Maatschappij* had a lot of experience with overseas construction projects, such as the naval yards of Onrust, in the Bay of Jakarta, and Sourabaya on Java, in the 1840s and 1850s.[12]

Japan had also ordered three – albeit small – modern warships to be built in Holland, with the assurance that these vessels were intended for training and peaceful purposes only. They would originally be delivered without armament, but eventually all three left Holland in March-June 1857 armed with twelve guns. The *Japan*, *Edo* and *Nagasaki* as they were called (which in Japan were re-christened *Kanrin Maru*, *Choyoo Maru* and *Denryu Maru*), were schooners of the newest type, with screw propulsion powered by 100 Hp direct acting diagonal engines designed by Huijgens.[13] Fabius, a modern officer with a realistic vision, had insisted the Japanese order wooden screw-propelled vessels with good sailing qualities. Japan after all lacked bunker stations for coal, so a good sailing performance was vital and paddle-steamers therefore out of the question. There were also no dock-

[10] P. Mijer & M. Gever van Endegeest, 'Mededeeling betrekkelijk Japan', in *Verhandelingen en berigten betrekkelijk het zeewezen*, 1857/I, 231–247.

[11] Nationaal Archief, The Hague, Archief van de Nederlandsche factorij in Japan 1609–1860, 1639/II.

[12] M.G. de Boer, *Leven en bedrijf van Gerard Moritz Roentgen, grondvester van de Nederlandsche Stoomboot-Maatschappij thans Maatschappij voor Scheeps- en Werktuigbouw "Fijenoord"1823–1923* (s.n., 1923), 149; Idem, *Honderd jaar machine-industrie op Oostenburg (Gedenkboek Werkspoor*, Amsterdam, 1927), 45–46.

[13] H.Huijgens, 'Z.M.Schroef-Schooner Bali', in: *Verhandelingen en berigten betrekkelijk het zeewezen* (1857/3), 178–182.

ing facilities, which would have been indispensable for the maintenance of iron ships.

The workshop machinery and mining equipment were shipped to Japan with the three schooners.[14] The crew of the *Japan* was to relieve the team at Nagasaki as naval instructors. Among the newcomers was Hendrik Hardes (1815–1871), a steam engineer who would supervise the erection of the construction workshop in the bay of Nagasaki, and a number of specialized workmen to assist him. The commander of the second naval delegation, lieutenant W.J.C. Huyssen van Kattendijke (1816–1866), agreed with Hardes that the village of Akunoura, across the bay from Nagasaki town, was the most favourable spot for the construction workshop in view of future expansions. Next to Akunoura the draught was enough for large ships to approach, but a quay had to be made, which Hardes built using an old diving bell bought from the Dutch by the Tokugawa shogun Ienari (1773–1841) in 1834. In the years that followed Hardes, who also taught steam engineering for six hours a week at the naval academy, with his assistants and Japanese labourers built a steam workshop out of virtually nothing. Even bricklaying was unknown in Japan and the Dutchmen had to find clay, build furnaces, teach Japanese labourers how to bake bricks and tiles, how to make cement and to lay bricks. On the spot that was chosen for the workshop near the village, a pile foundation of almost a thousand piles was made. On 19 July 1858, less than one year after arrival, the first stone of the workshop was set. Less than a year later, on 7 May 1859, the steam hammer and eight furnaces with ventilators were taken into operation, but by that time the workshop had already been able to replace the engine and boilers of the *Kanko Maru* and to perform numerous repairs on Western steam ships.[15]

At the naval academy the second naval mission, after a relatively cool start, also turned out to become a success. Both the Dutch officers and the Japanese officials were enthusiastic about the progress that was being made. But in August 1858 things started to change when first the Tokugawa shogun Iesada (1824–1858) and then Shimazu Nariakira, lord of Satsuma (1809–1858), died within ten days from eachother. The extended trade agreements with the Netherlands, USA, UK, France and Russia, which had been signed by Iesada in 1858 (the Ansei Five-Power Treaties), were of a disputable nature, since they had no imperial grant – the emperor or *Mikado*, residing in Kyoto, was the official head of state of Japan, which in prac-

[14] De Boer, *Honderd jaar machine-industrie*, 45–46; Gemeentearchief (City Archives) Rotterdam, Archief van de Maatschappij voor Scheeps- en Werktuigbouw Fijenoord (Nederlandsche Stoomboot Maatschappij) 1822–1890, appendix: four sets of drawings of machine parts for Japan, 1856–1865.

[15] Herman Stapelkamp, 'Hendrik Hardes (1815–1871): grondlegger moderne Japanse scheepsbouw en industrie', in *Tijdschrift voor Zeegeschiedenis* (1992/1), 29–40; Scheepvaartmuseum, Amsterdam, S.639 (B-II-312), Huyssen van Kattendijke, *Journaal*, with additional reports by Hendrik Hardes; Jhr. J.L.C. Pompe van Meerdervoort, *Vijf jaren in Japan (1857–1863). Bijdragen tot de kennis van het Japansche keizerrijk en zijne bevolking* (2 volumes, Leiden, 1867), I, 172–174.

tice however was ruled by the shogun (warlord) and his *bakufu* (government). The treaties would lead to much violence in the years to come. The change of winds became very apparent in March 1859, when the Dutch were suddenly ordered to shut down the naval academy within a couple of months. The announcement came completely unexpected and no explanation was forwarded. The *Kanrin Maru* had already left Nagasaki in 1858 to reinforce the Edo naval academy, the *Choyoo Maru* soon followed, the *Denruy Maru* went to Saga. Japan was setting out another, more conservative, course in foreign policy. Only Jhr. Pompe van Meerdervoort (1829–1908), who had succeeded Van den Broek as physician at Deshima, and Hendrik Hardes with some of his workmen were asked to prolong their stay, the first to provide medical tuition, the second to finish the construction works at Akunoura. The students and undoubtedly the entire library of the academy were transferred to Edo.

The Dutch authorities now lost interest and reduced official involvement to a minimum. When Hardes left in 1861, the Japanese government through the offices of the Dutch Trading Company contracted several technicians for a period of four years to build a slipway at Akunoura. Actually the Japanese government preferred to concentrate its naval forces near the capital, just like the naval academy, and ordered the engineers in charge to move their activities to Edo. They refused, ostensibly because they demanded but were refused extra pay, but more likely because they felt uncomfortable with the growing xenophobic violence in the capital and preferred the relative calm of Nagasaki. They did not complete the period of their contract and without Western management the Akunoura construction plant dwindled to a near standstill. The slipway was left unfinished. The first operational slipways and dry docks in Japan were built by French engineers in Yokusake in 1865–1879.[16]

However, the involvement of the Dutch navy with Japan did not quite finish with Hardes' departure. In 1862 the *bakufu* sent a number of students, partly from the former Nagasaki naval academy, to Holland for further training, most of them with the Dutch navy.[17] More orders for warships were placed, amongst which the famous *Kaiyo Maru*, built at Dordrecht in 1863–1866.[18] For this ship, which was much larger than the three schooners, Huijgens again designed the engine. The *Kaiyo Maru* arrived in Japan in 1867, but in the meantime much had changed.

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16 J.W. King, *War-ships and Navies of the World* (Boston, 1880), 423.

17 Takashi Miyanaga, *Bakufu Oranda Ryugakusei. The Japanese Naval Students Sent to the Netherlands by the Tokugawa Shogunate in 1862* (1982); H.J. Ernst, 'De eerste Japanners in Amsterdam 1862–1868', in *Ons Amsterdam*, 35 (1983), 178ff.

18 *Kaiyo Maru. Een in Dordrecht gebouwd negentiende-eeuws Japans oorlogsschip*, Exhibition Catalogue (Dordrecht, October 1979); Nationaal Archief, The Hague, *Survey of Papers of the Head Office of the Nederlandsche Handel-Maatschappij N.V. and of the with these deposited archives concerning the relations between Japan and the Netherlands* (*Historical Research Program Japan and the Netherlands* (s.n., s.d.).

From the Ansei Five-Power Treaties to the Bosjin War and Meji Revolution

The treaties that the Western powers in the wake of Perry's expedition forced onto Japan put the country at a serious disadvantage, leading to a collapse of Japan's monetary system, which gave rise to growing Japanese resentment. Within Japan a fierce (and to Westerners very confusing) power struggle ensued, roughly between followers of the *Sonno Joi* ("Revere the emperor, expel the barbarians!") movement and the pro-Western Tokugawa shogun faction. This power struggle also had its roots in the seventeenth-century distinction between the pro-shogun *fudai daimyo*, with ruling power in the shogunate government, and the "outside" *daymio* or *tozama*, who were generally adversaries of the Tokugawa shogun.

In 1862 an Englishman was killed in Yokohama by retainers of Satsuma for lack of respect in a street encounter (Namamugi Incident), for which Britain furiously demanded reparations. The *daimyo* of Satsuma, Shimazu Tadayoshi (1840–1897), refused and in August 1863 a British squadron turned up before Kagoshima. Negotiations failed, after which the British seized three Satsuma steam vessels anchored in the harbour. The Kagoshima shore batteries retaliated with fire, whereupon the British fleet shelled the town. There were only five Japanese casualties as the town had been evacuated, against thirteen dead on the British ships, but the material damage to the town and Satsuma's fleet was considerable. Having no land forces on board, the British fleet left the Kagoshima defences untouched after the fight. Thus Satsuma's face was saved – the Japanese even claimed victory. But, impressed by the military power displayed by the rifled Armstrong guns of the British fleet, Shimazu Tadayoshi now began negotiations with the British and later paid £ 25,000 compensation.[19]

Although a *tozama*, Satsuma had always been a supporter of the shogun and in favour of the modernization and opening of Japan – the Namamugi Incident had actually been untypical of Satsuma's stance and quite unfortunate. This was different for the *tozama* Mori clan of Chosu or Hagi domain (Nagato province, today Yamaguchi). The *daimyo* of Chosu, Mori Takachika (1836–1869), was a fervent *Sonno Joi* adept and also fiercely opposed to the shogun. In an attempt to cast his own artillery, he had a reverberatory furnace built in Hagi in 1856, which however never outgrew its experimental stage.[20] The ruling emperor Komei (1846–1867) was quite sympathetic towards the *Sonno Joi* movement and opposed to the Western treaties, which had been signed without his grant, and for the first time in centuries began to engage into active politics. In 1863 he issued an "Order to expel the barbarians", which the shogunate had no intentions of effectuating, but which inspired the *daimyo* of Chosu to set up shore batteries in the narrows of Shimonoseki

[19] W. B. Rowbotham, 'The Bombardment of Kagoshima, 15th August, 1863', in *The Rusi Journal*, 1963, pp. 273–278.

[20] In Hagi also a shipyard was laid out, where a Western-style schooner was built – information from the Hagi Museum, Yamaguchi, Japan.

Strait and start shelling Western ships passing on their way from Nagasaki to Edo. His shore batteries were mounted with bronze smooth-bores, but he also anchored three Western vessels armed with rifled Dahlgren guns, purchased from the USA.

One of the first victims of the Shimonoseki batteries was the Dutch warship Zr.Ms. *Medusa*, which on 11 July 1863 was heavily shelled but escaped sorely damaged and with four dead. Ships of the French and American navies had also been attacked, but retaliating actions by the French and Americans later that year had little effect. Negotiations with the Edo government made it clear that Chosu was outside the reach of the shogun's power, after which the Western naval units present in Japan mounted their own punitive expedition. On 5 September 1864 a squadron of British, French and Dutch warships showed up before the Chosu batteries and started shelling the rebel's positions. After two days of battle the Japanese surrendered their positions, overpowered by the vastly superior artillery of the Western fleet. Although the Dutch vessels did not have rifled ordnance, they did use effective round percussion grenades of a unique type, which had been a secret Dutch weapon ever since their introduction in 1845. After their victory the Western powers demanded an indemnity of $ 3 million from the Japanese government, which it could not pay. However, in return for an imperial ratification of the treaties, a reduction of the custom taxes and the opening of Hyogo and Osaka harbour for foreign trade, the Western nations were willing to reduce the sum to be paid. A multinational squadron was sent to Hyogo to press the demands more forcefully and in the end the emperor gave in.[21]

After his capitulation Chosu soon also became a supporter of Western modernization – but still only with the intention to finally expel all foreign influence from Japan. More important, Chosu's position in the internal Japanese power struggle profited from the affair as he closed ranks with the emperor against the shogun; when Satsuma in 1866 switched sides to join Chosu (the Satcho Alliance), the shogun's fate was sealed. After a number of clashes with the Chosu-Satsuma armies the shogun resigned and emperor Meiji (1867–1912) declared the formal

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[21] 'Krijgsverrigtingen der Nederlandsche zeemagt in de wateren van Japan', in *Verhandelingen en berigten betrekkelijk het zeewezen* 1864/II, 397ff.; 'Het gevecht te Shimonoseki door de Japanners verhaald', in *Verhandelingen en berigten betrekkelijk het zeewezen* 1865/I, 145ff.; 'Krijgsverrigtingen der Nederlandsche marine in de straat van Shimonoseki; met eene kaart', in *Verhandelingen en berigten betrekkelijk het zeewezen* 1866/II, 146ff.; F. de Casembroot, *De Medusa in de wateren van Japan* (Den Haag, 1865), passim; Scheepvaartmuseum, Amsterdam S.1717(8) (B-II-332), *Stukken afkomstig van de zeeofficier P.A. van Rees, betrekking hebbende op het verblijf van Zr.Ms. Djambi te Sydney (1863) (...) en enkele tekeningen van de actie in Japan* (1863–1879); Idem, *Japan-Holland vóór vijftig jaar* (Amsterdam, 1914), passim; A. Korthals Altes, 'De kanonnen van Shimonoseki', in *Spiegel Historiael* (13/3, 1978), 158–169; G.A. Ballard, *The Influence of the Sea on the Political History of Japan* (London, 1921), 95–124; Herman J. Moeshart, *Journaal van Jonkheer Dirk de Graeff van Polsbroek 1857–1870. Belevenissen van een Nederlands diplomaat in het negentiende eeuwse Japan* (Assen/Maastricht, 1987), 3–12, 20–25.

restoration of his power (Meiji Restoration, 3 January 1868).

However, many disagreed with this shift in power and a civil war ensued, in which the ex-shogun's forces attempted to reverse the course of events (Boshin War, 1868–1869). After the defeat of the shogunal army in November 1868, the entire navy under the command of admiral Enomoto Takeaki (1836–1908) fled to the island Hokaido, where he established the independent Republic of Ezo. Enomoto had received his first training at the Nagasaki naval academy and in 1862–1866 continued his studies in the Netherlands. During this visit he also supervised the building of the *Kaiyo Maru*, which in 1867 became the flagship of the shogunal navy under his command. However, in the Battle of Hakodate (December 1868 – June 1869), the imperial fleet destroyed Enomoto's forces. The admiral surrendered, accepted the emperor's rule, but was imprisoned. In 1872 he was pardoned, after which he rose to the highest positions in the Meiji governments, holding five different ministerships subsequently.

Conclusion

From the day that Perry appeared in Edo bay, and even before, it was clear that technology would be the key to safeguard Japan's integrity and sovereignty. The Tokugawa shogunate fully recognized this, although at first it still believed – as many others in Japan did – that it would be able to catch up without or with only minimal outside assistance, as the Saga and Satsuma gun foundries demonstrate. Japan went one step further with the Nagasaki naval academy and the Akunoura construction workshop, but the foundation of the Tsukiji Naval Training Centre in 1857 and the sudden forced closure of the academy in 1859 show that the predominant conviction had yet remained unchanged. It took two asymmetric conflicts to drive home the fact that Western technological superiority could not be challenged, nor overtaken in isolation.

Meanwhile the importance of the Dutch naval academy at Nagasaki and the Japanese legation to the Netherlands in 1862–1864 is evident, as were the Japanese missions to other Western countries. Many of the Japanese students ended up occupying key positions in the Japanese navy, the Meiji government and Japanese society, Enomoto Takeaki, Katsu Lintaro (1823–1899) and Arai Ikunosuke (1836–1909) to mention just a few. Likewise the construction workshop at Akunoura can be seen as the cradle of Japan's industrialization; the workshop was taken over by the Meji government in 1868, a drydock was completed in 1879 and in 1884 the property was taken over by Mitsubishi Company, thereby becoming the birthplace of one of the world's leading industrial giants.[22]

[22] http://www.mhi.co.jp/en/company/organization/nagasakiw/history/index.html

Robyn L. Rodriguez (USA)
The Importation and Adaptation of Technology and Tactics: The German Military Mission in China, 1927–1938

On 10 October 1936, spit-and-polished soldiers armed with Mauser pistols and rifles goose-stepped down the boulevard followed by row after row of giant Krupp guns and artillery. The spectacle of the nation's new found military might excited the assembled masses. This scene, reminiscent of the Wehrmacht parades in Berlin under Adolf Hitler's watchful eye, did not take place in Germany; rather, it took place half way around the world in Nanjing, China. Chiang Kai-shek presided over the parade of his elite German-trained divisions of Chinese soldiers. Between 1927 and 1938, over one hundred high-ranking German officers served in the German military mission in China as military and economic advisors. They were tasked with transforming Chiang's ragtag armed forces—a conglomeration of feudal warlord armies that were generally poorly armed and received minimal training—into a modern national military that could be competitive with the great powers, especially Japan. The German military mission was the main avenue of transnational exchange between Germany and China during the interwar period and facilitated the sharing of technology between the two countries. The advisors brought German technology, which should be defined broadly to include not only the machines but also tactics, military organization, and military doctrine, to China. Many advisors recognized that German East Asian policy was at a crossroads in the 1930s—whether to solidify a military alliance with Japan or to pursue closer relations with China, from whom the Reich was importing raw materials that were vital to its armament program. Germany maintained a precarious policy of neutrality in East Asia throughout the decade but the German military advisors in China recognized that if Sino-Japanese tensions escalated into a Sino-Japanese war, Germany would have to choose a side and with the Nazis in power, that meant Germany would sacrifice its relationship with China. The advisors used German technology to strengthen the Chinese military and hoped that a modernizing military force would deter Japanese aggression and prevent a Sino-Japanese war. Ironically, the improvements made by the Chinese military under German supervision throughout the 1930s and the utilization of German technology played a significant role in transforming what could have been a limited incident in 1937 in to the beginning of World War II in Asia and led to the severing of the Sino-German relationship.

Before looking at the outbreak of World War II in Asia in 1937, it is important to first consider the Battle of Shanghai in 1932. Historians have often neglected this battle as it was overshadowed by the Japanese action in Manchuria in 1931 and the subsequent establishment of Manchukuo as well as the start of the Sino-Japanese War in 1937. While the battle remained a limited "incident," it proved the mettle of the Chinese troops and the improvements they were making under the German advisors, who had been working with Chiang's forces for three nearly three years. The German-trained 87th and 88th divisions, with their German arms and tactics, were tested in battle. The Battle of Shanghai proved to be an overlooked indicator of the Chinese willingness to fight and defend their country and demonstrated their increasing ability to do so with German technology and assistance from the German advisors.

The battle began on the night of 28/29 January 1932 when Japanese troops attacked the city. The following morning they began an aerial bombardment of the city. Over the next week the Japanese landed marines and continued the aerial and artillery bombardments on the Chinese settlement in Shanghai.[1] Much to the surprise of the Japanese forces as well as the Great Powers, the Chinese forces did not fold instantly under the weight of the attack but rather resisted the Japanese offensive for over a month. An Italian observer of the battle noted that time and again the Japanese were surprised by the ability of the Chinese forces—a markedly inferior force in terms of training and armament, yet still able to give a good account of itself. The war records of the Japanese 9th Division said "the attack revealed the presence of a defense system prepared with great care. This shows how the enemy had, with considerable foresight, foreseen … the future action."[2]

The German advisors had designed these strong Chinese defenses around Shanghai. They included well-prepared, dug-in positions, protected posts for machine guns, trenches and barbed wire.[3] The defensive network and tactics resembled the German trench networks of the World War I in Europe. One historian of the battle, Donald Jordan, wrote that the Chinese defensive tactics were "Flexible and resilient, the Chinese seemed to follow the *tao* of falling back when necessary to survive, then returning to fight again."[4] While Jordan attributes this tactic to Chinese tradition, its close resemblance to the German First World War tactics

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1 For the best account of the Battle of Shanghai see, Donald A. Jordan *China's Trial by Fire*: *The Shanghai War of 1932* (Ann Arbor: University of Michigan, 2001).

2 The Italian observer's report "The Shanghai Incident: January 20–March 5, 1932. Causes of the Conflict and The Military Action," fell into the hands of the US Army. US Army Major R. S. Bratton, the acting military attaché in Tokyo, who forwarded the Italian report and accompanying English translation to the War Department in Washington D.C. in 1933. MID report 2657-H-377-6 Quote taken from pg.1. National Archives and Records Administration II (NARA II) in College Park, MD, USA, RG 165, Entry No. 65 Microfilm M 1216, roll 7.

3 Krummacher's report on the Battle of Shanghai, 1932, BAMA *Die Deutsche militärische Beraterschaft in China Sammlung* Bundesarchiv-Militärarchiv (BAMA) in Freiburg, Germany, MSG 160/2.

4 Jordan, *China's Trial by Fire*, 115.

of elastic defense-in-depth cannot be ignored. German doctrine allowed for withdrawal as long as initiative was not surrendered to the attacker. The idea was to force the attacking enemy to expend his resources and energy while the defender preserved his strength for the counterattack, which is exactly what the Chinese forces were doing.[5]

Elastic defense-in-depth proved to be quite effective against the Japanese in Shanghai. The German-trained 87th and 88th Divisions gave a good account of themselves in the battle. One observer, who was generally critical of the Chinese army's actions in the battle, credited the 87th and 88th Division with being effective at holding their positions. He pointed out that while the Cantonese 19th Army avoided offensive action and hand-to-hand combat, the 88th Division defending Miaochang launched a number of decisive attacks against the Japanese.[6] These attacks were so effective that on 22 February, the Japanese units were even forced to retreat. In order to save face, the Japanese press described the action as "pulling back to shorten the front."[7] Ultimately, as a result of these attacks the 88th Division ended up expending its resources. As a result of repeatedly attacking the Japanese forces, it incurred high losses and hence, needed to be reinforced by the 87th Division. While the 88th Division had been fighting the Japanese in Miaochang, the German trained 87th Division had successfully defended Liuho and prevented the Japanese forces from outflanking the Chinese defensive network. It was only when the 87th withdrew to reinforce the bloodied 88th Division that the Japanese were able to breakthrough at Liuho.[8]

The Chinese defense was not flawless as the forces ended up withdrawing from the battlefield at the beginning of March, *but* their fierce resistance stood as a testament to the improvements in the Chinese army as well as the effectiveness of the German advisors, who had played a significant role in planning the defense and advising commanders throughout the campaign. The 87th and 88th divisions utilized German arms and tactics in their defense of the city. The fierce Chinese resistance forced the Japanese to continually pour reinforcements into the city and

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5 For more on German elastic defense in depth see Timothy Lupfer, *The Dynamics of Doctrine: The Changes in German Tactical Doctrine in the First World War* (Fort Leavenworth, KS: Combat Studies Institute, US Army Command and General Staff College, 1981) chapter 1. Much of his study of German defensive doctrine is based on an in-depth analysis of the German doctrinal manual *The Principles of Command in the Defensive Battle in Position Warfare*.

6 "The Shanghai Incident: January 20–March 5, 1932. Causes of the Conflict and The Military Action" MID report 2657-H-377-6 pg. 3–4, 32, 38 NARA II RG 165, Entry No. 65 Microfilm M 1216, roll 7.

7 For an overview of the fighting at Miaohang and Chiangwan from 20–25 February see Jordan, *China's Trial by Fire*, chapter 9. The quote from the Japanese press release is taken from pg. 145.

8 "The Shanghai Incident: January 20–March 5, 1932. Causes of the Conflict and The Military Action" MID report 2657-H-377-6 pg. 3–4, 32, 38 NARA II RG 165, Entry No. 65 Microfilm M 1216, roll 7.

commit greater resources to the campaign than they had anticipated. Following the battle, there was a surge of Chinese nationalism. One historian wrote "for many Chinese, to merely survive in positional warfare such pounding from Japanese naval and army tanks and cannon and bombing for over a month seemed to be China's first modern victory."[9] For the Chinese it was a moral victory. While it may not have been a military victory, the battle proved that the Chinese forces were indeed making progress and capable of defending against Japanese attacks. Their resistance perked the interest of many westerners, who began to see China's growing potential as a military power and as a counter-weight to Japan.[10] The Battle of Shanghai stood as a marker of the progress of the Chinese army under the German advisors and it went on to influence future German advisors and their preparations for the next war with Japan.

Retired German General Alexander von Falkenhausen, who personally advised Chiang Kai-shek from 1934–1938, was responsible for the bulk of the German military mission's planning for a Chinese defense in the event of war with Japan. Interestingly, von Falkenhausen was well acquainted with China's enemy. Prior to the First World War, he studied Japanese and after living in Japan for nearly five years was by all accounts virtually fluent. His first assignment in Japan in 1910 was to conduct a study of the Japanese army for the German military. He then became the German military attaché in Tokyo, where he remained until the beginning of World War I.[11] This experience gave him an intimate understanding of the Japanese military as an institution, its doctrine, and the psychology of its soldiers.

Von Falkenhausen was straightforward towards Chiang and the Chinese commanders in his assessments of the Japanese armed forces. The Japanese armed forces were superior to the Chinese in terms of their training and armaments. One of the most significant areas of Japanese superiority was their armaments industry. German economic and industrial advisors worked alongside the German military mission in an effort to create a modern armaments industry to support the needs of the modernizing Chinese military but China's war industries were still in their infant stages. China relied heavily on imported arms from Europe, especially Germany and the United States. Von Falkenhausen knew that Japanese navy could effectively blockade China from its shipments of western armaments while China had virtually no means of interdicting the Japanese sea lines of transport.[12]

While his military assessment seemed quite bleak for the Chinese, von Falken-

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[9] Jordan, *China's Trial by Fire*, 235–6.

[10] Jordan, *China's Trial by Fire*, 235–6.

[11] Hsi- Huey Liang, *The Sino-German Connection: Alexander von Falkenhausen between China and Germany, 1900–1941* (Amsterdam: van Gorcum 1978), pg. 7–8.

[12] von Falkenhausen, "Grundsaetze der Landesverteidigung Chinas," Nanking 26 January 1935 BAMA N 246/7 pg. 1.

hausen did not think the situation was hopeless. He strongly believed that the Chinese could wage an effective defense against a Japanese attack. The Chinese defense of Shanghai in 1932 demonstrated that the basic building blocks of a strong defense existed and von Falkenhausen believed that with the additional training and improvements in armaments, as well as the preparation of fortifications and obstacles, the Chinese defense against Japanese attacks in the future would be even stronger.

Von Falkenhausen believed a strong defense would be effective in bringing Japan to the negotiating table but the Chinese needed to fight fiercely and not cede any ground without a fight. He knew that no power would intervene on China's behalf unless China demonstrated its commitment and ability to fight against Japan. In a memo to Chiang, von Falkenhausen explicitly said that in order to ensure its own survival and encourage international assistance, China must fight like it had in 1932 in Shanghai.[13] The possibility of international intervention either through direct military support or economic support would leave Japan in a precarious position, especially in financial terms. Von Falkenhausen understood the limits of the Japanese war industries and their access to raw materials. If they were to attack China, the Japanese could no longer rely on monetary support or weapon deliveries from the US and England. Von Falkenhausen believed that Japan could not afford a long, full-scale war with China. Through a strong defense, like in the 1932 Battle of Shanghai, the Chinese would compel the Japanese to commit more men and material to the battle without being assured of a final victory.[14] Von Falkenhausen believed that once Japan encountered "real resistance" it would reconsider its course of action and that the prospects of a long war would bring Japan to the negotiating table.[15]

The Japanese, however, failed to consider the lessons from 1932 and underestimated the Chinese tenacity in 1937 as they sought to expand their territorial holdings after the Marco Polo Bridge incident. This incident did not necessarily need to escalate into a full-scale war. Like the Mukden Incident in 1931, the Battle of Shanghai in 1932, and the Great Wall incident in 1933, it could have remained a limited "incident." As in the previous cases, many in Japan, China, and throughout the world expected a quick cease-fire followed by negotiations and Japanese territorial gains in China, which would restore a tense but stable state of affairs in East Asia. In contrast to the Munich conference mentality that would overtake Europe a year later, von Falkenhausen's assessment that the Japanese could not af-

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[13] Report from von Falkenhausen to Chiang Kai-shek, Nanking 12. August 1935 in BAMA N 246/7 pgs. 7–9, 13.

[14] Report from von Falkenhausen to Chiang Kai-shek, Nanking 12. August 1935 in BAMA N 246/7 pgs. 3–4.

[15] Von Falkenhausen, "Grundsaetze der Landesverteidigung Chinas," Nanking 26 January 1935 BAMA N 246/7 pgs. 3–4.

ford a full-scale war with China and would back down as soon as they encountered real resistance as well as the marked improvement of his 87th and 88th divisions, likely played no small part in Chiang's decision to militarily resist Japan and make a stand at Shanghai.[16]

The Battle of Shanghai in 1937, comparable to Verdun and Stalingrad, was a fiercely fought battle that lasted three months and resulted in heavy casualties on both sides.[17] The German advisors had been instrumental in the defense of the city. Since the 1932 battle the Chinese had set up numerous defensive measures based on German advice on the outskirts of Shanghai, especially near the coast. Much of the defense had been based on the plans drawn up by von Falkenhausen between 1935 and 1937. Many German advisors were actively involved in the battle assisting with anti-air defenses, artillery, and closely advising commanders in the field. Von Falkenhausen hoped that the tenacious Chinese defense at Shanghai would convince Japan that a war in China would be too costly to pursue.[18]

After three months of heavy fighting in Shanghai the Chinese troops were forced to withdraw from the city and they subsequently pulled back from Nanking as well. While it was a costly defeat for the Chinese and the German-trained 87th and 88th divisions were virtually destroyed, it had given the government time to relocate and move a significant portion of China's industrial base to the interior. The Chinese perseverance in the face of overwhelming firepower did indeed draw world attention and it also sparked a surge of Chinese nationalism. A decisive Chinese victory with the assistance of the German advisors in the *Kesselschlacht* of Taierchuang in March 1938 further fueled the will to resist Japan.[19]

Interestingly, the first year of the war in China enabled the Wehrmacht to observe its future ally, Japan, in action. The assessment was bleak. The German

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16 See von Falkenhausen's pre-war reports, letters, and contingency plans in BA-MA MSG 160/13 and BAMA N 246/7. Akira Iriye, *The Origins of the Second World War in Asia and the Pacific* (New York: Longman, 1987), pgs. 43–4.

17 F. F. Liu, *A Military History of Modern China, 1924–1949* (Princeton: Princeton University Press, 1956), 105.

18 Liu, *A Military History of Modern China*, pgs. 162–3. The Chinese defense is discussed in the OKH report *Erfahrungen und Betrachtungen aus dem japanisch-chinesischen Feldzug 1937/38*, 15 March 1938, BAMA RH 2/1848. Bärensprung discusses the close involvement of many advisors in the opening battles in his OSS file on German military mission in China, NARA II RG 226 Entry No. 210, Box 255, Folder no 10929.

19 For more on the opening battles of WWII in China see, Frank Dorn, *The Sino-Japanese War, 1937–41: From Marco Polo Bridge to Pearl Harbor* (New York: MacMillan, 1974) and Hsi-Sheng Ch'i,*Nationalist China at War: Military Defeats and Political Collapse, 1937–45* (Ann Arbor: University of Michigan, 1982). A number of Chinese officers discuss the German influence in the battle of Taierchuang in their interviews with Colonel William Whitson. The interview notes can be found at the USMA library. The German Military Mission also has extensive reports on the first battles in BAMA MSG 160/8. These reports comment on the fierce resistance of the Chinese and the growing will to resist.

military mission sent reports back to the Wehrmacht High Command in Berlin. One advisor griped in a report from early 1938 that in qualitative terms, the Japanese army did not compare to any of the European forces except for maybe Italy.[20] Another report from early 1938 concluded by noting, an observer of the battles of Shanghai and Nanking, presumably one of the German advisors, "is of the opinion that the Japanese army is no match for a European opponent—which in this case includes the Russians."[21] The Battle of Nomonhan a year later confirmed the Wehrmacht's doubts about Japan's ability to fight the Soviet Union.

Ultimately, Hitler withdrew the German military advisors from China in June 1938 and while they had only been in China for a decade, their impact should not be underestimated. The German military mission played a significant role in giving the Chinese the tools and confidence they needed to fight in the Sino-Japanese War. Though Chiang's forces were only in the infant stages of importing and utilizing German tactics and machines, China did not collapse under the weight of the Japanese onslaught. The importation of German technology to the Chinese military and von Falkenhausen's confidence in the Chinese military's ability to defend against a Japanese attack contributed to Chiang's decision to militarily resist Japanese aggression in 1937. Ironically, the German tactics and technology that helped keep China in the war also weakened Germany's own ally as the China Theater continued to suck resources away from the Japanese military throughout World War II.

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[20] *Beurteilung des japanischen Wehrmacht auf Grund der Kaempfe in China seit Juli 1937,* Hankow, 1 February 1938, BAMA MSG 160/8, pg. 11.

[21] *Erfahrungen und Betrachtungen aus dem japanisch-chinesischen Feldzug 1937/38*, 15 March 1938, BAMA RH 2/1848, pg. 32.

Fábio Neves Luiz Laurentino (Brazil)
The Influence of the French Military thought and Technology in the Post-first World War in the Brazilian Army

Introduction and contextualization

This article, that has a historical character, aims, with the help of proper historiographical references, to demonstrate briefly how occurred the reformulation of the Brazilian Army and the use of French equipment due the arrival of the French Military Mission, hired in September 1919, to guide from 1920 onwards, the modernization of the Brazilian Army. For this research it was used documents included in the archive "Service Historique de l'Armée de Terre" (SHAT), of the French Ministry of Defense (Chateau de Vincennes), in Paris, and also sources of the Historical Archive of the Brazilian Army, in Rio de Janeiro, and an extensive bibliography written by Brazilian and French researchers, and the lectures (published during the period of the Mission by the Brazilian Military Press) given by French officers, mainly at the old General Staff School, current Army Command and General Staff School (ECEME), located in Rio de Janeiro.

A reform has been considered in the Army by open-minded officers since the internal revolts that had just happened at the turn of the century (Federalist Revolution in 1893, War of Canudos in 1896 and Contestado War in 1912), in which the Brazilian Army was tested, and it showed with some concern stagnation and professional limitation among some military officers, still influenced by thoughts and technologies of the Brazilian Imperial Army in the campaign of the War of the Triple Alliance, against Paraguay. The first steps of modernization, even though slow and with the fear felt by politicians and some conservative military leaders, appeared in the state military reserves, justified by the necessity of reinforcement of these corporations to ensure its power and the internal stability, in other words, a micro vision of the security, in favor solely of the interests of state oligarchies that governed in the state military reserves. Therefore, in 1905, occurred the first negotiations for the contract of a mission of foreign officers to the Public Force of São Paulo.

It is also necessary to remember that in the years of 1906, 1908 and 1910 a group of officers (approximately 30) of the Brazilian Army integrated a "training" in the German Imperial Army, invited by the General Staff of the Kaiser Wilhelm II's Army, invitation made to the Minister of War of Brazil at the time, Marshal Hermes Rodrigues da Fonseca, and reinforced by Baron of Rio Branco, then Minister of Foreign Affairs, who had pro-German tendency. These young officers, lately called *Young Turks,* tried to start a "revolution" and a modernization of the Brazilian Army through literature, by setting up newspapers that expressed the desire for change and aspirations for the "new Army". The magazines, *Revista dos Militares* of 1910, and *A Defesa Nacional* of 1913, were the principal means to show to the Brazilian people what was seen by them in Germany. These two magazines were inspired in the writings of *Militar-Wochenblatt,* main German military magazine.

The American historian Frank McCann (1980: 6–7), states that a small approach of American military officers also occurred to defend a possible instruction and modernization mission led by the American Army, and he points out that the American military attaché in Brazil along with the Department of State insisted on inviting Army and Navy officers to train in the Coast Artillery School, in Virginia. According to the military attaché: "It was necessary a fast and organized work to end the German influence in Brazil".

The arms race, and the concept of "Armed Peace", also concerned the Brazilian Government, that accelerated the debate for the hiring of a modernization mission and military instruction, but in July 1914, these change and modernization plans would be again delayed, because of the outbreak of the First World War, that put again face to face the German and French military power, just over 40 years after the end of the Franco-Prussian War.

Theorical and methodological aspects: "the book, the manual, the Cartesian thought".

With the arrival of the French Mission in Rio de Janeiro, the three major highlights in lectures in Brazil, General Gamelin, Colonel Barat and the Lieutenant Colonel Derougemont, sought to achieve a full "Saint-cyriennes" conception even before they arrived in Brazil. The basic bibliography to be read (by students of the General Staff School) before the beginning of the Mission contained works about General Geography, History, Strategy, Tactics and patriotic works. The justification would be that these works are important books for the formation and structuring of the military spirit, based in the theories and in the modern scientific and literary knowledge as well.

According to the French historian Jean Pierre Blay, the military science in Brazil develops, as soon, for instance, the Regulation for exercises of Cavalry was published, in 1908, in Rio de Janeiro. Before that, the "Lippe concept" lasted from 1763 until 1881, when it is founded The Army Library, by the Minister Franklin Doria, with the purpose of diffusing among Brazilian officers a library with books about wars. With the arrival of the French Military Mission, French officers stimulated the Brazilian military thought improving them with works about recent campaigns, such as the Battle of Sedan and the Battle of Sadowa. From this point onwards, treaties, books about instruction and internal procedures and about campaigns were translated or elaborated to Brazilian Army officers. At the end of 1922, most of Brazilian regulations had been reformulated.

The French Cartesian logic in the military administration showed to the Brazilian Army a new concept of technology, strategy and comprehension of the new military doctrine that was been presented.

Final considerations

As for the technological influence, since the signing of the contract it was established that the Brazilian Government would give preference to the French warlike industry, strengthening the prestige of France, winner in the First World War. Therefore, *Spab, Breguet* and *Nieuport* airplanes were purchased to improve the Military Aviation in Brazil, contracts were signed with the Schneider company to deliver new 155 mm cannons to the main Army garrison and *Renault* armored fighting vehicles completed the sections of the 1st Infantry Regiment.

Brazilian Army's change and strengthening with the arrival of the French Military Mission are notorious and visible until nowadays. The result in a short term can be noticed soon after, in the 1940s, with the Brazilian participation in the Second World War, represented by the Brazilian Expeditionary Force. The travel of groups of the Brazilian General Staff before the boarding of the first echelon to Italy to study the geography of the land, weather conditions and logistic support are some clear examples of the influence of the French military strategic thought.

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Professor Matitiahu Mayzel [Israel]
Weaponry and Revolutionary Spirit: artillery vs. infantry in Russia 1917. Paper presented at the 38th ICMH annual conference, Sofia, Aug. 2012.

The Russian Revolution of 1917 erupted in the midst of the First World War. Like the Great War, the Russian Revolution was an event that defined the 20th century. The connection of war and revolution is a well known theme in Russian history. Indeed it is a well worn-out theme, a belaboured cliche. Moreover, as the theme of war and revolution was one element in the ideological quest for the causes of the revolution, post-Soviet historians are not interested any more in the origins of the Soviet regime. Yet the question remains, especially with regards to the military: how does the army behave when a revolution comes, what does the army do to make a revolution happens. There is no need to dwell here in length on the variety of historiographical approaches to the question of the causal relationship of war and revolution. One reason is that the Russian Revolution was a long drawn series of complex events, starting during the war and stretching over a period of at least four years. It is the old, intuitive perception of historians and laymen alike, forgetting what the 18th century Scottish philosopher David Hume taught us [on the fallacy of inferring causality from chronology], that the war brought revolution. The mechanism of such a process, according to this view, was the military failures in the war. A simple comparison with other countries fighting the same war will prove the fallacy: until almost its very end no country was militarily successful in the Great War, yet no army turned revolutionary, all armies, soldiers and officers alike, became more and more patriotic. It is worthwhile to bring here the opposing argument – that the war delayed the revolution, that if it was not for the war the revolution would have had broken out earlier than 1917. More than the war, the causes of the revolution are to be found in Russia's internal situation, its social and political processes.

In early 1917, indeed since late 1916, the Russian Army was deployed over a front of thousands of kilometers, all across Eastern Europe. It stretched from south of Riga on the Baltic, through the Pripet marches, Galicia and the Carpathian Mountains, to the Danube and the Black Sea. The army of early 1917 was numerically much larger than in the outbreak of the war. On the eve of the war the army was 1 423 000 men strong, and after the mobilization of August 1914 grew to 5 338 000, larger than either the French, German, or British armies. In late 1916, just two months before the revolution, the army at the front was 6 960 000 men strong, and 2 000 000 more inside the Russian Empire. The great losses caused heavy turnover, thus on the eve of the revolution the accumulated number of soldiers was about 14 600 000, and towards September 1917 it grew to 15 800 000. This was more than in any European Power [Germany 14 000 000, The Habsburg Empire 9 000 000, France 6 800 000, Britain 4 900 000], but it showed the basic weakness of Russia. While its population was much larger than any other country in Europe, it managed to mobilize only 8.7%, compared with 20.7% in Germany, 17.1% in the Habsburg Empire, 17% in France, 10.7% in Britain.

It was a mass army, a peasants army. Of those over 9 millions in 1917 only approximately 2% were not peasant. It was short of officers, even considering that during the war the officers corps grew from 60 000 in 1914 to 145 000 at the end of 1916, during that period officers casualties amounted to 92 000. Every able body male from the age of 19 to 40 was mobilized, and all rules and traditions of the pre-war army were abandoned. The most extreme example for this were the reserve regiments of the Guard, those who were stationed in the capital Petrograd replacing the elite Guard regiments who went to the front and suffered heavy losses. Even simple, illiterate peasants and even Jews were among them. Thus in February 1917, when the Tsar and the government wanted to use the army against the mass demonstrations in the capital, as they successfully did in 1905, it was discovered that the army changed radically its behavior. Not only that the soldiers did not obey their commanders, but the High Command did not obey the Tsar. With the change of the regime, there were three centers of power: two in the capital, namely the newly emerged Provisional Government and the Soviet of Workers and Soldiers in Petrograd, and in the front – the mass of Soldiers, now full of revolutionary spirit.

The deep dissatisfaction in the army, by soldiers and officers, which was squashed for the years of the war, came out to the surface in late February 1917. This was more than only a manifestation of the revolution, rather it was the environment in which the revolution broke out and in which could succeed. “Order No. 1”, directed at the garrison of the capital Petrograd was intended to satisfy the deep unrest of the soldiers. It established the civil and political rights of the soldiers, it marked the politicization of the army. The politization spread soon to the front. The Soviet and the Duma issued and published decrees on the rights of the soldiers, something unheard of earlier in Russia [and other countries as well]. During the next coming months soldiers’ committees were created in every military unit, from company to Armies and Fronts [the Russian term equivalent to Army group]. These committees immediately clashed with the officers, as the very existence of such committees was incompatible with the regular, ‘normal’ structure of the army. It was not an immediate change, but it took some months, till the early summer, when committees were established in all levels of the military. It was not homogeneous process, there were many ways in which the soldiers committees were formed, relations of soldiers and officers developed in different ways in different units.

The army was united in its support of the revolution. As politization of the army intensified, so grew the differences between various sections of the army as to the way to achieve this aim. Thus internal division in the army reflected the political division of the country as a whole. Soldiers and officers, committees and staffs, associated themselves with political parties. It took paradoxical dimensions, when soldiers committees and individual soldiers supported certain parties even when they did not accept the party's position on the questions involved. usually it was the basic problem in Russian history, the land question, but with the army it was the most present question – the war question. The fronts, both in Eastern Europe and in the caucasus, were stable, and relatively quiet. The enemies in Europe concentrated their efforts in other theaters of the war. For the army in the field, both officers and soldiers, it was a very present question, how support of the revolution expresses itself on the frontline. The question as perceived in Russia at that time was how to end the war: would continuing the war strengthen or weaken the revolution. As the debate evolved toward the summer of 1917, it was connected to the questions of Russia's foreign policy. The distinction between military and diplomatic on one hand and internal political on the other hand disappeared. Alexander Kerensky, the Minister of War from May 1917, argued that the revolution had no chances of survival without the Allies support. Hence Russia should fulfill her international obligations to her allies and prepare and carry out military offensive. In other words, continuing the war was a matter of revolutionary survival, not of national policy. Thus he, and the army's high command were to prepare the army's ability to launch an offensive. The more radical revolutionary parties [the Left SR, part of the Mensheviks, the Bolsheviks, and more] held opposing views in this matter. They argued that the survival of the revolution depends on ending the war. The mass of soldiers saw it otherwise.

For the soldiers the question of offensive, whether to attack or stay on the defensive was a question of life and death. Unlike other times and unlike other armies, they did not leave it to the commanders and political leaders. It was a question discussed intensely by soldiers on the front and in the rear. One aspect of the problem was political: many soldiers saw the planned offensive as a mean by which the officers and high command would impose their power on the soldiers, abolish the committees, and bring an end to the democratization of the army. Preparations for the offensive would require re-instating the strict military discipline, that of the 'Old Army', including military courts and death penalty. Moreover, it would require moving military units from the rear, especially from the capital to the front. This would reduce the political strength of the more radical parties in the capital, and they objected strongly. And, of course, soldiers in the rear did not like the idea of moving to the front with all the dangers involved.

Then there was the question of fraternization. There are numerous stories about fraternization of enemies across the barbed wire of the front line, yet it was only on the Russian – German/Austrian front that such events did occur. Local commanders on both sided supported it, as it served to maintain stability on the front. It reduced the danger of surprise attack by the enemy. For the German and Austrian side it was useful when forces were moved to the front in Western Europe. But it had its dangers, because any change or attempt to stop fraternization could serve as a warning sign to the enemy on an attack. Among Russian parties on the left there was support for fraternization with the hope that it will increase revolutionary feeling among German soldiers. This was also one reason for the German commanders to forbid fraternization. Within the Russian army, fraternization was one [among many] source for violent clashes between soldiers committees and traditional 'patriotic' officers. Soldiers threatened officers and attempted killing officers for forbidding fraternization.

Another aspect in the dynamics of the revolution was in technology. What is of interest here is the use of technology, mainly military technology, for political purposes of the revolution. One of the first such an event, in the very last days of the Tsarist regime, was the use of the railways system to deprive the Tsar of his power. The Tsar wished to go from the site of the Imperial Supreme Headquarters in Mogilev to the capital Petrograd. On its way, the railways workers stopped the Imperial train, shifted it from one station to the other, from Pskov to Dno and back, isolating the tsar from his government, from the capital and from political institutions. During the coming months the Union of Railways Workers shifted more and more to the political left, later playing an important role at the time of the seizure of power by the Bolsheviks. Some special units of the army had an important role in strengthening, or weakening, the government in Petrograd. These were the telephone and telegraph units, the bicycle-riders units, the machine-gun units, and the armored-cars unit of the army. They supplied various political forces in the capital with military means towards their ends. For instance, in the crises of April and later July 1917 the machine-gun units, and the armored-cars units supported the government against the more radical Bolsheviks. But later in August their allegiance shifted leftwards, and at the Kornilov Affair, and in October, they were at the hands of the Bolsheviks.

Technology as an important factor in the intensification of the conflict within the army on the question of war and revolution. It developed within the army, on the front, on a double fault line: one between those who supported the war toward national objectives until victory, those who in June 1917 supported the offensive. The second fault line was between the soldiers in the trenches and those in their rear, i.e. between infantry on one side and artillery on the other. From the start of the 'democratization' of the army and until the failure of the June offensive and the Kornilov Affair in August, those who called for "war to victory" had much stronger voice. This voice was louder among the artillery men than among the infantry. Even before the failure of the June offensive the clashes between the two sides, and between supporters and opposers of fraternization sometimes took violent form. The artillerists were ready, even eager, to shell the enemy. The infantry in the trenches feared the enemy's artillery bombardments. They blamed the artillerists for their predicament. There are enough evidence on many instances in which infantry soldiers threatened the artillerists with bayonets in order to prevent them from firing. Thus the military operational became political, even personal. Solidarity among the soldiers came under heavy pressure, not only by fractures dividing front and rear [e.g. the capital], but also within the frontline soldiers themselves.

Contrary to Lenin's old claim that the army disintegrated, that the soldiers 'voted with their feet', in fact the Russian Army of 1917 held its own. The soldiers did not deserted the trenches, did not leave their positions. They abandoned one type of discipline – the old one, for what they saw as a new, revolutionary type of military discipline. On 25 October 1917, the day the Bolsheviks seized power, the field army numbered almost 6 400 000 soldiers, and 3 millions more in various parts of the country, all in all about 9 millions. After the long months of revolutionary upheaval, the Russian Army was much larger army than when the revolution started, the Russian soldier of 1917 was loyal, patriotic, and revolutionary.

Major General (r) Dr. MIHAIL E. IONESCU (Romania)

Romania's War Technology: Between Requierements and Budgetary Allotments (1920–1939)

The present paper intends to clarify the behavior of the Romanian political-military ruling elite during the inter-war period regarding the preparations for the next war. Our study will first include an assessment of the national and international framework in which the Romanian elite addressed the issue of defending the country, being followed by a presentation of the institutions which were created at the highest level for defining and monitoring the implementation of an adequate strategy in this regard. Then it will focus on the principles which guided the decision makers, finally detailing the main programs which were conceived and partially put into practice. Conclusions will wrap up the study.

1. Domestic and international landscape

After the World War I, Romania fulfilled its national goal, which pushed her to enter the conflict in alliance with the Entente. The territories which were inhabited mainly by Romanians were added to the Old Kingdom, and the new Romania has tripled the dimensions and almost doubled the population. New problems have been added to new resources and capabilities. Ethnic minorities represented almost 30 percent of the population, all of them having their nation-states in the immediate neighborhood, which is a recipe for an unstable political situation domestically and abroad. In addition to that, the legislation, currency and, generally, the entire socio-political fabric of the society has to be transformed in order to function after a heavy war and the unification of the territories that belonged until then to other state entities.

The inter-war period is divided generally in two parts, the first one being up to 1933 (the moment of Hitler's advent to power in Germany and the beginning of the open contestation of the Versailles Treaty) and afterwards up to the outbreak of the World War Two. The second phase has been characterized by the open contestation of the world order by Hitler and the preparations for the new war, which launched a huge arms race on the continent. The Romanian ruling elite acted in accordance to the main characteristics of both phases, but, as we will see, lacked the perspective of strategic planning for the long term in the field of defense.

2. Institutions

After the war, Romania created the needed institutions in order to tackle efficiently the issues of defense. It was a precious 'lesson learned' from the previous war, when the Romanian Army was caught unprepared and subsequently defeated in the first battles in 1916 due to the lack of war materiel, which had to be supplied by the Western Allies via a long way through Russia.

Two main institutions were created immediately after the end of the World War: 'Consiliul Superior al Armatei' (Superior Council of the Armed Forces)/ CSA in 1919, as part of the War Ministry, directly subordinated to the minister, and 'Consiliul Superior de Apărare a Țării' (Superior Council of Homeland Defense) – or CSAT – established in 1924 to deal with the strategic assessment and the long-term planning, led by the king. According to the law, it examined all the issues concerning the national defense, decided on policies in this field and coordinated the related state structures. The head of the state was practically the head of that CSAT, even if, by law, the Prime Minister was the president, and comprised the ministers of War, Home Affairs, Foreign Affairs, Industry and Trade, Finance, Agriculture, Public Works, Health and Communications. CSA had a consultative role, and the head of General Staff was, by law, its secretary. CSAT had to be convened twice a year (in March and September) and, by law, the King could attend, in that case taking the presidency. All the decisions of CSAT were mandatory and the government was responsible for their implementation. Among the bodies inside the CSAT, it is worth mentioning the 'Commission of Studies', led by the head of General Staff, which was divided in many sections, such as: leadership in war; organization of the nation for war, transportations and communications; procurement, war industry and aeronautics[1].

Another important measure was the creation of the Ministry of Aviation and Navy by merging the State Subsecretariat of Aviation with the General Inspectorate of Navy[2]. On April 18–19, 1932, the Senate and the Chamber of Deputies adopted the Law regarding the Organization of the Navy and the establishment of the State Subsecretariat of Aviation[3], published in the "Monitorul Oficial" ("The Official Monitor") on June 5.

The deteriorating international situation at the end of thirties pushed the decision makers to centralize the military procurement. According to the decree law no. 2329 of May 27, 1973, the Inter-ministerial Delegation for Military Procurement was established, under the authority of the prime minister, which included the ministers of Defense, Finance, Aviation and Navy, Industry and Trade. Eventually, the Ministry of Military Procurement was created in October 1938, and two months later its structure was optimized to better define the competence of the new structure and its components (as it overlapped with some bodies from the Ministry of National Defense)[4]. According to the law, the Ministry of Military Procure-

[1] „Monitorul Oastei", no. 21, Septembrie 12, 1924, pp. 669–671: *Lege de organizare a Consiliului Superior de Apărare a Țării* (Law of CSAT organization).

[2] „Monitorul Oastei", no.266 of 14 November 1936.

[3] Virgiliu I. Slăvescu, *Drum nou în Aeronautica Română*, București, 1932.

[4] no. 252 of 30 October 1938.

ment had the competence to make the military procurements needed by national defense, “which are paid from the National Defense Fund”, and the attributions of the specialized structures from the Ministry of National Defense were further refined[5].

In spite of the existence of CSA and CSAT, strategic planning for medium and long term was delayed in the twenties and gradually speeded up in the following decade. While there were plans for equipping the military with new technologies needed for the modern warfare, they were only on annual basis and lacked the imperative correlation with the available resources. At the same time, the acquisition of the war materiel was done on ad-hoc basis, special commissions and special representatives being called to act at the request of various offers or in the cases of imperative needs for the military. The assessment of the army’s necessities in different fields were undertaken by specialized divisions of Weapons Department within the Ministry of War, in accordance with the requirements from the field and taking into account both the international standards of the equipment and also the available resources. This kind of assessment contained a certain degree of doubt and vagueness, as it was not centralized and it did not establish an order of priorities in the acquisition processes.

The landscape will change entirely especially after 1930, when the procurement process began to be done in terms of long-term planning, entirely subordinated to an evaluation of the strategic position of the country.

An example from this point of view is particularly revealing. In 1929, in the aftermath of the death of King Ferdinand and installation of the regency, but also of the change of government as a result of much disputed elections, it was presented to the CSAT one of the first plans for the modernization of the armed forces to be developed in a period of ten years. Presenting the plan, general Nicolae Samsonovici, chief of General Staff, at that time and, then the Head of Defense, had informed the members of CSAT that “the armed forces have a mobilization potential severely less than needed, that there are big shortcomings in armament, ammunition, equipment, signal material, sanitary material, that the armed forces have no necessary horses for the training, no sufficient caserns, that air force is practically non-existent, that the Navy does not have a naval base and the materiel needed to defend the coasts, finally that the borders do not have fortifications”.[6] Signaling that it is an “absolute necessity” to give the armed forces the tools to wage a modern war and to be able to mobilize a sufficient number of units in order to act operationally with chances of success, Samsonovici said that 77 billion lei must be invested in that ten-year plan. The prime-minister, Iuliu Maniu, said that ten years are too many, “because we do not know what could happen in the meantime”. But,

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5 „Monitorul Oficial” no. 300, December 24, 1938, Înaltul Decret Regal no. 4407.

6 Arhivele Militare Române (next AMR), fund Secretariatul Consiliului Superior de Apărare a Țării (next S-CSAT), dossier no. 4, record no. 3 of July 2, 1929, p. 3.

he said, "the situation of the armed forces should be changed at any cost starting now" and consequently he divided the issue in two parts: "Needs which can be accomplished within the country, as defensive organization, equipment and others being covered by the current income" and "armament, ammunition which should be procured from abroad using the loans of our allies, but also preparing at the same time our war plants which are mostly needed"[7].

During the 1920s, the activity of CSAT was at best a forum where the political leaders had the opportunity to learn about the needs of the armed forces and their readiness for war and the military leaders to complain about the lack of preparation. Consequently, the meetings were inertial, with no programs in sight and no overall vision concerning the way ahead. Only in 1929 something began to change. On February 22, 1932, King Carol II (who succeeded to the throne less than two years earlier) painted the state of affairs regarding the activity of the CSAT with the following words: "I have convened CSAT to launch the work because I have also attended other meetings, but their decisions were null and void. We should establish precisely what we can produce in the country, and our strive should be that in the future everything to be produced in the country". At the end of this meeting, the King asked the CSAT "to study and establish a plan with all we can produce in the country, being known that, from that day on, nothing will be ordered abroad, everything having to be produced in the country"[8]. Leaving aside the rhetoric, at least that was a vision and a roadmap for the future.

What happened afterwards in the procurement field was caused by the worsening of the European international situation, which obliged the decision makers to do something to prepare the military for the next war.

3. Principles

What kind of principles guided the decision-makers in their efforts to lift up the Romanian military at the international standards in terms of employed technologies? To properly answer this question, two realities of the inter-war Romania should be considered.

Firstly, Romania was an underdeveloped country, in spite of its size, demographic potential and natural wealth, especially oil – it was the second oil producer in the world at that time –, belonging to what economically should be considered as a periphery. According to the incomplete data, the GDP of Romania at that time was among the lowest in Europe. That implied that agriculture represented the backbone of economy, industry and the tertiary sector being heavily underdeveloped. And that reality had a great impact on the defense sector.

Secondly, after fulfilling its national unity, Romania has entered a huge pro-

[7] Ibidem, p.4.

[8] AMN, Fond S-CSAT, dosar 10/1932, f.3, 9–10

cess of ‘nation-building’, which presupposed a lot of issues. Establishing priorities within this process was in itself a most difficult task. Of course, the differences between the Old Kingdom and the new territories were visible. Speaking of Transylvania, it was more urbanized, more developed economically, clearly more advanced in terms of political culture, while Bessarabia was closer to the Old Kingdom as an agricultural-oriented province. What to do first? The territories united with Romania in 1918 previously belonged to two great empires – of Romanovs and Habsburgs – each having their own administration, currency, education system and culture defined along centuries. What to do first in order to homogenize the new state? What to keep and what to erase from the heritage of the defunct empires? Where should go the resources primarily to speed up an unavoidable homogenization and, at the same time, to resist the inevitable irredentist claims? How to build a coherent society?

As countless documents prove, the main principle which guided the behavior of the ruling elite in this field has been that it is necessary to create a national war industry. But what should be mentioned is that this principle got its way to implementation only later on, being put into practice – up to mid-1930s – only sporadically and unconvincingly. To be more precise, the first pillars of the national war industry were created in 1925, when the results of the comparison between the cost of ordering the war materiel abroad and to create the plants for that in the country practically imposed such a step. In March 1924, the Aeronautical Division of the Ministry of War launched an auction for about 150 planes (fighters and bombers) and the report of that activity concluded: “to proceed immediately to the creation of the National Company of Aeronautical Construction Plants in Romania”, which “should be obliged to be installed in a way to make possible to assure production of at least 200 gliders for the planes, as well as of at least 250 planes engines of the chosen types by the War Ministry”[9]. Already, on November 21, 1925, this company, officially named the “Romanian Society for Aeronautical Industry” (IAR) informed the Ministry of War that it began the production of the planes orders (110 planes ‘Spad-61’ and 100 engines ‘Lorraine-Dietrich’ of 450 HP[10].

The ruling elite became gradually aware of the necessity of the national war industry, strengthened by the complications of the international situation. In 1929, it was decided in the CSAT to proceed accordingly, combining the creation of the national war industry and procuring from abroad, the latter remaining predominant. In the following years, the needs of the armed forces in equipment were met and, by 1932, there was already a program on these lines. But, according to the estimates by the CSAT, the needed sum was of about 211 billion lei, which exceeded

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[9] *Documente înzestrare,* vol. 2, p. 173–174, “The acquisition of planes for the Ministry of War”, *Report by the Aeronautical Division*, March 15, 1924.

[10] Ibidem, pp. 242–247, *Contract no. 5957 of November 10, 1925.*

the possibility of the country. Here was the main reason for promoting another option, namely to reverse the hierarchy and to put the creation of the national defense industry first. During the meeting of February 22, 1932, of the CSAT, King Carol II ordered as a strategy in military procurement to produce everything within the country[11].

Among the important decisions taken at the initiative of prime-minister I. Maniu in 1929, one envisioned the close cooperation with our allies in order to overcome the shortcomings in preparing the armed forces for the future war. That decision implied not only asking the allies to give priorities to our orders (as in the case of Skoda plants in Czechoslovakia), but to begin a cooperation in which the surpluses of one should cover the necessities of other and, more importantly, to create an allied war industrial base for covering the needs of a common war in the future. This could be considered as another essential principle in the overall efforts of the Romanian decision-makers to prepare for the future war.

This has not been a premiere for Romania. Since the end of the First World War, Romania has resorted to the expertise of the more powerful and more advanced military in order to prepare the country's armed forces. In what the navy was concerned, for instance, at the beginning of the 1920s, the Ministry of War asked a British mission to assess the military needs for Romania's new strategic position at the Black Sea (given that its shores now extended to the mouth of Dniestr and potential of the entire country tripled)[12]. In 1929, in the CSAT meeting (2nd July), the Finance Minister even proposed a kind of specialization in terms of ordering our weapons ("for the Navy – Italy, for artillery – UK, for infantry, etc. – France")[13].

On the other part, budgetary constraints and especially the increased tension in the international relations in Europe since 1935–1936 have obliged the decision-makers to accept not only a coordination of the allied war industries (Little Entente), but even to organize in the middle of the territories of that alliance (Transylvania) a 'tri-nations industrial fortress'. CSAT's "Plan of Development of the War Industry" of 1937 stipulates: "In the case when – according to the provisions of the protocol that will be agreed with our Allies in Little Entente that some factories, in the interest of three or two armed forces to be located in Transylvania, in these factories the respective states should be interested equally. These factories will satisfy the peace needs of the states and will be ready to be developed to assure the needs

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11 AMN, fond S-CSAT, dossier 10/1932, p. 9–10.

12 *Documente Înzestrare, vol. 1,* p. 71, *Raport la Majestatea Sa Regele, 19 decembrie 1920* (Report to His Majesty the King, December 19, 1920). The agreement with the British authority also stipulated that four Romanian sailors were to be sent to the Naval School in 1921, while in the following years that number was to increase to 12–16 officers and mechanics; p. 140 – in the budget of 1924, money was assigned for sending students to schools abroad in order "to have people trained technically" (Direcția XI Technică, nr. 1188, către Marele Stat Major, 3 octombrie 1923).

13 AMN, fond S-CSAT, dossier no.4, p. 10 – *Record no. 3*, July 2, 1929.

for one year of war. The same principle must be applied also to Czechoslovak industries, which eventually will be decided to be moved in Transylvania“[14].

Of course, this was not the only principle which guided the decision-makers in their efforts to upgrade the military equipment to the required level. They also had underlined the fact that it is imperative to centralize the entire activity in the field in order to avoid duplications and wasting resources, but also to avoid improvisation, to acquire experience and to create the scientific capability, to plan and act gradually – due to the lack of expertise and personnel – and not on a grand scale from the beginning, and especially to plan financially on a long term.

4. Resources

During the interwar period, Romania’s economy was under-developed, agriculture representing the main sector of the economic potential until the end of the 1930s. If we compare Romania’s share from the global GDP using GDP per capita, in 1913 it had only 0,8 per cent, Poland having 1,70, Italy 3,49, France 5,29 and Hungary 0,60 per cent. If we add to this the fact that, in 1926, Romania recovered only 72 per cent of the level of 1913, while, for example, Poland registered 79 per cent, Yugoslavia 99 in 1922, Hungary 91 in 1922, we acquire an image of the economic difficulties encountered by Romania during that period. We should also take into account the fact that Romania had to reschedule its debt in 1933 and also that the rate of annual growth (per capita) was negative (-2,91 per cent), the only exception being the period between 1929–1939, when growth was positive (0,83 per cent)[15].

The evolution of the budgetary allocations for the national defense is proving that scarcity of resources was the main factor behind the severe lack of preparedness for war of the Romanian military. It is striking to compare the percentage allotted to national defense in the period 1922–1931 and 1932–1939. If, in the first period, that percentage varied between 12,91 (1927) and 15,93 (1923), in the second period it fluctuated between 16,8 (1932) and 27,2 (1937), since 1933 being always above 23[16]. If we add to this the amount of money allotted to procurement, which was, for example, only slightly above 10 per cent, the personnel expenditures being always over 40 per cent (in 1931, they represented about 50 per cent), and that this policy changed only after 1934, we begin to have a clearer picture of why the spending for the military equipment was gravely inadequate during the first 15 years after World War I. After 1935, when the ‘Ten Year Procurement Plan’ has been adopted, this situation changed dramatically, military procurement

14 Idem, dossier no. 8 /1930, p.27, *Planul de dezvoltare a Industriei de Razboi* – Text (The Development Plan of the War Industry- Text).

15 Reinhard and Rogoff and Joan R. Roses and Nikolaus Wolf, *Prosperity and Depression in the European Economy during the Interwar Years. (1913–1950): An Introduction*, in Working Papers in Economic History, June 2008, Universidad Carlos III de Madrid – table 1.1; table 1.2.

16 Stefan Pâslaru, Marin Stănescu, *Apărarea Națională în Parlamentul României*, vol. 2, Editura Militară, Bucharest, 1994, p.172; Gotha Almanach, 1931–1938.

spending being in some years even close to 40 per cent of the military budget. But it was too late and far from being satisfactory for getting the right military for the rapidly unfolding events (the plan itself has been prolonged to …1945 due to the scarcity of resources).

The authorities were aware of the limited resources for military procurement, so they started looking for ways of increasing the existing budget. On May 1st, 1931, the National Fund of the Aviation[17] was created, which aimed at ensuring the funds needed for the procurement of aircraft and armament. Three years later, through the *Decree no. 3013 of November 13, 1934*, the *National Defense Fund* (F.A.N.) was created, destined exclusively for managing the spending for military procurement[18]. This fund was financed from sources other than the regular revenues of the state budget. The National Defense Fund, deposited at the National Bank of Romania (B.N.R.), had the responsibility to ensure the necessary payments in order to equip the national armament industry with the necessary machines, as well as to supervise the payments of all the orders of armament contracted by the state with the same industry. It is worth mentioning that the spending for the maintenance of the armed forces was done from the annual budget of the Ministry of Defense and not from the National Defense Budget.

The Navy was another beneficiary of this measure. On September 24, 1938, the *National Fund of the Navy* was created, which provisioned a 100 percent increase of the levy on exported goods and a 250 percent increase of the levy on imported goods, the revenues being meant to be used for maritime works such as ports, maritime bases, channels, coastal defense, procurement of ships, etc.

The existence of the three special funds required the unitary regulation of their use, something that happened on December 13, 1938, through the *Law regarding the organization and administration of the National Defense Fund*.

The result of the under-resourced military was that the armed forces were visibly unable to fulfill their mission to defend the Romania's national interests when threatened. In 1937, the decision makers were aware of that conclusion as we can see in the preamble at the 'Development Plan for the War Industry': "Our country will face a very critical situation in the case of the outbreak of war in Europe. We have great gaps in the industrial mobilization necessity, for the replacements during the war we couldn't count on our industry as it is today because it is not organized for the war. Our neighbor allies could not satisfy our necessity, and distant allies, as well as the transportations, being unsecured and the connection is under the threat of being broken. Therefore, it is necessary to organize our own industry in order to wage war without any support from outside"[19].

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[17] Arhivele Naționale Istorice Centrale/Central Historical National Archives (hereafter A.N.I.C), fond Preşedinția Consiliului de Miniştri, File no. 25/1932, f. 3

[18] A.M.R., fond CSAT, File no. 7/1935, f.4.

[19] AMN, fond Secretariatul Consiliului Superior de Aparare al Tarii, File no.8/1930, f.3, March

5. Plans

As it mentioned above, there were two periods in this regard – namely, to have a military able to defend the country – during the inter-war years. The first one, beginning after the Great War and ending in the early 1930s, and the second covering the 1930s until the outbreak of the World War II. During the first one, there were efforts, undoubtedly, but they were inconsistent, un-centralized, wrongly oriented, guided by the decisions taken without clear perspective or shaped by a clear vision, not supported by the necessary financial means. One of the main characteristics of that period is that the military procurement was thought to be assured overwhelmingly from abroad (exclusively from the allies), the result being high costs of the equipment and high diversity of the acquired hardware.

During the second period, on the eve of the World War II, the 'philosophy' of procurement had fundamentally changed. It was considered an imperative to create in a very short time (five to ten years) a national defense industry able to equip the national armed forces, who, at least for the first year of war, were supposed to be able act independently, and in the meantime to ask the allies for support, if the hostilities begin earlier. According to this new strategic orientation, the process of creation of the national industry and to procure on national basis the military equipment had to be developed in a centralized manner, in conformity with an agreed plan, allowing the needed resources to reach the target.

The main achievement of that period was the partial implementation of a comprehensive plan. The 'Ten year Plan of Military Procurement, totaling about 29 billion lei" was adopted in the CSAT meeting of April 27, 1935.

One of the main characteristics of the 'Ten-year Plan' was that it was intended to be "executed only within the country, by the private industry, and by the Arsenals, Pyrotechnic and military establishments. Even if the equipment could not be yet produced in the country, we shall make sure the external orders have a stipulation pressing the foreign factories to organize the production in the country"[20].

Among the achievements reported in the financial year 1934–1935 in fulfilling the provisions of the 1934 plan, it should be mentioned that some prototypes were bought in order to be produced in the country by the war industry (such as the machinegun ZB and the 100 mm and 150 mm 'Skoda' guns from Czechoslovakia), as well as the Schneider prototype gun of 105 mm and Brandt mortars of 88 mm (France), which all were assimilated by the national war industry; also, 320 planes and hydro-planes of different models were ordered from the national industry and from abroad, etc. In the following two years of the 'Ten-Year-Plan', several factories of armaments and ammunitions (infantry and artillery) were built at Copşa Mică – Cugir (3500 rifles annually), "Voina" – Braşov (250 Brandt mortars

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1937, *Planul de dezvoltare a industriei de razboi-text (Plan of War Industry Development).*

[20] Ibidem.

annually), ‘Malaxa’– Bucharest (artillery ammunitions), Marsa, Zărneşti, Orăştie (artillery ammunitions), Roman, Sibiu, Târgovişte, Făgăraş (regional arsenals for repairing the weapons), all due to begin production by the end of 1937 and during 1938. Also, 126 medium tanks and 35 light tanks were ordered to be received in 1937–1938 (Skoda and Cesnomoravskla plants in Czechoslovakia), several tens of batteries of artillery in Czechoslovakia and France, several hundreds of warplanes at IAR Brasov and SET Bucharest, etc[21].

The results of ‘Ten-Year-Plan’ of 1935 were not so encouraging at the end of the first two years and the military authority was increasingly alarmed, prompting it to attempt to speed up the procurement. Also, it was reality that the international situation delayed dramatically the arrival of the equipment ordered from abroad (there were several years of delay) because the factories in France and Czechoslovakia were busy producing for their needs.

Under these circumstances, it was decided to supplement the existing plan with another plan targeting especially the building of the national war industry. In June 1936, it was held a meeting of the Chiefs of Staff of the three members of the Little Entente, which produced an agreement for a common preparation for a long war, and for that to organize a common industrial regional center in Slovakia, Serbia and especially Transylvania. To implement this concept, a meeting was planned for the allied experts in April 1937 in Czechoslovakia. According to the ideas expressed by the Czechoslovak General Staff, the discussions were meant to clarify what priorities in terms of war industry has each state, the national war industrial potential, regions where the new industries can be located, the required expenditures, financial participation of each ally and ways of implementation. In line with that conception, the Romanian General Staff prepared a “Development Plan for the War Industry” at the beginning of 1937.

The main characteristic of this plan was that it was closely connected with an orientation which became embedded in the mentality of the Romanian decision-makers. Namely, it emphasized the need to create war industry in the country in order to be able to wage war independently of any foreign support, at least, in the beginning, for the first year. It was written in the plan that “**the main thing will be that the industries to be created on our territory**, and Czechoslovakia not only to support it with funds and specialists, but also to move even a great part of its own industries in Romania”[22].

The second feature of the plan is that it covered all the categories of equip-

[21] Idem, dossier no. 8–1930, ‘Dare de seamă asupra înzestrării armatei la data de 1 decembrie 1936’ (Report on the procurement for the armed forces at December 1, 1936), p. 1–32 – there are tables detailing all the newly built factories in the country and their production for the military, including the orders placed abroad for various equipment.

[22] Idem, fond Secretariatul CSAT, dossier no. 8/1930, Plan de dezvoltare al industriei de razboi – text (from now on, ‘Plan 1937’, p.5).

ment, the needs for one year of war and for other it is even impossible to organize to the great quantities possible to be and consequently was envisaged the creation of stocks.

The third characteristic was that it was considered that if the allied countries will become involved, then timing will be shorten, but the first and second criteria should also be followed in that case.

On the eve of the Second World War, it was clear that Romania was not able to wage a successful war that seemed looming and the planning, instead, of a grand strategy was to be considered as a possible option. Therefore, in the first phase of the war, it was agreed on neutrality as the core strategy to be followed, decision taken at the highest level in the summer of 1939. The lack of military equipment was to play a central role in the decision making process, especially due to the fact that the main allies, France and Britain, were not able to provide the necessary support in this regard. On April 11, 1939, Grigore Gafencu, the Romanian foreign minister, during the meeting with the French minister to Bucharest, Adrien Thierey, insisted on reminding France and Britain, Romania's traditional allies, that, under those conditions, "even more important than the perfect symmetry of mutual assistance is the effective support in supplying us with weapons"[23]. It is worth mentioning that, on April 13, 1939, France and Britain offered guarantees to Romanian and Greece, but the significance of these guarantees was uncertain, as they did not detail the practical method of supporting Romania[24].

Aware of this situation, prime-minister Armand Călinescu wrote, on April 15, 1939, after a meeting with King Carol II and foreign minister Grigore Gafencu, that the latter "should inform Paris and London that we are highly grateful for the guarantees, but that we will achieve nothing unless we are able to put a fight. We must be supplied with weapons…"[25].

Unfortunately, the two Western countries proved reluctant in honoring the contracts, although the pressures from the authorities in Bucharest, doubled by those of the French diplomats accredited here, were rather intense. In addition, since the middle of the fourth decade, Paris and London refused to sign new deals in supplying weapons, munitions and military equipment to Romania, something that worried the Romanian authorities[26].

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[23] The Archive of the Ministry of Foreign Affairs, fund 71/special dossiers, vol. 303, p. 172.

[24] Regarding these guarantees, please see, among others, David Britton Funderburk, *Politica Marii Britanii față de România 1938–1949. Studiu asupra strategiei economice şi politice*, Editura Ştiințifică şi Enciclopedică, Bucureşti, 1983, p...; Bogdan–Alexandru Schipor, *Politica Marii Britanii la frontiera de vest a Uniunii Sovietice 1938–1941*, Editura Junimea, Iaşi, 2007, p.119–136.

[25] Armand Călinescu, *Însemnări politice 1916–1939*, foreword by dr. Al. Gh. Savu, Humanitas, Bucureşti, 1990, p. 416.

[26] More details in Georgiana Margareta-Scurtu, *Relațiile internaționale în contextul celui de-al doilea război mondial,. Studiul de caz: Relațiile României cu Franța (octombrie 1938—iunie 1940*), Institutul Cultural Român, Bucureşti, 2006, p. 189–197.

In 1937, it was clearly too late to reach the targets established in the plan for 1934–1935. As it was said before, even the procurement planning was done having the time limit to get a military able to wage a modern war in 1945. The war began in September 1939 and, in spite of the fact that Romania has declared itself neutral to avoid the catastrophe, that didn't shelter it from the vicissitudes of having the armed forces unable to cope with the challenges of the modern war. The year of 1940 brought the disintegration of the territorial unity and, subsequently, the tragedy of huge human losses in a war fought on both sides.

6. Conclusions

The 'safari' over a period of two decades of Romanian military procurement has revealed some interesting 'lessons learned', which still prove valid today.

Firstly, that right after the end of a Great War, the elite started neglecting the military as a fundamental instrument for national survival. As a result of this disregard towards the military, the shortages accumulated rapidly, while the delays in decisions further complicated and prolonged the recovery. For the Romanian elite – inexperienced and having to tackle a lot of exigencies of the 'nation building' process after achieving national unity – this abandon of the military lasted up to 1930–1934, when it was devised the first strategic planning regarding the war procurement. Even so, it was too late and also not being approached appropriately.

Secondly, that issue of adequate procurement for the military for the next war is complicated in the case of a European country with a weak economy, unable to provide the military with the needed resources and not having a war industry able to equip the military for a war in which technology plays an important role. Weaknesses of an economy based on agriculture coupled with the disregard of the military by the elite created a framework in which the expenditures for the military were inefficient on a medium and long term and practically wasted.

Thirdly, the elite realized in the 1930s that it is too late to do something in order to safeguard national survival and consequently adopted a two pronged process of overcoming the difficulty: firstly to speed up the creation of the war industry and secondly to use the support of the most technologically advanced allies – in our case Czechoslovakia – to cover the needs, launching the project of bringing their war industries on the national territory. It was a plan which encountered insurmountable difficulties of political order and had been proved being inappropriate.

Finally, the main lesson learned is that neglecting the military instrument as a tool of national policy does not come cheap, often implying high historical costs.

Prof. Svetlozar Eldarov, Prof. Dimitar Minchev (Bulgaria) Bulgarian Military Communications in the Wars 1812–1918

The application of the various communication methods is a significant element of the development of armies and warfare. The need to exchange information and the ways to carry out such exchange have been present at all stages of the evolution of the army as an institution and of the war as a social phenomenon ever since the remote past. Military communications gained an utmost importance in the modern age with the progress in the field of science and technologies radically transforming the organization of the army and the character of warfare. The increased strength of the troops, the introduction of rifles and mechanical traction necessitated a new strategy and tactics where the management based on information exchanged assumed a leading role. Throughout the historyof warfare, technological innovations in the field of communications have been gaining new territories at the expense of the traditional ways and methods of communications. In this respect the second half of the 19^{th} C. has been marked by a true revolution in the development of military communications through the introduction of several new means of communication – the telegraph, the telephone, and the radio.

Bulgaria reemerged on the political map of Europe at a time when work on the technological improvement of military facilities was in full swing. This sircumstance had an ambiguous impact on the Bulgarian army. On the one hand, it had to catch up with the more advanced armies of its neighbours and future adversaries, yet, on the other hand, it was able to adopt developed models, technological concepts and practical experience from the armies of the Great Powers, which were the true generators of the innovations. The creation and the organizational and technological improvement of military communications in Bulgaria were closely linked to the development of the Bulgarian army. As a structural component of the organization and management of the armed forces, they evolved through the main stages in the development of the Bulgarian state and were affected by the changes in its political life. Without claiming to be comprehensive, the present study offers a consise outline of the historical development of Bulgarian military communications with respect to the interrelationship between them and the evolution of the army, state, and society. Although Bulgarian military history has seen some isolated attempts along these lines, such topics still remain insufficiently studied and call for further research.

The Bulgarian army in general, as well as the Bulgarian military communications in particular, were organised on the basis of Russian military theory and practice. In the field of communications however, this heritage was rather lacking and could not ensure a development congenial to the aspirations of Bulgarian statesmen and to the Bulgarian national and political interests, requiring a modern army.

The new communication technologies were introduced in the Russian army comparatively late and rather slow to establish themselves and to win over the traditional communication facilities such as couriers (on foot and mounted), flying columns, heliographs, and the structures, people and intersts related hitherto. It was not untill the very eve of the 1877–1878 Russia-Turkish War that the telegraph was introduced on a large scale. Six military telegraph parkes participated directly in the military operations, and three of them operated in the territories that subsequently fell within the boundaries of the new Bulgarian state. Organizational and technological shortcomings notwithstanding, the military telegraph parks played a sygnificant role as means for intercommunication and management of troops.

The postal and telegraph communication system of the young Bulgarian state was based on the wartime heritage, further improved and developed during the nine months of Russian occupation. By an ordnance of the Postal and Telegraph of the Department of the Russian field forces, dated July 1, 1879, all telegraph and postal stations with the available equipment were turned over to the civil telegraph administration in Bulgaria, whereas the replacement of personnel was carried out gradually. Thus, the Bulgarian state became owner of 1630 km of telegraph lines as well as of 26 telegraph and 39 postal stations with all their equipment.

Organizationally, the development of Bulgarian military communications was closely connected to the formation and development of the communication service of the Bulgarian Army. The first communication unit was formed in September 1878. Among the priorities of the development of Bulgarian military communications between 1880 and 1885 were the search for an adequate organizational structure, the training of personnel and the modernization of equipment. In 1880, the telegraph operators were enlisted in a training class which in 1883 became a telegraph command, and in 1885 developed into a telegraph company. Over this period, the outdated and ineffective Russian aparatuses left over from the war were replaced by new and more advanced equipment from Germany.

In September 1885, being discontent with the Unification of Bulgaria, Russia withdraw all her military officers from the Bulgarian Army. At this stage, however, Bulgarian commanders were still lacking clear understanding for the role of the military communications and were unable to make full use of the equipment. Instead, they preferred to work with the traditional communication facilities in the form of courier services. The telegraph company was regarded as some useless burden, all the more that its personnel was not armed with rifles.

Between 1885 and 1912, Bulgarian military communications went through a new stage in their development in respect to their organisation and equipment. Under the influence of West European military theory and practice the Bulgarian army started to pay greater attention to the development of communication system. The telegraph company was restructured as a part of the pioneer regiment. In 1880 a bicycle company was formed – a true revolution in the history of the messenger service which until then had used foot and mounted couriers. During the 1880s the telegraph company developed into an intensive training center.

The period of the wars 1912–1918 brought a new stage in the development of Bulgarian military communications. In accordance with the wartime regulations after the mobilization in September 1912, the telegraph battalion was restructured into 13 telegraph companies with a total personnel of 3890. A radiotelegraph department with 4 radio stations was formed – one of them at General Staff Headquarters, and the others – at the Headquarters of the Separate armies. A special telegraph park was also placed under the command of the General Headquarters.

Each telegraph company was equipped with 8 telegraph aparatuses Siemens & Halske, 8 Mans heliograph sets and 8 magnetic telephone stations. The materiel of the Radiotelegraph Department consisted of 4 transportable and 6 stationary radiostations Radioelectric, Pilsen and Telefunken. The radio stations were small-output; their effective range did not exceed 40 km. At the beginning of the war the telegraph park at the headquarters of the field forces was located in Stara Zagora. The Headquarters of the field forces did not have a general head of communications. The Commander of the telegraph park did not stay constantly in touch with headquarters and was not familiar with the state of the telegraph lines in the area of the three armies. As a result of that the park was idle in crusial moments. The line materiel was rather insufficient in both the telegraph park and the telegraph units in armies and divisions. The facilities for establishing communication between armies and divisions were quite frequently used to provide connection with the Supreme Command. This circumstance had a negative impact on the management of the troops on the front line units – division and lower. As a result the orders from the armies arrived in the divisions with a big delay, rendering the management of the military operations ineffective. Time and again, the inadequate wire communications between the armies and divisions necessitated the use of traditional communication facilities such as mounted couriers. The entire cavalry regiment of the 3rd Army for instance, was mainly used for communication tasks.

Even more limited was the use of telegraph in the communications: division – brigade, and brigade – regiment. This was the result of the mobile character of military operations, as well as of materiel shortages and bad organization. In its initial phase the Balkan War had a mobile character. Under such conditions, the telegraph companies at the divisions were barely able to catch up with the regiments, and to establish wire connections when the next offensive would force them to collect the equipment and to move on again behind the offencing units.

Telegraph communications found better application during the positional warfare operations during the siege of the fortress of Edirne. There the headquarters of 2nd Army succeeded in establishing wire connections to divisions, which, in their turn, were linked to the smaller units up to battalion level. The best communication systems were built in the Eastern sector under General Vazov's command, who was able to estimate their importance. On his order special regulations were issued, regarding establishment of telephone connections, and maintenance of installations. A single brigade section of the eastern sector had 55 telephones installed. Well-organized military communications allowed adequate management and interaction of troops, which played an important role during the seizure of Edirne fortress.

The Balkan War clearly demonstrated the advantages and disadvantages of the Bulgarian military communications. First of all, the level of technological culture of both military officers and soldiers regarding the communication facilities was dramatically low. Because of that, the failures of the wire connections were rather the result of the actions of the Bulgarian troops, than of the enemy. Bulgarian soldiers, cutting down telegraph poles for firewood, and using the wires to hobble their horses, or as boot-laces, were a quite common occurrence. Alas, their commanders were not more competent. For instance, the one of the telegraph lines, built by the telegraph company of 1st Army was deliberately broken at the order of a Bulgarian cavalry unit commander. After the cavalry passed, the line supervisor "repaired" the line by tying the cable in a knot just like an ordinary rope. Such anecdotal cases were not rare in the practice of communications during the war.

The weak points of Bulgarian military communications during the Balkan war were rooted not as much in their organization and equipment, but rather in the inadequate and incorrect operation and maintenance. The background and training of the personnel were rather unsatisfactory. All but a few of the commanders at the various levels were prejudiced against the new communication technologies, giving preference to the traditional means and methods of the passed. In the course of a mobile war, such as the Balkan War, such disadvantages had an adverse repercussion over the management and effectiveness of the military operations. With a clear communication strategy and a more complex peacetime preparations, the outcome of a number of battles and operations might have been very different from what has been registered in the history books.

The Bulgarian Supreme Command managed to derive maximum benefit from the Balkan War experience and to learn a lesson from its own mistakes. In spite of the short peacetime period, best efforts were made to remove the shortcomings in the organization, material and technical basis, and in the operation of wartime communications. Considerable improvements were introduced in their organizational structure, the personnel was increased in number, their qualification was bettered, more advanced technologies and equipment were adopted. In 1913 two military officers, and two sergeants were sent to Germany for specialization and training at the Telefunken company, and in the next year a military officer and a sergeant were sent to the French company Radioelectric.

The communication system of the Bulgarian Army during WWI was organized as follows: the connection between the Field Forces Headquarters and the single armies were provided by a telegraph park, restructured into a telegraph battalion in 1916, which used to be a unit of the Military Postal and Telegraph Department. The battalion consisted of three construction companies, a station company, a main telegraph, a telegraph depot, and a radio department with two radiotelegraph stations. The connection between the armies and divisions was provided by telegraph parks, radiotelegraph department, bicycle company, and an automobile department at the headquarters of the armies. The connection between divisions and regiments was provided by telegraph companies and mounted units, attached to the divisions.

During WWI Bulgarian military communications had at their disposal miscellaneous equipment: Morse and Hughes telegraph apparatuses, Telefunken, Radioelectric and Pilsen radiostations, field telephone sets with induction and phonic calling, Mans and Mangen heliograph apparatuses, field cables and telegraph wire. As the military operations developed in different theatres, it became evident that the available equipment could not fully satisfy the needs of the military communications. Organisational and hardware shortcomings were being removed in the course of the war.

The main bulk of Bulgarian military communications was handled by the telegraph and the telephone, where the former was mainly used in the strategic rear, whereas the latter fully dominated in the management of units and detachments. As a matter of fact, during this war the telephone finally outweighed the telegraph as a result of the invention and application of the so called simultaneous transmission that allowed sending of telephone and telegraph messages at the same time.

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A Succesful Blockhouse System or A Disastrous "Blockhead System"? The British Use of the "New Technology" of Blockhouses during the Anglo-Boer War in South Africa, 1899–1902

1. Introduction

In this paper, the elaborate British blockhouse system that was used by the British Army in South Africa in their efforts to defeat the Boer forces during the Anglo-Boer War of 1899–1902, will be discussed and evaluated, in particular the idea of having fixed fortifications built in an effort to counter the flexible operations of a mobile and agile enemy in a guerrilla war that raged over a very large area. This will be done within the broad framework of a debate with regard to the design and application of "new technologies".

2. The Reasons why Blockhouses were Built

Although the British blockhouses of the Anglo-Boer War are associated with the fourth main phase, i.e. the guerrilla phase (March 1900–May 1902), of the war, the root reasons for the erection of an elaborate and very expensive blockhouse system, can be traced back to even the first (semi-) conventional phase (October-November 1899) of the conflict (i.e. the limited Boer offensive). When the war broke out on 11 October 1899, the British Army was not really prepared for war against the two small Boer republics. There was no proper strategic planning, and to complicate matters, the British underestimated the Boers, and were convinced that the war would be won in the space of a few months. But on the side of the Boers there were also unrealistic expectations. As a matter of fact, the Boers were not interested in invading British territory on a large scale and in forceful way, but got bogged down in a defensive strategy. And so the scene was set for a long and bitter conflict – where blockhouses would in due course come into play.

During the second main phase of the war (November 1899–February 1900), General Sir Redvers Buller was in command of the British forces in South Africa. He divided his Army Corps in an effort to relieve the British garrisons besieged in Kimberley and Ladysmith, but his offensive ground to a halt when his forces were defeated on three fronts in the course of a single week. Buller was relieved of his command, and Lord Roberts was sent to South Africa to pick up the pieces and lead the British to victory. With Lord Kitchener as his Chief of Staff, Roberts launched the elaborate second offensive, captured Bloemfontein, the Orange Free State (OFS) capital, as well as Pretoria, the Transvaal capital.

In terms of European warfare, the Boers were now supposed to be defeated and the war was to end. But this did not happen. Although the British had ostensibly captured large areas of republican territory, they were not at all really in control of the war zone. Many Boer commandos had broken through the British lines of advance, to continue the struggle, and at a council of war meeting held at Kroonstad on 17 March 1900, the Boer leaders decided to resort to guerrilla warfare.[1] Henceforth they would exploit what was probably their greatest strength, namely their mobility. While the British were in practice only in control of the land as far as their guns could shoot, the Boers roamed around almost at free will, attacking British columns and camps, and destroying the railway lines, bridges and other infrastructure on which the British Army in South Africa depended on for its communications and supplies.

In essence, the guerrilla war was, from a British point of view, a struggle against or for control over the vast open spaces of the South African war zone. The mobile Boer forces, who could, to a large extent, live off the veld, and knew where water for man and beast could be obtained, for a long time could operate almost without impediment across the length and breadth of the vast war zone. Somehow the British Army would have to gain effective and continued control over this war zone. But they had too few troops.

Boer attacks on and destruction of railway lines increased. As early as 16 June 1900, Roberts issued a proclamation in which it was said that if a railway line was destroyed, the houses of Boers in the vicinity would be destroyed in retaliation.[2] Those Boer (and black) civilians who were left destitute after their homes had been destroyed, were then carted off to internment camps (a term to be used instead of the emotionally charged term concentration camps).

The damage to the infrastructure cost a lot of money to repair, and could be a time-consuming and dangerous exercise. It became increasingly dangerous to travel by train, especially after dark, and it was clear to the British military commanders that something drastic had to be done to safeguard the railway infrastructure in the war zone. Right from the outbreak of hostilities, several stations were protected by digging trenches around the building(s). In due course the defensive works became more elaborate, and eventually blockhouses would become the most common form of defence. The primary reason for the construction of blockhouses, was the necessity to protect the most important railway lines with its many culverts and bridges. But as time passed, and the war escalated both geographically and in intensity (in terms of Boer guerrilla activities), blockhouses would play an important role in support of British drives against the Boer commandos; i.e. the primary

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1 J.H. Breytenbach, Die Geskiedenis van die Tweede Vryheidsoorlog in Suid-Afrika, 1899–1902 volume 5 (Pretoria 1983) 156–167.

2 S.B. Spies, Methods of Barbarism? Roberts and Kitchener and Civilians in the Boer Republics, January 1900–May 1902 (Cape Town 1977) 101–103.

purpose of the blockhouses was to defend the British lines of communication, but later a secondary purpose developed, namely to play a role in the offensive British counter-guerrilla strategy. The blockhouses had to protect the British key points, lines of communication and supply routes; and in due course also had to serve as barriers which had to deprive the Boers of their freedom of movement. By using blockhouse lines that criss-crossed the war zone, the British hoped to hem in the Boers and to win the war against the vast open spaces of the war zone.

3. The Various types of Blockhouses

3.1 Multiple-level blockhouses

Multiple-level blockhouses were usually two or three storeys high, and were either square or rectangular in shape. They were sturdily-built structures and nearly 40 of them can still be seen in South Africa today. Originally, 441 masonry blockhouses were built during the war.[3] These multiple-level blockhouses each cost £800–£1000 to build, and it usually took about 30 men some three months to build a single blockhouse.[4] The fact that no bridge was destroyed in the vicinity of a multi-level blockhouse, underlines the deterrent value of this kind of blockhouse. But the multi-level blockhouses also had disadvantages. They were expensive to build; took long to complete, and skilled artisans were needed to do the construction work.

3.2 Rectangular blockhouses

In an effort to increase the speed by which blockhouses could be built, Major S.R. Rice of the 23rd (Field) Company, Royal Engineers, designed a simple, yet sturdy and safe blockhouse that consisted of double walls made of corrugated iron (usually 4,57 m x 3,05 m), with an opening between the walls – which was then filled with gravel or small stones.[5]

3.3 Octagonal blockhouses

In the course of February 1902, Major S.R. Rice designed an octagonal blockhouse. These blockhouses had double walls of corrugated iron, and – as was the case with the rectangular blockhouses – the gap between the walls was filled with gravel or small stones.[6]

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3 Royal Engineer Corps Library (Chatham), Accession No 10905: R. Harvey, Table showing no. of blockhouses and posts to date; National Monuments Council (now the South African Heritage Resources Agency) (Cape Town), File 4/A/SA/1/A: Preservation of blockhouses.

4 M.H. Grant, History of the War in South Africa 1899–1902 volume IV (London 1910) 568.

5 "Records of the South African War, 1899–1902. Records of units. 23rd (Field) Company, R.E.", in: The Royal Engineers Journal volume 33, number 2 November 1903, 243.

6 Royal Engineer Corps Library (Chatham): S. Walker, A History of Royal Engineer Operations in South Africa 1899–1902 (unpublished manuscript) [henceforth referred to as the Walker manuscript] 304.

3.4 The round or Rice-Type blockhouses

Although Major S.R. Rice designed most of the Anglo-Boer War blockhouses, his name is inextricably linked to the most successful of his designs, namely the round blockhouse. Rice designed this blockhouse in early March 1901, and in due course this kind of blockhouse became the most numerous kind of blockhouse to be erected all over the war zone in South Africa.[7]

The Rice blockhouses consisted of two cylinders of corrugated iron that were placed 15 cm apart; i.e. the one cylinder was somewhat smaller than the other, so that it could fit inside the larger one. The cavity was then filled with soil, gravel or small stones. Once it became clear that the Rice blockhouses were ideal for the British war effort in South Africa, they were mass-produced.

3.5 Mobile blockhouses

Not many mobile blockhouses were constructed by the British forces during the Anglo-Boer War. The 38th (Field) Company, Royal Engineers, manufactured a few mobile blockhouses, but reported that they were not always very successful, mainly because they were usually too heavy to be truly mobile.[8] In the Kimberley district, there were seven mobile blockhouses including four that were ox-wagons armoured with steel plates.[9] Sometimes a construction that was very similar to a Rice-Type blockhouse, was placed on top of an ox-wagon.[10]

Mobile blockhouses came in handy with regard to the defence of convoys, and also to defend an existing blockhouse line at a point or in an area where the Boers threatened to break through. Sometimes mobile blockhouses were also deployed to defend those people who were busy erecting a permanent blockhouse line.[11] The fact that the mobile blockhouses were drawn by oxen, meant that they moved very slow. The draught-oxen were dependent on the availability of fodder and water, which further hampered the deployment of mobile blockhouses. (With a little bit of imagination, these mobile blockhouses can be regarded as the forerunners of the first tanks in the Great (First World) War of 1914 to 1918.)

4. Defensive Measures

On their own, blockhouses would not deter Boers from breaking through the blockhouse lines. In an effort to defend the blockhouses better, and to make it diffi-

7 E.H. Bethell, "The Blockhouse System of the South African War", in A.T. Moore (ed.), Professional Papers of the Corps of Engineers volume 30, 1940, 280; Walker manuscript 305.

8 Royal Engineer Corps Library (Chatham), Accession No 10905, File B.W.11: Report on work done by 38th (Field) Company R.E. 1/12/1900 to 31/12/1901, 6.

9 Royal Engineer Corps Library (Chatham), Accession No 10905, File 3: List of blockhouses erected in the Kimberley District from 1/12/00 to 31/5/02.

10 Walker manuscript 306–307.

11 Bethell, "The Blockhouse System of the South African War" 281; Walker manuscript 307.

cult for the Boers to break through the blockhouse lines, the British forces adopted several defensive measures.

4.1 Barbed-wire entanglements

Initially the British put up ordinary barbed-wire between blockhouses, but the Boers experienced no problems in cutting these wires. Consequently the British wound three or four barbed-wires together to form a thick band of barbed-wire.[12] But still the Boers could not be stopped. Consequently the British used 3,55 cm thick steel wire, which was resistant to most wire-cutters, albeit that it could be chopped off by an axe. When the Boers found it difficult to cut the wires, they pulled out the anchor poles, so that the wires would fall flat.[13]

4.2 Alarm guns

Alarm guns consisted of rifles that were positioned at several places along the wire entanglements. A thin trip-wire, attached to the guns, was laid parallel to the wire entanglements. The triggers of the guns were also attached to the wire entanglements via thin wires, so that when the wire entanglements were cut, the guns would go off. The Boers soon learnt to be on the look-out for alarm guns and even succeeded in rendering them harmless.[14]

4.3 Chemical alarms

In an effort to prevent the Boers from breaking through the blockhouse lines, the British also sometimes attached a small flask, containing chemicals, to the wire entanglements. When the wire was cut, the flask broke, and its contents then flowed into another chemical substance which led to a loud bang, or lighted a flare. These flares were sometimes also shot off by a detonator which ignited gunpowder.[15]

4.4 Fixed gun rests

To ensure accurate gunfire against anyone who dared to try to cross the blockhouse lines, fixed gun rests were installed in many blockhouses, correctly aimed at the wire entanglements, so that those soldiers who manned the blockhouse, only had to place their rifles in the gun rests and pull the triggers. The guns would then fire all along the wire entanglements. In some instances, two to six rifles were grouped together to form a "battery" of rifles – discharged by only one soldier.[16]

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[12] "Modern warfare and mediaeval fortification" in The Royal Engineers Journal volume 32, number 1, March 1902, 35; Bethell, "The Blockhouse System of the South African War", 286.

[13] R.M. Holden, "The Blockhouse System in South Africa", in: The Journal of the Royal United Service Institution volume 46, January–June 1902, 485.

[14] Bethell, "The Blockhouse System of the South African War", 287.

[15] Walker manuscript 316.

[16] Ibid., 317; Bethell, "The Blockhouse System of the South African War", 288.

4.5 Landmines

Initially, landmines were not used on a large scale in the Anglo-Boer War, albeit that before blockhouses were built, the British sometimes laid mines in an effort to defend railway lines against attacks. These landmines usually consisted of a tin or old kettle, filled with approximately 13 kg gunpowder that was then buried near the railway line. Trip-wires were placed near the landmine, and when there was in interference, a rifle trigger was pulled, a cartridge was fired, and the gunpowder set alight. In due course, this same type of landmine was also used to further strengthen the defences around and between the blockhouses. Then there were also electric landmines, which were activated by an electric current, instead of by the discharge of a gun. Dummy mines, which only consisted of a heap of stones, were used to confuse the Boers. But on the whole, mines served as an important deterrent.[17]

5. The Building of the Blockhouses

By the end of the Anglo-Boer War, the British had erected at least 7 879 blockhouses of all shapes and sizes (at least 441 multiple-level masonry blockhouses, 6 883 other blockhouses – mainly of the Rice-Type – as well as 555 defensive works) in lines stretching over a distance of 5 920 km. The total cost was about £1 000 000.[18]

The first full-fledged corrugated iron blockhouses were built in January 1901 near Nelspruit (today known as Mbombela) in the Eastern Transvaal (today the Mpumalanga Province). As from March 1901, when the first Rice-Type blockhouses were built, blockhouse lines were gradually formed. Initially the railway network served as basis for the blockhouse network, but in due course blockhouses were also built in lines across the open veld – i.e. the so-called cross-country blockhouse lines, also known as veld (field) lines. Most of the cross-country blockhouse lines were built next to or near existing roads, so that henceforth these roads would also have protection.[19] Gradually the blockhouse lines formed an elaborate network that expanded across South Africa like a giant spider-web.

The Boers realised that the blockhouse lines posed a serious potential threat to their mobility. At several instances they attacked the working parties that were erecting blockhouses, and the British were obliged to send troops to guard the workers. Attacks continued, but there was no serious interruption of the block-

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[17] Royal Engineer Corps Library (Chatham), Accession No 10905, File B.W.11: Report on work done by the Seventh Field Company, R.E., from Dec 1st to Dec 31st 1901, 4.

[18] Royal Engineer Corps Library (Chatham), Accession No 10905: R. Harvey, Table showing no. of blockhouses and posts to date.

[19] L.S. Amery (ed.), The Times History of the War in South Africa 1899–1902 volume 5 (London 1907) 257–258, 324–326.

house building project.[20] From time to time, the Boers also launched orchestrated attacks against the completed blockhouse lines as such.[21]

The building material used in constructing the blockhouses, came from various sources. Most of the corrugated iron used in the building of Rice-Type blockhouses, was imported from the United Kingdom.[22] Sometimes corrugated iron taken from Boer homesteads that were destroyed as part of the scorched-earth policy, was also utilized in the building of blockhouses.[23] Blockhouse factories were built at, for example, Pretoria and Middelburg (Transvaal), where pre-fabricated portions of blockhouses were manufactured. Black and brown people were used in assisting the Royal Engineers in building the blockhouses. Three to six sappers of the Royal Engineers, assisted by ten to twenty British soldiers (infantrymen) and black and brown labourers, took four to nine hours to erect a Rice-Type blockhouse.[24] Once a blockhouse was completed, the permanent garrison, which included armed black and/or brown soldiers in British service, would move in. As many as 60 000 white British soldiers were used as blockhouse guards (i.e. more men than the Boers ever had in the field at any time during the war), assisted by at least 25 000 black and brown combatants.[25]

6. The Strategic and Tactical Application of the Blockhouse System

By using blockhouse lines to divide the sprawling war zone into more manageable "cages", the British also hoped to frustrate the Boers in their movements and hopefully make it easier to defeat and capture these commandos. Earlier in the war, the British had already launched drives, for example the so-called first De Wet hunt (15 July to 14 August 1900), which was an unsuccessful effort to corner and capture the elusive OFS Boer commander; but it was only in the course of 1901, that drives would be linked to the blockhouse network. In this way the blockhouses became part of an elaborate British counter-guerrilla strategy. Several drives were launched in the Western Transvaal in an effort to curb the guerrilla activities by the commandos that fought under the overall command of General Koos de la Rey – and blockhouses formed part of the plans.[26]

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20 I. Robertson (ed.), Cavalry Doctor: Letters written from the Field 1900–1901 during the Anglo-Boer War by Col. A.F. Russell (Cape Town, 1979) 244; C. Mellor, "A Scrap with the Boers whilst Blockhousing", in: The Royal Engineers Journal volume 32, number 1 January 1902, 3–4.

21 The National Archives of South Africa (Pretoria) Microfilm M670: Staff Diary Harrismith District. April 1902.

22 H.W. Wilson, With the Flag to Pretoria. After Pretoria: The Guerrilla War volume 2 (London, 1901) 892.

23 T. Pakenham, The Boer War, (London, 1979) 572.

24 Bethell, "The Blockhouse System of the South African War" 282, 288–289.

25 André Wessels, The Anglo-Boer War 1899–1902: White Man's War, Black Man's War, Traumatic War (Bloemfontein 2011) 115.

26 Grant, History of the War in South Africa volume 4, 506–509; H.F. Bidder (ed.), Two

The British also launched several drives in the OFS, for example in November 1901 when approximately 15 000 soldiers took part in a massive drive in the North-Eastern OFS; but it was a failure, *inter alia* because at that stage there were no significant blockhouse lines in the area that could be utilized as barriers.[27] Kitchener now personally intervened and from February until May 1902, five so-called "new model drives" were launched in the Northern OFS. Kitchener took command of the drives, ensured that each drive would take place between two parallel blockhouse lines (which would form the flanks of the forward-moving mobile British columns), and that there was a blockhouse line that would form the end line of the drive (i.e. the barrier against which the Boers were to be driven and then either killed or captured). Armoured trains were also employed to patrol railway lines in the vicinity of the drive, and to strengthen those blockhouse lines that were built along railway lines.[28]

Everything considered, the "new model drives" were relatively successful: De Wet, as well as several other Boer commanders, evaded capture, often breaking through the blockhouse lines or breaking back through the advancing British sweeping forces; but many Boers were captured – and, most importantly, the Boers were kept on the move, exhausting man and horse. Small wonder then that, when the peace negotiations started soon afterwards, the majority of Boer delegates eventually were prepared to accept the British conditions for surrender.

Another relative new technology employed by the British forces in South Africa during the Anglo-Boer War, was armoured trains – apparently first used in the American Civil War of 1861 to 1865. During the Anglo-Boer War, armoured trains were sometimes successfully employed during drives. The British Army deployed armoured trains right from the start of hostilities; as a matter of fact, the first clash of the war, which took place on the evening of 12 October 1899, at the Kraaipan railway siding, between Mafeking (today Mahikeng) and Vryburg, involved a British armoured train, the *Mosquito*, which was derailed by the Boers.[29] But armoured trains were initially mainly used for patrol work and to ensure the safe transportation of troops. In due course, the role of armoured trains changed from merely defensive work to being used as part of offensive counter-guerrilla actions; i.e. when they were used in conjunction with blockhouses during drives to corner and destroy Boer commandos. Armoured trains, which can also be regarded as large mobile blockhouses, were used to strengthen those blockhouse lines that were threatened by Boer attacks and to try and prevent the Boers from breaking

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Years on Trek, being some Account of the Sussex Regiment in South Africa (London, 1907) x; Despatch by General Lord Kitchener, dated 1st June, 1902, relative to Military Operations in South Africa (Cd. 986), (London, 1902) 8.

27 Amery (ed.), Times History volume 5, 415–417; Despatch by General Lord Kitchener, dated 8th December, 1901, relative to Military Operations in South Africa (Cd. 824), (London, 1902) 7.

28 Amery (ed.), Times History volume 5, 467–469.

29 Ibid., volume 2, 267–268.

through blockhouse lines. The searchlights of armoured trains also came in handy in this regard.

When the war broke out, there were only five armoured trains in Natal and five in the Cape Colony. Eventually, a total of nineteen armoured trains were used by the British forces in the course of the war in South Africa. They were used for patrol work, reconnaissance, defence of the railway lines, escorting other (for example troop) trains, the defence of stations that were threatened by the Boers, and in conjuncture with mobile columns and blockhouses during drives, for example to secure the flanks of the driving forces and to intercept and destroy those Boer commandos that were driven against a blockhouse line. In the light of the fact that during the last months of the war the Boers had mostly discarded their artillery, they were not able to attack the armoured trains with field guns. Nevertheless, by blowing up railway lines, the Boers did manage to derail at least five British armoured trains in the course of the war.[30] British armoured trains did play a role in making life even more difficult for those Boers who remained in the field during the last months of the war, but they were, just like all the other measures taken by the British Army, not able to root out all opposition. But by using armoured trains against mobile Boers, the British did practically demonstrate the importance of combining advanced technological means, in this case guns (artillery and rifles) and trains.

7. Evaluation

According to General Christiaan de Wet (the most famous of all the Boer guerrilla commanders), the blockhouse lines were not insurmountable obstacles. In practice he indeed broke through such lines on several occasions, and he was of the opinion that the British could just as well have done without these blockhouse lines. He was also of the opinion that if the British had not spent so much time in building blockhouses, but had rather deployed the troops building blockhouses in mobile columns and in drives against him, it would have caused him more problems. By mid-1901 the British were spending so much time in improving and expanding the blockhouse network, that it gave the Boers time to regroup. Consequently De Wet was of the opinion that the blockhouse network actually prolonged the war by at least three months. Nevertheless, De Wet admitted that his burghers were scared to break through the blockhouse lines. But De Wet also referred to the blockhouse system as the "policy of the *blockhead*",[31] and to the blockhouse lines as a white elephant.[32]

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[30] J. Stone and E.A. Schmidl, The Boer War and Military Reforms (Lanham, 1988) 70; E.P.C. Girouard, History of the Railways during the War in South Africa, 1899–1902 (London 1903) 129–141.

[31] C.R. de Wet, Three Years War (October 1899–June 1902) (London 1902) 321–326. The quotation comes from p. 321.

[32] Ibid., 322, 367.

In the course of the Anglo-Boer War, the British "blockhouse technology" developed from sometimes crude forts and covered trenches (for example in the defence of Ladysmith, Kimberley and Mafeking, railway bridges and other strategic key points) to multi-level masonry blockhouses, and then to blockhouses manufactured of corrugated iron, culminating in the round Rice-Type blockhouses. The British did not invent blockhouses as a result of the war in South Africa, but adapted the "blockhouse technology" that existed to suite local conditions, and in the process came up with new innovations. Roberts, but especially Kitchener, was far-sighted as far as the use of blockhouses in a defensive, but in due course also offensive role, was concerned.

The British were, of course, very satisfied with their blockhouse system: Lord Roberts complimented Lord Kitchener with the success that was achieved with the system,[33] and Lord Milner was also suitable impressed.[34] MH Brice correctly pointed out that the Boers were eventually defeated by the mass-production methods of the industrial revolution: barbed-wire and blockhouses.[35]

The British blockhouse system was an expensive, yet essential emergency measure adopted by the British Army Command in order to sway the geographically escalating guerrilla war in their favour. Eventually, the system played a significant strategic and tactical role, and although the system did not restrict the Boers entirely, it did nonetheless restrict their freedom of movement to a greater or lesser extent. In this respect, the "cross-country" blockhouse lines, in conjunction with the "new model drives", were of particular significance.

However, the blockhouse system was not the main reason that the majority of Boer commanders ultimately decided to end hostilities, surrender and accept the loss of independence. In this regard, factors such as the destruction of farms and the internment (concentration) camp policy also played an important role. In practice, however, the blockhouses played a significant role, but this role should be seen in conjunction with several other factors, such as the hot-pursuit operations, as having a role in the ending of hostilities. Nonetheless, blockhouses on their own would never have contributed to an early end to the war. The message was clear: on their own the blockhouses could not win the war, but in conjunction with other methods of war, they could make a significant contribution towards the outcome of the conflict. The idea of having fixed fortifications to counter flexible operations in a mobile guerrilla war, indeed indicated how the "new technologies" could play an important role in modern warfare.

In practice the British blockhouse system of the Anglo-Boer War was neither a disastrous "blockhead system" nor an unqualified success. From a British mili-

33 National Army Museum (NAM; London), Roberts Papers, 1971-01-23: Roberts-Kitchener, 13 December 1901 and 17 January 1902 (letters).

34 E. Protherse, Lord Kitchener (London 1916) 258–259.

M.H. Brice, Stronghold: A History of Military Architecture (London 1984) 156.

tary perspective, it was an expensive but necessary system – and it added a fascinating chapter to the history of fortifications. As indicated above, the blockhouse system, together with many other factors, eventually forced the Boers to accept the British conditions for surrender – at the end of a traumatic conflict that left large areas of South Africa devastated.

Today, of the original approximately 8 000 blockhouses that were built, some 50 remain scattered all over South Africa, mostly multi-level masonry blockhouses – silent reminders of a devastating war which cast a dark shadow over the history of twentieth-century South Africa, but also of one of the most remarkable fort-building exercises in the military history of the world.

Lt. Colonel Miloslav Čaplovič and Dr. Peter Chorvát (Slovakia)
Building of the Czechoslovak Fortification System – Problems of Using Technologies (1933–1938)

The issue of Czechoslovakia's permanent fortifications, built predominantly in the Czechoslovak Republic's border areas in the years 1933 – 1938 for the purpose of ensuring the country's defence against potential adversaries, has been a very captivating theme for many researchers. This particular statement applies both to experts and lay people, whether that be in the Czech Republic or in Slovakia. Apart from a large number of relevant archival resources, there exist volumes of specialized publications which portray this engaging subject-matter from many different angles.[1]

In our research paper we are committed to providing a concise description of the characteristics of fortified emplacements and to pinpointing the key technological deficiencies that emerged with their construction.

The 'roots of the idea' of the future construction of permanent fortifications in the then Czechoslovak Republic may be faithfully traced, above all, to the military and political outcomes of the First World War.

A fundamental prerequisite for fortified emplacements to emerge in the period under investigation was especially the concept of delineating Czechoslovakia's borders as an integral component of the Versailles Peace Treaty system.

The rise of Nazism in Germany in 1933 with its efforts to rectify the said system and Hungary's concurrent attempts to achieve the review of the Treaty of Trianon were decisive in bringing about a phenomenon whereby the military and political aspects of national border defence came to the fore throughout the 1930s.

Therefore, in our opinion, it was no coincidence that it was exactly in the year 1933 that the first ideas to fortify the country appeared in the Czechoslovak

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1 Áron, Lubomír (Ed.), Československá opevnění 1935–1938 [Czechoslovak Fortifications in 1935–1938]. (Náchod 1998).; Beneš, Jaroslav – Lakosil, Jan – Nič, Martin – Škoda, Jan, Zvláštní zařízení na komunikacích v letech 1936–1938 [*Special devices on the roads in the years 1936–1938*]. (Dvůr Králové nad Labem 2009).; Dubánek, Martin – Lakosil, Jan – Minařík, Pavel, *Utajená obrana železné opony, Československé opevnění* [*Czechoslovak Fortifications, The Classified Defence of the Iron Curtain*] *1945–1964*. (Praha 2008).; Holub, Ota, *Zrazené pevnosti* [*Forlorn Fortifications*]. (Praha 1982).; Honský, Marián – Krivá, Anna – Čaplovič, Miloslav, *Vojenské dejiny Slovenska* [*Military History of Slovakia*], IV. T, 1914–1939. (Bratislava 1996).; Chorvát, Peter, *Kapitoly z dejín československých opevnení na Slovensku* [Chapters from the History of Czechoslovak Fortifications in Slovakia]. (Zohor 2011).; Stehlík, Eduard (Ed.), *Lexikon těžkých objektů československého opevnění z let 1935–1938* [*Lexicon of Heavily Fortified Emplacements in Czechoslovakia in the years 1935–1938*]. (Dvůr Králové nad Labem 2001).

Republic and that the first fortified emplacements were constructed still later that year.

It is interesting to note that the first fortification initiative did not get underway in the then border area between Czechoslovakia and Germany but rather in the equally important bridgehead of Bratislava, lying in close vicinity to Austria and Hungary.

If we go back to the theoretical issues surrounding the fortification initiative, regardless of Bratislava's specific bridgehead area, the first theoretical postulates envisaged allied France with its own defensive strategy and fortifications, in particular the Maginot Line, as a potential model for Czechoslovakia's future construction of fortifications.[2]

In July 1934 Paris hosted a meeting of high-ranking officers of the Czechoslovak and French Armies. High on the agenda was the provision of defence for the Czech lands against a potential adversary. During the talks the French counterparts made a request for extending the defensive system of Czechoslovak territory, suggesting that the vital border sectors should be secured by permanent iron-concrete fortifications.

The French Command even offered to assist in implementing the initiative. This event most probably marked the momentum when it was finally decided to proceed with the construction of fortifications, throughout the Czechoslovak Republic – the permanent fortifications network.[3]

There were several reasons why the Czechoslovak Army adopted such measures, some were already outlined above, yet there were others, especially military ones.

First and foremost, the Czechoslovak Republic had a strategically unfavourable geographical position. It shared a relatively long border with Germany, Austria, Hungary (i.e. potential adversaries – authors' note) and Poland. Numerically speaking, of its 4,120-km national border, Czechoslovakia shared only 201 km with allied Romania. This, coupled with the oblong shape of its national borders, made Czechoslovakia's defensibility less advantageous.

A real threat of the German Army's blitzkrieg unfolding simultaneously in several locations and its personnel and material supremacy provided a very strong stimulus for the decision to proceed with the construction of the border fortification system. This urgency was closely connected with the fact that Czechoslovakia's vital economic and communication hubs were situated in the proximity of its national border with the potential enemy.

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2 Stehlík, Eduard, *Francie a opevňování Československa ve třicátých letech* [*France and Fortifying Czechoslovakia in the 1930s*]. In: Historie a vojenství. 48, 1999, Nr. 4, p. 816.

3 Šrámek, Pavel, *Ve stínu Mnichova, Z historie československé armády 1932–1939* [In the Shadow of Munich, From the History of the Czechoslovak Army in 1932–1939]. (Praha 2008), 51.

Another critical point that needs to be taken into account is that the Czechoslovak Republic, in respect to the total number of its inhabitants, was virtually unable to generate the required military formations that would be capable of defending its territory independently. In addition, there were other factors to consider: allied France's military influence and the said Maginot Line, with the latter having been just completed at that time. Interestingly, fortification activities were also underway in other European states, including, notably, Germany.

In the context of its complicated geopolitical situation in the latter half of the 1930s, for the Czechoslovak Republic there was no other option but to start building border fortifications. There was no real alternative, nor were there any other options at that time under serious consideration by the Czechoslovak Army Command.[4]

Czechoslovakia's permanent fortifications were designed to perform the following basic tasks:

- to enable a timeframe for mobilization and army build-up;
- to protect the country's strategically important facilities;
- to secure suitable areas for the Field Army's operations;
- to preserve the strength of conscripts;
- to gain time for implementing mobilization and involving allied armies.[5]

Needless to emphasize that the fortifications alone would have had very little significance without the assistance of Czechoslovakia's allies, especially France, and, to a lesser extent, that of the Little Entente states. Obviously, the Czechoslovak Republic was unable to defend its own territory without France's military assistance[6], which was directly linked to and contractually confirmed by the Soviet Union's assistance.

March 1935 saw the set-up of the Council for Fortifications and its executive body, the Fortification Works Directorate. Thus, after some years of improvisation, the implementation of fortification works finally relied on concrete fortification programmes, developed by the said Directorate. In general, the documents laid down the methods for and the stages of fortifying Czechoslovakia's border sectors.

A new scheme for permanent border fortifications was drafted by Divisional General Karel Husárek, Fortification Works Director and Deputy Chief of the General Staff, and finalized on 2 June 1936. The Czechoslovak Government approved the document three days later – on 5 June 1936.

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[4] Šrámek, Pavel, *Československá armáda v roce 1938* [*Czechoslovak Army in 1938*]. (Brno – Náchod 1996), 22.

[5] Ibid., 23.

[6] Stehlík, Eduard, *Československé opevňovací programy 1936 – 1938* [*Czechoslovak Fortification Programmes in the years 1936 – 1938*]. In.: Historie a vojenství. 54, 2005, Nr. 1, p. 5.

The said programme envisaged the construction of continuous and discontinuous fortification lines in the most endangered sectors of the Czechoslovak Republic. Besides the initially planned fortifications, the programme also reckoned with the building of 'light emplacements'. Their construction was approved in May 1936 by the Chief of the General Staff, Army General Ludvík Krejčí. The emplacements were part of a temporary protection regime of national borders before the construction of the previously planned, heavy fortifications had been completed. This move thus led to the division of fortifications into two basic types – heavy and light fortifications.

With the worsening international situation, as early as July 1936 the Czechoslovak government ordered that fortifications be erected along the entire border of the Czechoslovak Republic.

Because of restricted financial resources, this meant constructing only light emplacements in some border sectors. On 9 November 1937 General K. Husárek, who had shouldered the major burden of responsibility for the construction of fortifications, submitted for approval a comprehensive study, one taking account of the already implemented fortification works.

This document, amongst other things, set the construction timeline for the years to come. In the study, General K. Husárek emphasized that the main pillar of the Czechoslovak fortifications system was to be composed of two echelons of new-type lightly fortified emplacements. In addition, they were to be reinforced in vitally important areas by heavy emplacements – isolated infantry blockhouses.

The so-called Husárek programme was scheduled to be implemented by 1951, with the fortifications network as a whole planned to be of considerable fighting value as early as 1939. In compliance with this programme, at the end of 1937 the Tactical Branch, Directorate of Fortification Works, drafted the 1938 Fortification Works Programme, which also contained the outlook for the future years.

Shortly upon adoption of this document, the strategic situation of the Czechoslovak Republic had radically changed with Austria's '*Anschluß*' by Nazi Germany. Initially conceived as definite, the fortification programme now had to undergo review. As a consequence, a new document, the 1938 Fortification Works Programme – 'Upgrade' was finalized as early as 14 April 1938.

The fortification programmes, which we attempted to briefly characterize above, represent a set of documents that, among other things, faithfully reflect the development of opinions on the construction and tactical use of fortifications in the Czechoslovak Republic. However, their authors were unable to predict the rapid political developments that were to sweep across Central Europe, i.e. the changes in Europe's geopolitical and strategic constellation. As a result, each fortification programme had to be modified still before being implemented, and, practically, none of the fortified emplacements reached 100 percent completion.

As we mentioned earlier, Czechoslovakia's permanent fortifications may, with the exception of several atypical emplacements built in Bratislava's defensive bridgehead in the years 1933 – 1934, be divided into two basic categories or types – light and heavy emplacements. They differed from each other in technical as well as combat specifications.

Whereas light emplacements were designed to make the enemy's advance into the interior of the country more difficult and enable field army units to conduct defensive or retreating operations, heavy emplacements were intended to halt the enemy's advance directly on the border for an extended period of time and prevent the enemy from penetrating into the interior of the country.[7]

The border sectors dotted with light and heavy emplacements within the permanent fortification network were, depending on terrain conditions, further supplemented by light (anti-personnel) and heavy (anti-tank) obstacles.

Apart from the fortified structures mentioned above, there also existed specialized roadblocks of several types, which either restricted or completely halted the enemy's transportation capabilities in the fortified zone.

Atypical Emplacements

In the years 1933–1934, a total of nine fortified concrete emplacements were constructed in Bratislava's bridgehead area. Based on a draft by General Josef Šnejdárek, the blueprints and design documents for the emplacements were most probably produced by engineering officers from the Territorial Military Command in Bratislava, and '...inspired by their own ideas about fortifications.'[8]

These atypical fortified emplacements differed from later emplacements in several characteristics, for example, in their specific floor plans, thin layers of armouring rods, lower quality concrete mixtures. The emplacements were typically designed with mainly forward-firing ports. All of these improvised emplacements were most probably constructed by members of Bratislava-based Engineering Regiment No. 4.

After establishing the Fortification Works Directorate, the Directorate dealt also with the hitherto constructed emplacements. For instance, when the fortifications were inspected in 1935, it was reported that the emplacements failed to meet the requirements for modern fortified structures. Similarly, their parameters were not commensurate with the strategic significance of specific fortified sectors.[9]

As a result, such emplacements, being a hybrid mix of light and heavy fortifications, were later modified to meet the standards of isolated infantry block-

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7 Šrámek, *Československá armáda v roce 1938,* 24.

8 Vondrovský, Ivo, *Opevnění z let 1936–1938 na Slovensku* [*Fortifications in Slovakia in the years 1936 – 1938*]. (Dvůr Králové nad Labem 1993) 6.

9 Ráboň, Martin – Svoboda, Tomáš (Ed.), *Československá zeď*, *Stálá opevnění z let 1935–1938* [*The Czechoslovak Wall, Permanent Fortifications in 1935–1938*]. (Praha 1993) 74.

houses[10], especially by installing new armoured firing ports (whilst walling up the forward-firing ports), airtight equipment, and making other modifications.

The fortification of Bratislava's bridgehead continued in the following years with the construction of heavy emplacements, light emplacements and obstacles. Thanks to this, in September 1938 this region was considered as a model of a well-fortified area in the Czechoslovak Republic.

Early-Type Lightly Fortified Emplacement (Lightly Fortified Emplacement Type 36)

This type of light emplacement was most probably modelled upon one of the many types of the light emplacements built along France's Maginot Line. It had a number of variants.

The emplacement contained exclusively one firing room, accessed from the rear side of the building. Situated opposite to the entrance door, the front wall contained firing ports, which were shaped directly in the concrete wall and enabled forward firing (depending on the type, the emplacement had one, two or three firing ports).

Such defensive structures were situated on hilltops facing the national border, in places where they could be easily camouflaged. Their task was to conduct machine-gun firing against targets on roads, intersections, railway hubs, bridges, valleys, etc. Gun emplacement crews consisted of two to six soldiers. The construction of emplacements was halted at the end of 1936 and the beginning of 1937. A total of 864 emplacements had been built under the supervision of the Territorial Military Commands in Prague, Brno and Bratislava.

New-Type Lightly Fortified Emplacement (Lightly Fortified Emplacement Type 37)

During the staff meeting of the National Defence Ministry of 5 January 1937, a decision was taken to cease the construction of the early-type gun emplacement and launch the construction of a new-type lightly fortified emplacement. The new light defensive structure was at the core of a different defence strategy for deployment of emplacements in the border areas. Compared to the early-type gun emplacement, which was built only in selected, vitally important areas, the new one was constructed in compactly fortified sectors along the border with the potential enemy. Just as it was with the early-type emplacement, so also the new one had several variants.

The new emplacements formed a continually fortified zone with several echelons. The mission of the first, fire cover echelon was to stop the enemies and ex-

[10] Fidler, Jan – Sluka, Václav, *Encyklopedie branné moci Republiky československé* [*Encyclopedia of the Czechoslovak Defence Force*] 1920 – 1938. (Praha 2006) 756.

pose them to the most effective fire from all weapons. Forming the main defensive zone, the second echelon was tasked with supplementing and supporting the first echelon with continuous gunfire. This type of emplacements delivered side-firing and cross-firing.

The basic prerequisite for their tactical use was that the emplacements were to engage the enemy in the area in front of and behind the neighbouring emplacements, and their own defence was also secured in this manner. The gun crew consisted of seven members and was equipped with a variety of infantry weapons, such as machine-gun Type 26, rifle Type 24, and other weapons.

Nearly 9,150 emplacements of this type had been built by September 1938. Most of them were also equipped with weapons. The new lightly fortified emplacement may be regarded as a genuine symbol of Czechoslovakia's permanent fortifications built throughout the 1930s.

Isolated Infantry Blockhouse

The isolated infantry blockhouse formed an essential element of the heavily fortified zone. It was a relatively robust, iron-concrete structure which contained, depending on its specific resistance levels, from 278 to 2,365 cubic metres of building material. The blockhouse was nearly eight meters tall and less than half of its basement was below ground. It follows from this that most structures had two floors.[11] The blockhouse crew numbered 35 to 50 soldiers. They were assigned to special blockhouse teams, set up ad hoc for specific missions inside the heavily fortified building.

The blockhouse's upper floor was designed for combat activity. It contained firing rooms with the main armaments, commander's room, telephone switchboard, and ammunition storerooms. On the other hand, the basement created a kind of a 'support' environment with a power-generating unit, NBC filtering unit and squad rooms. Besides food, ammunition and petrol storerooms, there was also a well and a washroom.

Isolated infantry blockhouses were armed with: 40mm Type 36 Gun, two Type 37 Machine-Guns, and Type 26 machine guns.[12]

The blockhouse roof usually contained several armoured combat workstations: bells, cupolas, and, exceptionally, even turrets. Armoured bells, equipped with mounted machine guns, aimed to provide immediate protection to the blockhouse, while cupolas enabled machine guns to fire at long distance targets.

A total of 300 blockhouses had been designed in blueprints and the same num-

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[11] Stehlík, Eduard (Ed.) *Lexikon těžkých objektů československého opevnění z let 1935–1938* [*Lexicon of Heavily Fortified Posts in Czechoslovakia in the years 1935 – 1938*]. (Praha 2001) 20.

[12] Dubánek, Martin, *Výzbroj čs. pevnostních objektů v Bratislav*ě [*Armaments in Czechoslovak fortified emplacements in Bratislava*]. In: Střelecká revue. 39, 2007, Nr. 2, p. 49.

ber of construction contracts had been awarded by September 1938. Of them, over 2/3 were to be constructed.

Needless to say, there were also other blockhouse variants, including, notably, isolated artillery and mortar blockhouses. In addition, extensive artillery fortresses, featuring complex facilities linked by underground corridors, formed a separate category. In most cases, the construction of blockhouses and complex facilities had been completed successfully by September 1938.

The issue of applying specific technologies in constructing the Czechoslovak fortification system in the years 1933 – 1938 is a delicate topic, one which is closely connected with the changes in the fortification programmes. Terrain conditions and local significance played a role in modifying the technologies directly on the spot.

It is believed that at the beginning of the fortification process in Czechoslovakia some fortifications were built by Czechoslovak soldiers themselves, which was reflected in the quality of the structures.

Early-type light fortifications were most probably modelled upon similar defensive structures that were built along the Maginot Line. French inspiration is also visible in the case of isolated infantry blockhouses. However, the new-type light emplacement was designed solely by Czechoslovak designers.

Contracts to build fortified structures were awarded by the Czechoslovak Army to 'civilian' contractors through competitive bidding.[13] At this point it is worthwhile to focus on the activities of building contractors after taking over the expropriated land – building site. They included transportation of materials, earthworks (including the removal of vegetation and trees), masonry, carpentry, concrete placement, insulation works, etc. Some materials – iron, cement, iron rods, doors, firing ports and armaments – were supplied directly by the military authorities.[14]

Speaking about the materials used in the production of reinforced concrete, they were relatively widely available in Czechoslovakia. There were rich deposits of limestone, which was suitable for burning lime and hence for the production of cement. Sand, gravel and other ingredients could be obtained from the vicinity of building sites, and in some cases, they were extracted directly from riverbeds. Iron components were supplied in different forms by iron works, depending on their application.

The following technological procedures were applied in the construction of the most frequently built, new-type lightly fortified emplacement. The construction began with the actual foundation digging below the frost depth. Next, the area was covered with a concrete base plate several inches thick. This was followed by

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[13] Šrámek, *Československá armáda v roce 1938*, 24.

[14] Vojenský historický archív (Archives of Military History) Bratislava, f. StR, B. Nr. 15.

application of iron fittings, metal rods and wooden frames. Thus, the conditions for concrete placement were met. Concrete placement was done manually by shovels and was completed by more skilful teams within 18 hours. After two weeks of hardening, the wooden frames were removed and the walls were plastered. A stone and soil barrier was built around the structure and covered by grass. If there was enough time, the emplacement would be painted in camouflage patterns.

That special emphasis was placed on the quality of fortifications is evidenced by the Directive of the Fortification Works Directorate of January 1937, which, in reference to deployment of gun emplacements, reads: 'Even one less resistant emplacement may cause a disaster, delivering a depressive effect on other gun crews in adjacent emplacements, though these may be built well and of high-quality concrete.'[15]

The actual construction of a fortified emplacement did not mark the end of its combat readiness. On the contrary, it was only just the beginning. At this moment other specialized companies and military agencies became involved in the project, supplying interior fittings (air filters, connectors, optical devices, electrical wiring, gun mounts, etc.). Naturally, this process became a lot more complicated especially when it came to equipping heavily fortified structures and isolated infantry blockhouses.

Needless to re-emphasize, the process of building Czechoslovakia's fortifications was not fully completed due to the Munich Agreement. This had a great impact on the physical condition of fortifications in general, as well as on their interior fittings. As a result, Czechoslovak fortifications found themselves at different levels of readiness. In some border sectors the level of completion was, indeed, very high. This is illustrated by the fact that some emplacements had even interior wooden panelling. Also, there was a network of connecting trenches between 'bunkers', with additional earth embankments, barbed wire coils, obstacles, etc.

In some sectors, on the other hand, emplacements were after concrete placement and contained only essential equipment to support combat activity, such as firing ports, often without any machine-gun mounts or periscopes.

In other cases, there were no earth embankments to cover up the existing emplacements and they were clearly visible from a distance in the estimated direction of the enemy's advance. Needless to add, the technological development of some specialized weapons for heavily fortified emplacements had not been completed until September 1938, therefore, there must have been a lot of improvisation. But these were not the only existing deficiencies.

[15] Ibid.

Conclusion

The process of building the Czechoslovak fortifications should be generally perceived as an integral component of the comprehensive protective measures undertaken by Czechoslovakia and its Defence Force in response to the growing threat of Nazi Germany.[16]

In the initial years of improvisation, efforts to organize the construction of fortified emplacements and their actual construction were relatively well coordinated. However, this cannot be said about their planned interior fittings and fixtures. Obviously, the major issue revolved around the application of technologies.

Although the fortifications network had not been completed in 1938, for the potential enemies – the German and Hungarian Armies – it was a credible obstacle which could in no way be underestimated.

Technically speaking, the unfinished fortification system became, amongst other things, a stunning example of the Czechoslovak Army's military engineering art.

Most importantly, after the declaration of general mobilization in September 1938 and the takeover of the existing fortifications, the Czechoslovak Army was ready to defend the Czechoslovak Republic.

In spite of the enormous efforts of construction companies and the readiness of the Czechoslovak Army to engage the enemy in September 1938, the 'Czechoslovak problem' was resolved politically, and not militarily.

The political developments that followed allowed the two neighbouring states – Germany, after the signing of the Munich Agreement (30 September 1938), and Hungary, after the Vienna Arbitration (2 November 1938) – to seize a greater part of Czechoslovakia's permanent fortifications, liquidate them, or use them for their own purposes.

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16 Čaplovič, Miloslav – Stanová, Mária, *Preparations for Defence of Czechoslovakia on the eve of the Second World War*, 1933 – 1938. In: "Strategic Planning for War". 7th Annual Meeting of the Military History Working Group, Currie Hall Royal Military College of Canada Kingston,Ontario, 18–21 March 2007. Ljubljana, General Staff of Slovenian Army, 2008, pp. 74–84.

Angel Dinev (Bulgaria)
The Use of Advanced Military Technologies and Innovations in the Military Art at the Operations of the Bulgarian Army during the First Balkan War (1912 – 1913)

The military art appeared and was developed in Bulgaria after the foundation of the modern Bulgarian army in 1878. It was most fully manifested during the wars for national liberation and unification (1912–1918). Amongst these wars, the First Balkan war takes a special place, due to the major operational-strategic results achieved.

The end of XIX and the beginning of the XX century is one of the key periods in the development of the world military art, driven by the numerous technical inventions, that provoked capital changes in the military art and technologies. Then were developed: the cordite (nitro-powder), the magazine rifle, the heavy machine gun, the rapid-fire artillery, the airplane, the hand grenade, the mortar, the military poison gas, the tank.[1] These changes made possible the accelerated peacetime development of the Bulgarian military thinking and the phenomenal manifestations of our military art in the Balkan war.

The scientific problem regarding the use of advanced military technologies and innovations in the military art at the operations of the Bulgarian army during the First Balkan War (1912–1913) is studied and analyzed using several main methods of scientific research. The object (The Bulgarian army in the First Balkan War) and the subject (the modern military technologies and innovations in the military art) of the study, predicate the predominant use of the problematic-chronological approach at the analysis of the historical events. From the specifics of the military history science research emanates the necessity of use of scientific methods for performing of theoretical studies and especially the combined methods: analysis, synthesis, systematic, historical and methods for creative research.

The general mobilization of the armed forces of the Kingdom of Bulgaria was declared on 17 September 1912, that has been performed quickly, efficiently and amongst unique, in the history of the warfare of XX century, total national enthusiasm. Many of the reservists appear before the mobilization points before their due time, the Bulgarians from abroad are returning to Bulgaria with haste.[2]

The total effectives of the mobilized army reach 599 879 men (6757 officers, 786 military clerks, 592 336 NCO's and privates). The Army in the Field numbers

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[1] Peytchev, At. Foundation and Development of the Bulgarian Military Art 681–1945. Sofia, 1986, p. 39.

[2] Vasilev, V. and others. The Bulgarian Army 1877–1911. Sofia, 1988, p. 266.

366 209 men (5859 officers, 783 military clerks, 359 567 NCO's and privates). The Bulgarian army has a significant quantity of armament and equipment: 334 323 rifles and carbines, 239 machine guns, 1116 guns, 1 airplane, 2 balloons, 2 searchlights, 19 837 sabers, 36 automobiles, 3 trucks, 2 motorcycles, 276 bicycles.[3]

These forces were divided in three separate armies, that after the completion of the strategic deployment have been deployed in the following manner: 2nd army under the command of Lieutenant General Nikola Ivanov have been deployed near Harmanly, Tyrnovo-Seymen (today Simeonovgrad), Haskovo; 1st Army, under the command of Lieutenant General Vasil Kutinchev has been deployed near Kazylagach (today Elhovo) on both sides of the Tundzha river; 3rd army under the command of lieutenant-general Radko Dimitriev has been deployed at about two daily marches from the border in the area east and south east from Yambol, behind 1st army. In the area of the Rhodopes mountains is deployed the Rhodope detachment under the command of Major-General Stiliyan Kovachev and in the area of Haskovo – the Haskovo detachment, that later forms the Kurdzhali detachment, commanded by Major-General Nikola Genev. 7th Rila Infantry Division with commander Major-General Georgi Todorov has been deployed in the area Kyustendil-Dupnitza, where it was included in the composition of the 2nd Allied army.[4]

In relation to the development of the military actions, the planned and the achieved results, the Balkan war can be divided provisionally in two separate chronological periods: first – from the declaration of the war on 05 October 1912 to the termination of the cease-fire on 21 January 1913; second – from 21 January 1913 to the capture of the Edirne fortress on 13 March 1913. The first period of the war, classified as war of maneuver, includes the Lozengrad, the Luleburgas-BunarHissar and the Chataldzha strategic operations of the Bulgarian army and the activities of the Rhodope, Haskovo and Kyrdzhali detachments. The second period of the war includes the successful repelling of the Turkish assaults from Chataldzha and Gallipoli and the capture of the Edirne fortress, that effectively ended the war.[5]

The original contribution of the Bulgarian army in the world military heritage during the First Balkan war (1912–1913) is shown in the rapid maneuvering of large military units, up to army level included. In the military history of the XX century are rarely found examples of such extraordinary in their intensity marches, that many units of the Bulgarian army performed during the Balkan war. At the redeployment from the North Bulgaria towards the Turkish border the troops of 3rd army made forced marches over 200 km. Thus the largest operational and strategi-

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[3] The War between Bulgaria and Turkey 1912–1913. Vol. 1, Preparation of the War. Sofia, 1937, p. 308.

[4] Stanchev, St. The Human Losses and Their Replacement during the Wars of Bulgaria 1885–1945. Sofia, 2001., p. 10 – 11.

[5] History of the Military Art. Sofia, 1987, p. 121.

cal surprise for the enemy high command was achieved with the hidden deployment of 3rd army and its sudden appearance at the right Turkish flank. After the victory in the Luleburgas-BunarHissar operation 1st and 3rd army performed a very heavy maneuver towards the Cataldzha positions by making about 130 km in 6 days with only a one day rest. As a result the lost contact with the enemy is reestablished and the Turkish troops are not allowed to strengthen their new defensive line, their plans to attract fresh reserves from Anatolia and to counterattack based on the naturally strong Cataldzha position are interrupted.[6]

Even at the first period of the war appeared the new form of strategic offense – the offensive operation of the highest operational unit – the United 1st and 3rd Armies – a prototype of the front or the group of armies.[7]

A characteristic feature of the strategic offensive of the Bulgarian army during the first period of the war is its start at favorable conditions, because it is conducted against an enemy, who has not yet finished its mobilization and strategic deployment in the planned zones.[8]

By its offensive, the Bulgarian army inflicted its decisive strike over the most neuralgic point of the enemy disposition. The Lozengrad offensive operation of 1st and 3rd armies from 9 to 11 October is an example of high mobility, maneuverability and impetus in the actions of the Bulgarian troops. The achieved average rate of advance of 13 km per day is a significant result for that period. As a result of the defeat of the Turkish Eastern army in that meeting battle, the fortress of Lozengrad (Kirklareli) is seized on the move[9], and our High Command captures firmly the strategic initiative in the war until the ceasefire on 20 November 1912.

According to Louis Burzina, a correspondent of "Daily Telegraph", the capture of Lozengrad is "one of the biggest triumphs, known in the military history".[10]

The Luleburgas-BunarHissar offensive operation of 1st and 3rd army from 15 to 20 October 1912 is executed under difficult conditions: the enemy is defending at a preliminary chosen and heavily fortifies naturally strong position at the Karaagach river. The success of the Bulgarian army is due to the determination, persistence and bravery shown during the offensive and the heavy hand-to-hand battles at the gradual breakthrough of the Turkish positions.

One of the most effective methods for performing effective military actions – the surrounding of the enemy through skillful maneuvering – is also used with success from the Bulgarian army at operational level from the Kyrdzhali detachment

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6 Hristov, D.The traditions of the Bulgarians at War. – In: Military History Journal, 1996, Vol. 2, p. 156.

7 The War between Bulgaria and Turkey 1912–1913. Vol. 1, Preparation of the War. SOFIA, 1937, p. 309.

8 Krivorov, Ig. The Miltiary Art of the Bulgarian Army 1885 – 1945. Sofia, 2003, p. 32–33.

9 Hristov, D. Op. cit. p. 157.

10 Krivorov, Ig. Op. cit., p. 114.

and mixed cavalry brigade, which with pining by the front and striking on the both flanks on 14 November 1912 managed to surround and capture the corps of Yaver pasha at Merhamla.[11]

A special place in the military art of the Bulgarian army at the Balkan wars occupies the capture of the Edirne fortress by 2nd army after a night offensive army operation with rushed assault for less than 2 days (11 – 13 march 1913). In the next century this sort of pinnacle in the Bulgarian military art is established in the consciousness of several generations of Bulgarian as a real national triumph over the ottomans. Its significance from the point of view of the military art is that it is achieved in an epoch, when in most modern European armies are predominant the conceptions that the fortresses could be taken only by long-term sieges and gradual attacks.

The General Staff of the German army evaluated the actions of the Bulgarian army as follows: "The Bulgarians did not stick to the pattern forms of attack. They adapted to the situation and used very skillfully all possible means for forward movement", and in a report to the General Staff of the Austro-Hungarian army is shown: "The attack is in the blood of the Bulgarians, their fighting spirit and élan is worthy of admiration".[12]

The experience of the 2nd army at the decisive assault of the Edirne fortress gives example of a number of innovations in the world military art in the XX century: an army artillery group is created, the rolling artillery barrage is applied as well as the static artillery barrage and the artillery, accompanying the infantry; the use of the airplane for bombing; the first try for radio reconnaissance and radio jamming. And for familiarization with this priceless experience and for its study before the assault of the Edirne fortress military missions from different European countries and even Japan arrived.[13]

The formation and the extensive use in the fighting during the Balkan wars of the different formats of artillery groups is a Bulgarian contribution to the history of the military art. Their creation started during the first offensive operation of the Bulgarian Army – The Lozengrad (Kirklareli) strategic operation (9–11 October 1912). They are formed in 4th Preslav division on the idea of its commander Major-General Kliment Boyadzhiev, who ordered the whole artillery in the organic roster of the division to be concentrated in a divisional artillery group. Its objective is to cover a wider area of the subjected to artillery fire enemy positions. On 10 October at the battle of 1st and 3rd Brigades of 4th Preslav Division with three Turkish divisions at Eskipolos-Petra the batteries of the 1st artillery division from 5th rapid fire artillery regiment and 1st and 2nd artillery divisions of 5th not rapid fire artillery regiment act together. This is the first successful example in the Bulgarian army

[11] Hristov, D. Op. cit., p. 160.
[12] Krivorov, Ig. Op. cit., p. 115.
[13] Hristov, D. Op. cit., p. 161.

of a centralized management of the artillery from the regimental commander with redeployment of the fire by batteries.[14]

At the battles of the 4th Preslav division at Kara Agach during the Luleburgas-BunarHissar offensive operation (15–20 October 1912) the actions of its entire artillery are united under the command of the division artillery commander. Its positions are on the crest to the northwest of the Karaagach vineyeards, representing an enourmous battery of 72 guns at 2,5 km front. Thus is ensured a reliable communication with the artillery divisions and the artillery fire is managed on centralized manner. The more numerous Turkish artillery, located dispersedly at covered, masked positions is silenced due to the maneuvrability and the centralized command of our artillery.[15]

After the positive results from the actions of this group in the next operations of the Bulgarian army are created regimental artillery groups, other divisional artillery groups, and during the Chataldzha offensive operation (4 – 5 November 1912) and at the assault of the Edirne fortress the stage of army artillery groups is reached. These are formed from all the available artillery.[16]

The artillery at the assault of Edirne (11–13 March 1913) is divided in two groups: siege and accompanying. The siege artillery, whose command is centralized with the one of the howitzer batteries, prepares the attack and is following the attack with massed artillery fire and an artillery rolling barrage. In the accompanying artillery is included the field artillery, that at the infantry attack moves forwards and depending on the developments takes position immediately behind its battle line in order to be able to effectively support the infantry.[17]

In close relationship with the creation of the artillery groups is another Bulgarian patent, also implemented for the first time during the Balkan wars. This is the large concentration of artillery systems at the sector, planned for the main attack, thus achieving massing of the fire in an unprecedented scale. In close relation to the massing of the fire is the innovation of the parallel distribution of the artillery fire in depth of the enemy defenses, alongside the advance of the infantry.

The method of use of the accompanying the infantry advance field artillery is also a Bulgarian contribution to the world military history, by its application at the assault of the Edirne fortress (11–13 March 1913). At the preparation of the attack is envisaged the hidden movement of the accompanying batteries, thus ensuring the pursuit of the enemy, the efficient support for the infantry assault columns and for the securing of the latter on the captured enemy positions.[18]

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[14] History of the Bulgarian Artillery., Sofia, 1977, p. 110.
[15] Ibid, p.128–129.
[16] Krivorov, Ig. Op. cit., p. 98.
[17] History of the..., p. 165.
[18] Valkov, Iv. Victory at Edirne and the Role of the Artillery. In. Artillery Review, Vol. 25, 1930, p. 47.

At the first hours of 13 March 1913 1st Rapid fire Artillery Division of 5th artillery regiment and 2nd rapid fire artillery division of 8th artillery regiment, under the command of major Drumev and captain Ignatov[19], totaling 9 batteries[20], moved forwards, in order to relocated in the captured by the infantry enemy positions.[21] The actions of the accompanying the infantry artillery had an important role for the consolidation of the tactical success at the Aydzhi Yolu fort, after which the fate of the fortress is sealed. The Mobile artillery group, acting on the North section of the Easter sector under the cover of the siege artillery, moves forward to the assaulting infantry columns at the decisive moment of the assault of the Edirne fortress and not only supports it directly, but leads it forward, thus successfully performing its role of accompanying artillery.[22]

At Edirne the Bulgarian artillery employs massively all types of artillery fire, especially the flanking fire. The barrage fire, the direct destruction fire and the suppressing fire are used at the most appropriate times and with the greatest power possible The artillery fire is also used for making corridors in the wire obstacles.[23]

The defense of the Bulgarian army at the Balkan war (1912 – 1913) is characterized with a persistence and activity. Especially noted in this respect are the activities of the 7th Rila Infantry division at the Galipoli peninsula, where the Turkish Bulair corps is defeated.[24]

The transition to defense after the successful strategic offense in the middle of the war is a sign of the rationality of the Bulgarian military thought and for the increased potential of its military art. By this decision of the High Command favorable conditions are created for avoidance of further efforts, unnecessary material and human losses of the Bulgarian army and the preparation for a opportunity to finally achieve the war objectives by a second military campaign.

The improvement of the defense also continues, at a front of over 250 km and depth of 55–60 km. From engineering point of view it has the characteristics of a field defense and is developed in two lines – main and rear, and on the Constantinople peninsula also with a security line.[25] Of note is the organization of the defense also against a sea landing, due to the theatre of war – the Constantinople and the Galipoli peninsulas.[26]

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[19] Rusev, Iv.. Eight Infantry Tundzha Division in the War against the Turks 1912–1913. From the Beginning of the War to the Fall of Edirne inclusive., 1923, p. 342–343.

[20] Peev, Tr. The Accompanying Artillery Group at Edirne. In: Artillery Review, vol. 25., 1930, p.168.

[21] Darvingov, P. The Attack of Edirne under the Light of History and Art. Historical and Psychological Analysis, Sofia, 1931, p. 73–74.

[22] Peev, Tr. O p. cit., p. 172.

[23] Valkov, Iv. O p. cit., p. 47.

[24] Hristov, D. Op. cit., p. 163.

[25] Krivorov, Ig. Op. cit., p. 23.

[26] Peytchev, At. Op. cit., p. 315.

The strategic defense during the Balkan war of the Bulgarian army yields positive results. The advance of the enemy at the direction of his main strike is stopped at the security line, his advance does not exceed 10–12 km and the purpose of the defense is accomplished at the tactical zone,[27] which represents a significant achievement of the Bulgarian military defense art.

The use of the surprise factor in this war is an inseparable element of the military art of our army. As a surprise can be classified the mass introduction of the new, modern forms of artillery fire – the rolling barrage, the stationary barrage, the accompanying artillery to the infantry and the use of the airplane for the first time as a war machine. Without doubt the biggest surprise in the Balkan war for the Turkish command, its German military advisors, the specialists in Europe and around the world, and for the world public opinion is the capturing of the Edirne fortress with an assault with a night army offensive operation for just three days.[28]

K. Shumskii, a correspondent of the "Russkaya molva" newspaper describes the success of the Bulgarian army at Edirne like this: "The capture of one modern big fortress after a two day assault is a case totally unknown in the warfare history of the last century…Undoubted and real military art has been shown by the Bulgarians at Edirne. The truths of the military art are known to everyone, but to apply them in the real life only gifted men can".[29] Even more impressive are the reports of colonel Piere de Mondesire, a commendant of the Tulon fortress, who commented that the "The capture of Edirne is equal to the most glorious military achievements in the military history of all nations".[30]

The foundations of the Bulgarian operational art were established during the Balkan war, when as a result of the changes, the role of the separate army for independent solution of the strategic problems diminishes significantly. The qualitatively new conditions for conducting the war along with the massive introduction and war use of modern war technologies nullify the possibility the war to be decided with one o several battles. Thus the operations of the separate army gradually take medium place between the strategic and tactical activities.[31]

A big achievement of the operational art of the Bulgarian army at the Balkan war is the organization of a close cooperation between the land forces and the fledgling aviation and aeronautical units. The information of the aerial reconnaissance become an obligatory element in the decision taking for operational activities. The first written document-request for making flights on request from the land command at real warfare conditions in the world history was made by the Chief of

[27] Krivorov, Ig. Op. cit., p. 24.
[28] Hristov, D. Op. cit., p. 168.
[29] Krivorov, Ig. Op. cit., p. 115.
[30] Op. cit., p. 115.
[31] Peytchev, At. Op. cit., p. 417.

Staff of the United 1st and 3rd armies colonel Zhostov. This document is a reflection of the modern method for preparation and implementation of the operations by the Bulgarian military elite, and the aim to use the full potential of the airplanes, as an effective mean to achieve the final victory.[32]

At the Balkan war the Bulgarian army introduces a number of new methods in the area of the tactics. The frontal assaults are predominant as the method of breaking a preliminary prepared defense by the enemy (Lyuleburgas – BunarHissar operation, Chataldzha and Edirne operatons). This is due to the character of the enemy defense and the increased firepower capabilities of our army, as a result of the introduction of a new armament – rapid fire artillery, heavy machine gun and magazine rifle. New tactics also appeared – attack from starting position and breakthrough. The breakthrough in the Balkan war takes a qualitatively new form. At the Lyuleburgas-Bunarhissar operation and after it is related to breakthrough of the defense, of its firepower and engineering organization, related to the field.[33]

Throughout the Balkan war the deployment of the forces of the Bulgarian army is mainly where by accident or planning a breakthrough is achieved (4th Preslav division at Karaagach in the LyuleBurgas-BunarHissar operation and at the Eastern sector of the Edirne operation). Thus 4th Preslav division makes its first breakthrough in a prepared enemy defense by deploying at the breakthrough sector its main efforts and achieving a density of 4 infantry battalions and 30 guns at a kilometer of front. At Edirne these densities reach up to 9 infantry battalions and 52 guns at a kilometer of frontline.[34]

Further development of the offense is the assault of fortresses that is applied as a tactical method at Edirne. A central point is the creation of assault columns, their order and action at the capturing of different points, as well as the preliminary preparation. The troops train for the overcoming of wire obstacles through the making of passages of these with wire cutters and special 20 kg piroxylin charges. For the preparation of the breakthrough in the Turkish defenses a special note is taken of the intelligence.[35]

Throughout the Balkan war the tactical deployment of the defense evolves from a group one, made up of supporting points, to positional. The creation of long and deep trenches started, blindages, machine gun nests, artillery sites and other defensive facilities. The number of the positions and the depth of the defense increases. For example, at Chataldzha are created two-three positions, each of two lines of trenches, a front security, front and main position. In some cases also a rear position for the divisional reserves is created. The depth of the tactical defense is increased and reaches up to 6–8 km. At the defense of the shore of Marmara sea

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[32] Nedyalkov, D. History of the Bulgarian Military Aviation. Sofia, 2012, p. 37.
[33] Peytchev, At. Op. cit., p. 382.
[34] Krivorov, Ig. Op. cit., p. 24.
[35] Peytchev, At. Op. cit., p. 382.

positions are created only at the areas of the ports and the possible landing sites. There are positioned limited forces and means for observation and security. The main forces are positioned in depth, at areas outside the effective range of the enemy naval artillery. For the own artillery positions are equipped, allowing the fire on the enemy landing equipment.[36]

The military theory and practice up to the Balkan war defines the order of battle of the infantry division in the offensive operation to include: advance unit (first line), maneuvering forces (second line), reserve, divisional cavalry, divisional first aid point, firearms train, administrative and supply train and Engineering train. The diversity of the conditions, where the battles occur, leads to a further evolution in the order of battle. It is manifested mainly in changes of the composition and the functions of the known elements and the emergence of new elements in the order of battle and their deployment in depth.[37]

At the preparations and the dispositions for the decisive assault of Edirne the assault column is domineering. The commanders of the units are solving the problem of forming the assault columns, depending of the specific situation, the tasks of the troops and their capabilities. For seizing fortresses like Edirne besides assault columns are created supporting artillery groups. The Assault column is formed of a reinforces infantry regiment and acts usually in three lines. The first line includes infantry of a battalion size, a group of wire cutters, a group of workers with bales of straw, a group of grenade throwers (Bombiers), an artillery crew without equipment, a group of signalers. The wire cutters and the workers made passages through the obstacles. The grenade throwers made a grenade strike and the infantry is attacking the enemy. The signal troops mark the lines, reached by the assault column and request artillery fire in depth. The artillery crew is ready to take over and use captured enemy guns. The supporting artillery group is performing close artillery support of the assault column. It consists mainly of field artillery and moves behind the column.[38]

Within 10th Rhodope and 23rd Shipka regiments, that made the breakthrough at the direction of the main strike are formed respectively two assault columns in 10th Rhodope regiment[39] and 3 assault columns in 23rd Shipka regiment.[40]

A significant part of the achievements of the world military art and the application of innovations in the military technologies from the Bulgarian army are shown in the Edirne operation, at the development and the use of the artillery

36 Krivorov, Ig. Op. cit., p. 85.
37 Op. cit., p. 98.
38 Op. cit., p. 99.
39 Hristov, K. and Ivan Shkodrev. Military history of 10th Infantry Rhodope regiment. Sofia, 1942, p.91.
40 Pashinov, Iv. 23rd Inf. Shipka Regiment in the War with Turks and Allies – 1912–1913. Sofia, 1928, p. 92.

tactics. The three artillery sectors and the groups formed within these has the characteristics of regimental, divisional and army artillery groups. The groups have enough maneuvering capabilities for a centralized management from the senior artillery commander and for supporting the infantry on request from the regimental and brigade commanders.[41]

Thus the barrages appear, the rolling barrage and is registered the biggest concentration of artillery at the direction of the main strike. At Edirne the Bulgarian artillerists manage to improve the modern type of artillery fire – the rolling artillery barrage at firing at certain targets. These targets are fired upon, until the infantry reaches these, afterwards the artillery fire moves forward to the next target in depth of the enemy defenses.

Of 430 guns of the 2nd army, 226 are deployed at the Eastern sector. At the breakthrough sector – the forts Ayvaz Baba and Aydzhiyolu the Bulgarian command amasses 70 guns per km of frontline. Such a density of rapid fire artillery is created for the first time from the Bulgarian army. Its experience is used by the German army at Verdun and by French and English at the Soma river operation in 1916.

The participants in the Edirne battles evaluate positively the actions of the Bulgarian artillery. In his book "The New War" Hassan Djemal writes: "Due to the rain of shells, which the enemy was firing, everyone felt his hands and legs ties….Our troops in Ayvazbaba….was subjected to destruction. It was a massacre. At Ayvazbaba there was no point that has not been subject to grenade and shrapnel fire" The effect of the amassed use of the Bulgarian artillery at Edirne is enormous.[42]

The amazing action of the Bulgarian artillery is describes in the "Morning Star" newspaper in the following manner: "The most modern forts Ayvaz baba, Tash tabia and Aydzhiyolu are completely demolished. When one looks at the remains, a man cannot help but wonder of the Bulgarian artillery fire ".[43]

An important factor for the big moral impact on the enemy from the artillery fire of the Bulgarian army is the predetermined before the attack signal communication between the assault columns of the infantry and the siege artillery. Its fire precedes with a hundred meter the infantry units, with the artillery destroying the obstacles before them, by making passages through the barb wire, and does not allow the enemy to make free use of his firepower, and prevents the movement of the enemy reserves and its maneuvering at the rear of the positions for counterattacks.[44]

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41 History of the..., p. 188.

42 Peytchev, At. Op. cit., p. 386.

43 Krivorov, Ig. Op. cit., p. 114.

44 Ivanov, N. The Artillery at the attack of the Edirne fortress on 12 and 13 March 1913. – In: Artillery review, Vol. 25, 1930, p. 10.

No less important for the development and the improvement of the military art in the age of the mass conscripted armies have the shown be the Bulgarian army command skills for: taking decisions for the operation and its planning, effective preparation and conducting of the operation, the timely redeployment of the troops, the formation of massive artillery groupings within the timeline of the operation, the organization and conducting of the interaction between the different types of armed forces, the preparation of the artillery fire and the skillful use of the principles and methods of warfare.

In this context the conclusion is that the right selection of the Eastern sector command at Edirne for the direction of the main strike – the outer angel of the fortress – is one of the main factors for the success of the operation.

An especially notable achievement of the Bulgarian command is the night attach of the infantry units during the assault of the Edirne fortress from 11 to 13 March 1913. The attacks at night of the forwards positions and the fort circle are organized superbly by our commanders and implemented with extraordinary energy and elan from the Bulgarian troops. Indicative of the quality and the skills of the Bulgarian officer corps during the siege and the assault of Edirne are words of the French military specialist Piere de Mondesire: "Orders brief, concise and timely, absolute secrecy at preparations, grand discipline and patience in waiting, close relations between all troop types, surprise and energy in the execution, such are the characteristic features of the command and its subordinates in the glorious achievement, that the siege army should be proud of".[45]

The General Staff of the German army characterized the command staff og the Bulgarian army during the war in the following manner: "The Bulgarian officer is accurate, diligent and carrier minded, thoughtful and without pretensions, hard to himself, keeps calm, shows bravery and offensive spirit and is filled with passionate love to his motherland".[46]

The means for achieving the victory are laid down not only in the quantity and the quality of the personnel in the army, in the personal qualities of the military leader and his abilities to apply creatively the military art postulates, but also in the armament of his troops, product of the military technologies. Of course their development and the creation of armament and equipment destined to the army and warfare, are in close correlation to the improvement of the science and the machines and the appearance of the technical innovations. Therefore one of the most significant tasks of the military genius (the commander, the minister of war, etc.) is constantly to check, evaluate and implement in the armed forces all technical innovations, available to the state. These are implemented in the technical branches of the armed forces – the air force and the navy.

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[45] Krivorov, Ig. Op. cit., p. 115.

[46] Op. cit., p. 115.

During the First Balkan war the newest type of armed forces at that time – the air force – appears in the Bulgarian army. The development of the Bulgarian military aviation is closely related to the wide use of modern military technologies, product of the highest achievements of the scientific progress. The original innovations in the ise of the airplane for military purposes from the Bulgarian army during the First Balkan war are of landmark significance for the overall development of the aviation and the aeronautics in the world. The Bulgarian planes operate mainly in the air above Edirne, by conducting the first bombardment of enemy fortified defenses from the air. Thus in practical warfare conditions are confirmed the concepts for the big potential of the airplane as a war machine. The scope of the performed tasks widens – aerial reconnaissance, topographical photographing of the forts, throwing proclamations and leaflets, bombardment of important military sites, correction of the artillery fire. All these performances of the Bulgarian military aviation provoke the interest of the world public by underlining the importance of the warfare use of the airplanes.

On 3 October 1912 poruchik Nikifor Bodanov flies with his airplane Bleriot XXI over the area of the future battlefields, thus performing the first military flight of the Bulgarian military aviation.[47]

The actual military application of the Bulgarian air potential takes place over the sky of Edirne on 15 October 1912. At 9 AM at 15 km northwest of the town the balloon "Sofia-1" rises, with observation performed with the help of ordinary army binoculars. Until 5 PM with several flags messages are sent. On the next day, 16 October with the help of the balloon unit is parried an attempt for an attack by the Turkish garrison, supported by the fortress artillery at the direction of the Kemal village. At 9.30 AM of the same day the poruchiks Radul Milkov and Prodan Tarackchiev perform a 50 minutes flight for reconnaissance over Edirne – Kadynkyoy – Papastepe with a biplane Albatros F.II., with revealing the positions of the enemy troops, including his reserves, and poruchik Milkov bombards the enemy positions with several hand grenades. The date 16 October 1912 is significant not only for the Bulgarian, but for the world aviation and aeronautics, because for the first time over Europe in real military conditions in one direction are operating jointly a balloon and an airplane for providing the land forces with tactical air reconnaissance information.[48]

According to different authors the duration of the first military flight is between 1h 20m and 1h 30 m.[49]

On 18 October 1912 for the first time an attempt of perspective aerial photo-

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[47] Nedyalkov, D. Op. cit., p. 24.

[48] Op. cit., p.27–29.

[49] Tangalov, D. The Military Activity of the First Airplane Detachment during the Balkan War 1912–1913, Second part. – In: Military History Journal, Vol. 2. Sofia, 1998, p. 64.

graphing was made of the Turkish positions over Edirne from the spherical balloon "Sofia-1".[50]

On 19 October 1912 after takeover for a test flight tragically dies poruchik Hristo Toprakchiev. His airplane falls on the ground from an attitude of 30 m, crashes and in the flames of the benzene poruchik Toprakchiev burns.[51] This is one of the first aviation victims in war time in the world history of the aviation and aeronautics.

The innovations in the use of the Bulgarian military aviation during the Balkan war continue on 30 October 1912 with the flight of the 15-year woman – the Red Cross servicewoman Rayna Kasabova – the first woman in the world history to fly in the air. She accompanies poruchik Stefan Kalinov at this flight and distributes leaflets over the fortified Turkish positions over Edirne.[52]

The increased military potential of the Bulgarian military aviation gives the possibility on 14 November 1912 to perform a try for the world military history first joint reconnaissance flight of three planes – type Albatros, Voisin и Bleriot, that take off at different time and flight routes for observation over Edirne, but the mission is not finished due to worsening of the metereological conditions.[53]

The date 17 November 1912 is significant in the history of the Bulgarian and European military aviation with two things: the first military flight in Europe with targeted use of armament from the air, performed with a two seated biplane Bleriot XI-2, when along with the proclamations for surrender of the garrison, over Edirne are thrown two aviation bombs. At the same time poruchik Radul Milkov with a biplane Albatros F.II. with the help of the British correspondent Gor performs the first successful attempts for photographing from a plane in war conditions in Europe.[54] The crew of the other plane, consisting of the Italian Giovanni Sabeli (pilot) and major Zlatarov (observer) flies over Edirne and throws the already said two hand grenades, constructed by Naum Tyufejkchiev, thus implementing the first aerial bombardment of an enemy military site from a plane in the Bulgarian aviation.[55]

During the period of the first ceasefire in the Balkan war (20 November 1912–20 January 1913 г.) the innovations in the Bulgarian military aviation continue. For training the skills for the use of the bomb armament from 7 to 19 December 1912 a two week plane tactical exercise is performed with the available planes at the airfield Mustafa Paha (Svilengrad). This is the first in its kind training in the

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50 Nedyalkov, D. Op. cit., p. 30.
51 Tangalov, D. The Military activity..., p. 121.
52 Vasilev, V. and others. Op. cit., p. 273.
53 History of the military aviation of Bulgaria. Institure for Military History athe the General Staff of the Bulgarian Peoples Army. Sofia, 1988, p. 24.
54 Nedyalkov, D. Op. cit., p. 34.
55 Tangalov, D. The Military activity..., p. 110.

world practice, taking in mind its conditions and the objectives set by the young aviation commanders.[56] During the period of the exercise in the First airplane detachment 19 plane flights are made with a training use of bombs and grenades of different design.[57]

Immediately after the renewal of the war the Bulgarian military aviation wrote another significant page in the history of the world military art and in the area of the implementation of avant-garde technologies in real combat situations. On 22 January 1913 poruchik Milcho Mitev with the Italian pilot-volunteer Giovanni Sabelli performed a flight over Marmara sea, found and bombed the Turkish cruiser "Hayredin Barbarossa". This is the first in the world military air history attack from the air on a warship.

From the airfield of Cherkezkyoi on 24 and 25 January 1913 poruchik Simeon Petrov and the Russian pilot Fedor Kolchin with different planes conduct flights over the Turkish fortified positions at the Cataldhza line at an attitude of 1500–1800 m. This is the first operational reconnaissance in the history of the military aviation, with the Bulgarian pilot approaching to within 20 km from Constantinople and observing the enemy capital from a height of 1600m.[58]

On 26 January 1913 a new significant achievement in the use of the Bulgarian military aviation takes place. For the first time is applied in practice and with significant level of effectiveness the new method of warfare – the joint flight.[59] Consequently take off 4 airplanes from the First airplane detachment. These are piloted by Radul Milkov, St. Kalinov, N. Bogdanov and the Russian pilot N. Kostin. Radul Milkov flew over the North and the Northwest sector of the Edirne fortress, St. Kalinov follows the Tudhza river to the Turkish barracks and back; N. Bogdanov and N. Kostin over the North sector.[60]

The capture of the Edirne fortress and the approaching victory increase the self confidence of the Bulgarian High Command and the young specialist in our military aviation. This leads to the organization of the first real air bombardment of an enemy capital – Constantinople, which represents first try in the warfare history for the use of the airplane against a strategic site. The ambitious task is assigned to poruchik Simeon Petrov and the volunteer Ernest Byuri too late in the afternoon of 14 March, which does not allow for its execution. On the morning of the following day only Ernest Byuri takes off, and after a flight of nearly 2,5 hour lands back on the Cherkezkyoi airfield. At his return the pilot of the Bulgarian plane meets with an enemy airplane, piloted by a German flyer. This meeting can be described as the first in the history of the aviation hostile engagement between air adversaries.[61]

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56 Nedyalkov, D. Op. cit., p. 41.
57 Tangalov, D. The Military activity..., p. 118.
58 Nedyalkov, D. Op. cit., p. 42.
59 Op. cit., p. 43.
60 Tangalov, D. The Military activity..., p. 111.
61 Nedyalkov, D. Op. cit., p. 46.

On 23 March 1913 the Bulgarian military aviation performs its last combat flight during the Balkan war. It was done by the flyers of the 3rd aircraft detachment, and the tasks is a reconnaissance of the naval communications of the enemy at the Dardanelles between Gallipoli and Lapseki. Actually for the first time in the world history a prolonged flight over two continents is performed, accompanied with the throwing of 4 aviation bombs over enemy sites in Lapseki and Galipoli, and while flying over the Turkish positions at Bulair the Bulgarian plane is fired upon from the ground with guns with shrapnel.[62]

During the Balkan war the Bulgarian army pioneers also in the massed use of the communication troops as a new, separate type of armed foreces. Then, besides the implementation of communication, the communication troops laid the beginnings of the radio reconnaissance and the radio jamming, predecessors of the radioelectronic warfare. At the preparation for the Edirne operation the communication troops of the 2nd army with radio jamming interrupt the radio communication between the troops of Shukri pasha and the Turkish High Command. In the radio jamming took part also the radio operators of the cruiser "Nadezhda", who jam the radio stations in Edirne and Constantinople, and these are the only connection between the besieged garrison and the High Command of the Turkish army. A navy command from the Bulgarian Black Sea fleet organizes and implements the phone connections between the command of the 2nd arm and the attacking forward units of the Eastern Sector of the Edirne fortress, and at the decisive assault service the searchlight units, which are ably used from the Bulgarian command to blind the Turkish artillerists and observers.

The contribution of the Bulgarian military thought in the use of the plane is not restricted to the scale of the tactics and the operational art, but rises to the development of the aviation on strategic level. In difference to Germany and France, the Bulgarian commander fix the developments of the aviation technologies to the needs of the war.

Besides these examples in the activities of the Bulgarian military aviation during the Balkan wars are realized other contributions to the world military art, related to the application of the avant-garde technologies in the area of armaments in real combat. In the first weeks of the war, the rapid advance of the land forces of the Bulgarian army ensure the possibility for the first time in the world military practice to make an airfield maneuver and to equip three types of airfields: main, reserve and refueling. After the end of the war against the Ottoman empire due to the preparation of the Bulgarian army for military action against the allied forces in Macedonia, our entire aviation is transferred to the west at a distance up to 500 km. This massive maneuver represents the first in the world military history operational relocation of aviation units at war.[63]

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62 Op. cit., p. 47.

63 Nedyalkov, D. Op. cit., p.52–53.

For the first time in the world military history the Bulgarian aviation command during the Balkan war shows operational skills and estimates correctly the potential of the air forces for administering moral and psychological impact on the enemy. This is done by the distribution of various types of agitation and propaganda materials over the besieged fortress and the town Edirne. The throwing of leaflets (called "proclamations") by the Bulgarian military aviation is performed for the first time on 18 October 1912, and then on 16 and 17 November 1912, 23 and 24 January 1913 and 09 March 1913.[64]

The Bulgarian military aviation during the Balkan war leaves a significant mark also in the area of the improvement of the logistic support, the supply and the maintenance of the new type of war equipment – the airplanes and the balloons. For the first time in the world military history on 22 September 1912 in a report from the commander of the airplane detachment N. Bogdanov the idea is raised for forming a mobile airplane workshop. It is not realized in practice, but aviation workshop in the Bulgarian aviation does exist, although it is not Bulgarian. It concerns the workshop of the Russian unit of volunteers and mechanics of Schetitin, which after their release in February 1913 until the end of the war with Turkey is used by the First airplane detachment of the Bulgarian aviation.[65]

There exists records for organization and steady supply of spare parts for the Bulgarian military aviation during the Balkan war, thus achieving a step forward in the area of the provision of interchangeability of the aircrafts and giving the aviation commander more security and time in the tactical planning of the combat flights and training flights.

An important element in the system of logistic provision of the aviation formations is the basing on appropriate airfields and the creation of reliable shelters for the aircrafts. Based on the preserved documents can be stated that the Bulgarian military aviation is world class pioneer in this area as well. Each of the airplane detachments is based and uses at least two airfields, with at the same time performing relocations to closer to the enemy airfields, with providing everywhere at some level covering protection over the valuable equipment – the aircrafts. In the beginning of the war the detachments have only improvised hangars, made from on hand materials. Only in 1st detachment at the end of October 1912 there is one specialized hangar for a monoplane Bleriot, and in November the same ear are supplied 4 more tent hangars for Farman and 4 tents for Bleriot.[66]

We have already stated that the Bulgarian army during the Balkan war massively applies modern war technologies in the process of use of the aviation not only for reconnaissance, but also for bombardment of enemy sites. For this pur-

64 Tangalov, D. First Airplane Detachment during the Balkan War 1912–1913, First part. – In: Military History Journal, Vol. 6. Sofia, 1997, p. 64.

65 Op. cit., p.157–158.

66 Op. cit., p.159–160.

pose in October 1912 from Russia are imported 120 aviation bombs “Gelgar”. The Bulgarian aviation uses also other models of airplane bombs. Those are : cubical hand grenade, produced in Bulgaria; spherical bombs, developed by the company of the Czech engineer Stascik in Bulgaria; the hand grenades of Naum Tyufekchiev, adopted in the Bulgarian army in 1906 – 1907.[67]

Therefore the Bulgarian aviation command shows a great determination and technical intuitiveness in the selection of aviation armament, with no hesitation to use these at real combat situations.

Furthermore, it made many efforts and spent a solid amount of funds for equipping the aviation units with equipments and apparatus for releasing the bombs and the other armaments with the aim of registering of as close as possible to the bombarded site impacts. These equipments are product of the most modern techonologies then available. At the beginning of October 1912 the Bulgarian army supplied from Russia one bomb throwing apparatus system “Landwehr” with 5 pcs of bombs. Later the same month 3 more such units (bombsights) again Russian production, but “Gilgar” system are sent from Odessa to the HQ of 2nd army.

An aviation bomb throwing unit is constructed also from the already mentioned Czech engineer Stashcik. Due to technical difficulties his unit is not adopted in the Bulgarian military aviation by the end of the war against Turkey. But records exist for the installation and the experimental use of the systems “LAndwehr” and “Gilgar” in the 1st airplane detachment in December 1912 and January 1913.[68]

Despite its small size and lack of combat experience the Bulgarian fleet has some noted examples of activity during the Balkan war that raises the level of our naval art to a new level. After the heavy defeats of the Turkish Eastern army at October 1912 the sea communication Kyustendja – Istanbul is of a special importance to the supply with valuable war materials from Germany of the Turkish army. Due to this, with the declaration of the war the Turkish command left in Aegean and Ionian seas only old warships, and its main forces are relocated in the Black sea, where it immediately blockades the Bulgarian shore and cruises in the seas alongside it, thus forcing Bulgaria not only to wage war on the main land forces of the Turkish army at the Eastern Thrace, but also against nearly all Ottoman naval forces.[69]

At the first sea raid by the flotilla of the Bulgarian torpedo boats is discovered that the fast (26 sea knots) ships can not catch up with the theoretically slower merchant ships. The reason is that due to the daily patrolling of the both sides of the minefield along the Bulgarian shore the boilers of the Bulgarian torpedo boats have been polluted and these are not capable of achieving their planned speed at

[67] Op. cit., p. 161.

[68] Op. cit., p. 163.

[69] The War between Bulgaria and Turkey 1912–1913. Vol. IV. The Chataldzha battle. Sofia, 1932, p. 473.

the decisive moment.[70] The speedy identification of the technical problem and the adequate measures taken for its removal and the consequent recovery of the main advantage of the torpedo boats – their speed and maneuverability in shore waters, represent a significant Bulgarian contribution in the area of intensification of the avant-garde naval technologies and the tactics of the small warships.

By initiative of the Navy, the Bulgarian High Command assigns it the task to interrupt the enemy communication Kyustendja – Istanbul, despite its difficulty, due to the superiority of the Turkish fleet, which blockades our Black seas shore. On the night of 7th to 8th of November 1912 a group of 4 Bulgarian torpedo boats discovers a convoy of Turkish ships and immediately attacks the cruiser "Hamidiye". One torpedo from the torpedo boat "Drazki" with captain Ensign Georgi Kupov strikes the bow of the enemy ship and damages it.[71]

The attack on the "Hamidiye" is brave and successful. It results in the heavy damage of the Turkish cruiser – at the front, below the bow a gap of 4 by 5 meters was made, the deck armour is deformed; 10 Turkish sailors are killed and wounded. The ship manages with great effort for 6–7 hours to get to a repair dock in Istanbul. "Hamidiye" is out of commission for two months, that makes a big impression in Istanbula and among the crews of the Ottoman navy, because after 8 November the Turkish ships in Black sea become more cautious, sail away from the Varna harbor and move to the open sea earlier – usually at 5 PM, sometimes earlier.[72]

As a significant reason for the successful attack, besides the exceptional bravery of the crew of "Drazki" and the favourable conditions for action: rough seas, mist, dark night – ideal for a torpedo attack, surprise and speed in the maneuverability of the Bulgarian torpedo boats around "Hamidiye", can be pointed the tactical acumen of the Bulgarian sailors. The plan of the commander of the flotilla Captain II rank Dimitar Dobrev is based on the similarity of the silhouettes if the Bulgarian and Turkish torpedo boats (both types have a similar look, equal tonnage and are constructed at the same time at the same shipyard), as well the use of light signals, used by the Turkish navy. As a result of the wits and tactical acumen of the Bulgarian sailors, the crew of "Hamidiye" initially mistakes the torpedo boats in the mist and the dark night for Turkish ones[73], and when the deception is found is too late to avoid the torpedoing of the cruiser.

The actions of the Bulgarian torpedo boats not only neutralize a big enemy warship, but make certain impact on the negotiations made by the Bulgarian diplomacy and the HQ of the Army in the Field, towards the coercion of the Turkish

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70 Op. cit., p. 476.

71 Vasilev, V. and others. Op. cit., p. 270.

72 The War between Bulgaria and Turkey 1912–1913. Vol. IV. The Chataldzha battle. Sofia, 1932, p. 484.

73 Petrova, Evd. Two Unknown German Documents for the Torpedoing of the Cruiser „Hamidiye" during the Balkan Wars (1912–1913). – Military History Journal, Vol. 2. Sofia, 1988, p. 110.

delegation to conclude a ceasefire at unfavorable terms. After the torpedo attack on "Hamidiye" the shipments on the communication line Kyustendzha – Bosphorus are sharply decreased. The superior enemy fleet is forces not to approach the Bulgarian Black sea shore.[74]

By idea of the Captain II rank Dimitar Dobrev the Bulgarian training cruiser "Nadezhda" is rearmed with 100 мм guns. The performed training test firings with a significant amount of shells give good results and increases the confidence of the navy of the combat utility of the cruiser.[75] Thus the command of the Bulgarian Black Sea fleet made an attempt in real war conditions to create a naval squadron, to operate in open seas, the backbone of which to be the cruiser "Nadezhda" and the torpedo boats. The eventual naval action of the planned squadron will increase significantly the capabilities of the Bulgarian navy and will create favourable conditions for achieving operational results at open seas.

The review made of the main contributions in the development of the Bulgarian military art during the Balkan war (1912–1913) gives us enough reasons to place it among the leading ones in the beginning of the XX century. The rich war experience of the Bulgarian military aviation is used with great success by all the countries, participating in the First World war, a proven fact, which proves the domination at world level of our military aviation in the period of the Balkan war.[76]

The most synthesized synopsis of the world level achievements of our army includes several dimensions: the creation and the use of the army artillery group, the widespread use of the rolling artillery barrage at offensive operations, the invention fo the stationary barrage and the creation of artillery units for close cooperation and accompanying of the infantry, the use a new weapon – the airplane – for reconnaissance, observation and bombardment of the enemy positions. Besides the Bulgarian army made the first organized and carefully planned examples of radio reconnaissance and radio jamming.

The expected results from the elaboration and the introduction into scientific exchange of the problem for the introduction and practical use of modern military technologies and new elements of the military art of the Bulgarian army during the First Balkan war, are projected in two main fields. The first is the in-depth research into unknown or not popular episodes from the military history of Bulgaria, related to the topic of the study. The second is related to the fact, that a significant part of the problematic about the new military technologies and the introduction of not used before that point methods and forms of military art, used on large scale in real

[74] Prokopiev, An. The Coastal Landing Defense of the North Black Sea and Varna druing the Balkan War. – In. Military Alliances and Coalitions during the XX Century. Sofia, 2007, p. 127.

[75] The War between Bulgaria and Turkey 1912–1913. Vol. IV. The Chataldzha battle. Sofia, 1932, p. 485.

[76] Nedyalkov, D. Op. cit., p. 527.

warfare from the Bulgarian army during the First Balkan war, like the airplane, the rolling artillery barrage, the army artillery group, the artillery for close cooperation and accompanying of the infantry have not lost their significance and topicality today, despite the deep changes at the technological level of our informational and globalised society.

Geoff Jackson (Canada)
The Canadian Motor Machinegun Brigade: A failed experiment with technology

The Canadian Independent Force (and its precursor, the Canadian Motor Machine Gun Brigade (CMMGB)), was a bold and innovative idea, championed by its creator, Raymond Brutinel. It was a force envisaged to deliver mobility and robust firepower to frontline units. It was hoped that this force would bring back mobility to the Western Front and thus revolutionize offensive military operations. However, this was not the case. Though it was a unique use of technology and demonstrated in rare instances what the potential for mobile warfare could be, it was overall a failure, the project in the end not being worth the time, energy, and manpower dedicated to it.

Brutinel was originally from the French Pyrenees, joined the French army in 1901. Starting as an enlisted man in the 53rd Regiment d'infanterie de Tarbes, he rose through the ranks until he was called out of the ranks and into the platoon of officer-cadets. However, he quit the military and immigrated to Canada in 1905, and at the dawn of the First World War was a wealthy businessman living in Montreal.[1] At the outbreak of war, Brutinel offered to raise an independent force of motorized armoured cars for the 1st Canadian Division. Supported by powerful politicians, such as the Minister of Defence, Sam Hughes, (thanks to $150,000 in donations from 15 Canadian businessmen)[2] the CMGGB was raised. It was envisioned by Brutinel to be used as a highly mobile breakout force that would deliver a powerful punch and would be able to strike forward and grab crucial territory if the opportunity presented itself.

There were 20 vehicles in all that formed the initial CMMGB. Eight armoured machinegun cars would be the fighting nucleus in the unit, with the remainder including five trucks for carrying ammunition and supplies, four for transporting the officers, one for carrying gasoline, one repair truck, plus an ambulance.[3] In all the 1st CMMGB consisted of around 350 men in the unit.[4]

All vehicles would be camouflaged a dull grey: "…so as to render them as inconspicuous as possible,"[5] and would also have interchangeable parts to facili-

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1 Eds. Bernard Horn & Stephen Harris. *Warrior Chiefs: Perspectives on Senior Canadian Military Leaders.* Toronto, 2001, p. 57

2 Ibid., p. 60

3 Cameron Pulsifer. *The Armoured Autocar in Canadian Service.* Ottawa, 2007.

4 Library and Archives Canada [LAC] RG9, Series III-D-3, Volume 4986 "War Diary 1st Canadian Motor Machinegun Brigade- June 1915"

5 *Ottawa Citizen*, 24th September 1914, p. 7

tate speedy repairs. The eight fighting vehicles would have modest armour plates (between one and two inches in thickness), and their roofs would be open with the driver's head visible above the armour. The front of the car would mount two headlights and a large searchlight. There were initially two Colt machine guns (these would be switched to Vickers as the war proceeded) mounted centrally, and running the length of the sides were steel chests holding ammunition (which could carry around 12,000 rounds). In ideal conditions, the fighting cars could reach speeds of 64 kilometers per hour, though they would normally travel at around 24km an hour. They would have a crew of eight (commander, driver, and two full Vickers machinegun crew), be almost 15 feet in length, and weigh three tons.[6]

The CMMGB vehicles were not the first armored vehicles used on the Western Front. It became obvious during the fall of 1914 that lorries (trucks) and cars were prime targets for strafing planes. The Royal Naval Air Service (RNAS) responded to this attention by equipping some of their vehicles with machineguns and boilerplates in lieu of proper armour. In September of 1914, 60 purpose built armored cars each equipped with one Maxim machinegun arrived in France. These were surrounded by a four millimeter thick armour plate, and by the end of the year the British cars had evolved into a completely enclosed armoured hull with their machineguns mounted inside a revolving turret.[7] The armoured car unit was named the Royal Naval Armoured Car Division, and it was soon taken over by the army and called the Machine Gun Corps (motors). In early 1915, with the solidifying of the Western front, these vehicles were not viewed as playing a useful role and were largely transferred to the Middle Eastern theater where they might be of more use.[8]

The 1st CMMGB was in England by October of 1914, however when the Canadian 1st Division went to France the following February the CMMGB did not follow. It was felt that they unbalanced the firepower of the Division and General Alderson, commander of the Canadian Contingent, left them behind.[9] In June of 1915, when the CMMGB finally went to France, three more batteries now also supplemented it. These new batteries consisted of unarmoured trucks that would carry machineguns, and when entering combat would unload the guns from the trucks to engage the enemy.[10] By the beginning of 1918 the 1st CMMGB consisted of 20 vehicles carrying guns, (the original 8 cars were the only ones that had mounted guns) and scouts mounted on motorbikes.[11] The CMMGB would evolve and expand in May of 1918 into the Canadian Independent Force operating under

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6 *Royal Canadian Armoured Corps: An Illustrated History*, p. 39

7 Fletcher, David. *War Cars: British Armoured Cars in the First World War*. London, 1987, p. 87

8 Ibid., p. 90

9 Tim Cook. *At the Sharp End: Canadians fighting the Great War 1914–1916.* Toronto, 2007, p. 88

10 Paddy Griffith. *Battle Tactics of the Western Front: The British Army's Art of Attack 1916–18.* London, 1994, p. 129

11 The cyclist battalion consisted of 300 infantry

the Canadian Machinegun Corps. This was to be regarded as:

"… a distinct arm, intermediate between the infantry and artillery, and with tactics of its own. Though there were occasions when M.G. companies or batteries might be temporarily attached to infantry Brigades or Battalions for duty, machine-gun Battalions were divisional troops, under the command and tactical control of a Divisional Machine gun Commander, whose position was closely analogous to that of the CRA (Commanding Royal Artillery) of a Division with respect to artillery."[12]

The commander of the Canadian Machinegun Corps was Brigadier General Raymond Brutinel.

It became clear in the summer of 1915 that the Colt machineguns were not as effective as Vickers and were soon switched on the eight motorcars. It also became obvious that the fighting on the Western Front was static and that cars would have little utility. The troops would have to dismount and fight on foot, forming groups of machine gunners to be added weight to a section of the attack. This would be the role played by the CMMGB for 32 months.[13]

To give an idea of the role these units played during this time, the Battle of Hill 70 will be examined as a case study. Hill 70 was a Canadian Corps' two-division attack. Lieutenant General Arthur Currie, the Canadian Corps commander, proposed an attack on Hill 70 in July of 1917 as an alternative to attacking the town of Lens directly, as he had first been instructed to do by General Henry Horne of the 1st Army.[14] The attack would be a limited bite and hold where the 1st and 2nd Canadian Infantry Divisions would take Hill 70 (the high ground overlooking Lens) and wait for the Germans to counter attack. Currie and senior Canadian commanders believed that the Germans would immediately launch counter attacks which, thanks to massed Canadian firepower, would suffer severe casualties.[15]

On July 16th the 1st CMMGB received operational order No.121. They were ordered to dismount from their vehicles and take up positions under Divisional Machinegun Companies, and to apply harassing fire by night on all targets engaged by the artillery during the day.[16] Between July 17th and August 14th, 20 Vickers guns from the 1st CMMGB would fire 22,000 to 26,000 rounds per night, usually from 10:30 pm to 3:30 am, at predetermined German positions.[17]

On the 15th, the day of the assault, the CMMGB provided covering fire from 4:30 to 6:30 as the infantry advanced up Hill 70. From 6:30am until 4:30 pm the guns were ordered to respond to S.O.S signals. From 5:00pm until 9:30 in the

12 G.W.L. Nicholson *Canadian Expeditionary Force 1914–1919.* Ottawa, 1964, p. 383

13 See the War diaries of the Canadian Motor Machinegun Brigade from June 1916–March 1918.

14 Geoff Jackson "Anything but Lovely: The Canadian Corps at Lens in the summer of 1917" *Canadian Military History*, Volume 17, Number 1, Winter 2008, p. 5

15 LAC RG 9 III C3, V.4014, folder 17, file 20, "Notes on the Attack"

16 LAC, RG9 Series III-D-3, 4987 "Report on Operations" 17th July to 20th August 1917"

17 Ibid.

evening the guns fired at predetermined German targets. All told the 1st CMMGB fired 197,500 rounds that day. From the 16th of August until the 20th of August the unit fired an average of 81,000 rounds a day at German targets. On the night of August 18th, after four days of hard fighting, an understandably elated Currie wrote in his diary:

"There were no fewer than twenty-one counter attacks delivered, many with very large forces and all with great determination and dash… Our casualties so far about 5600 but in my opinion the enemy casualties must be close to 20,000. Our gunners, machine gunners and infantry never had such targets, FOO's could not get guns for all their targets… It was a great and wonderful victory. G.H.Q regard it as one of the finest performances of the war…"[18]

Obviously machineguns played an important role in the attack on Hill 70 and were a necessary component of the Corps' success. However at no point was the use of the Motor Machinegun vehicles used operationally.

In the first 32 months that Brutinel's force had been deployed to France it had not used, in any effective manner, the vehicles that made this force unique. The machineguns were certainly effective and added a much desired punch to infantry attacks and defensive stands, however, the vehicles were ineffective and of little use. The unit- as well as the Corps- would have been much better served if it had just been integrated with divisional machine gun companies and been added on permanent strength. The founder of the motorized machinegun group was also reaching this conclusion. In early 1918 Brutinel pronounced the cars obsolete and no longer suitable as carrying platforms for mobile actions. He claimed they were hampered by the armour and that the motorized machinegun group should be unarmoured and used in a transport role. They had not found an effective use on the Western Front.[19]

In March of 1918, the Germans launched a last ditch effort called Operation Michael that they hoped would knock the Allies out of the war. A series of large scale offensives fell against the British 4th and 5th Armies at the Somme on March 21st. The British line began to crumble as the Germans surged forward making gains of up to 20 miles. The British high command was desperate for defensive weapons such as machineguns, and requested the 1st CMMGB. The unit, now commanded by Lieutenant Colonel W.K. Walker, travelled south from Vimy (where the Canadian Corps was located) to the 5th Army on the Somme.

On the 23rd, Lieutenant Colonel Walker met General Gough and his Chief of Staff, Major General Percy, at Villers-Bretonneux. It was decided that the unit would have three objectives; 1: to get in touch and co-operate with the nearest infantry. 2: to establish machinegun posts in depth. And 3: to support the machine-

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18 LAC MG 30 E100, Arthur Currie Papers, War Time Diary, 18th Aug 1917.
19 Cameron Pulsifer. *The Armoured Autocar in Canadian Service.* Ottawa, 2007, p. 15

gun posts by armoured car action. [20]

The eight autocars, as well as all the other vehicles, were quickly thrown into the fray. The unit was equipped with 40 Vickers machineguns (sixteen of them were mounted on the eight armoured cars), 51 scouts on motorcycles, as well as all of the ancillary supply/transport trucks. The tactics, as Captain H. F. Muerling, commander of the "D" and "E" batteries explained in the Brigade's narratives, were: "… of necessity very simple. They consisted simply in giving everybody as free a hand as possible to check the enemy wherever we could."[21] The autocars and trucks would rush to an area that saw a German attack coming and deploy. The scouts were especially useful in obtaining information on the location of German forces as well as maintaining intercommunications between the infantry, artillery, and armoured cars.[22]

The Motor Machinegun Brigade saw intense action over 18 days and was constantly engaged. An after action report by Lieutenant W.J. Campbell demonstrated how the vehicles were used:

"We moved out of Roye by 6 a.m. and took the convoy about half way to Amiens. From there, at about 2 p.m. I took four guns into a position on the outskirts of Warvillers. This was held for a while and then moved forward and up positions in front of Bouvroy. Early in the morning a German staff car, which had apparently lost its way drove up the rode and when about 75 yards we opened fire and put the car out of action…"[23]

The cars and trucks offered the British forces a unique tool. They were able to intervene in one location and then withdraw and quickly move by road to another location to deliver firepower.

The vehicles were also used to transport supplies. They were often loaded up with rations and ammunition that they transported to forward positions. These supplies were often badly needed by the men at the front who had been holding lines for days without any sort of relief. The 1st CMMGB Diary recounts one such action:

"… [The Car] went up full speed along the road, passed the gun line and turned round in No Man's Land, where Mowat called to the boys to come and unload it. At once our men clustered around it and had it unloaded. This was done in full sight of the enemy in No Man's Land. With machinegun bullets flying thick.

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20 W. K. Walker. "The Great German Offensive, March 1918 with some account of the Work of the Canadian Motor Machine Gun Brigade" *Canadian Defence Quarterly*, Vol. III, No.4 July, 1926, p. 404.

21 LAC, RG9, Series III-D-3, 4987 "Canadian M.M.G.B Narrative H.F. Muerling".

22 W. K. Walker. "The Great German Offensive, March 1918 with some account of the Work of the Canadian Motor Machine Gun Brigade". – *Canadian Defence Quarterly*, Vol. III, No.4 July, 1926, p. 404.

23 LAC, RG9, Series III-D-3, 4987 "Canadian M.M.G.B Narrative by W.J. Campbell".

The Infantry looked on in astonishment, and one officer asked Lieutenant Black what the devil was the car doing there. “Bringing rations to the machine gunners.” Said Lieut. Black. “We have had no rations for six days” said the officer, “Do you always bring rations up to No Man’s Land?” “Yes, when we have to”. Said Lieut. Back, “men can’t fight on empty stomachs”[24]

As the *London Times* enthused: “Everywhere they went they strengthened the line. They gave the infantry fresh hope and courage.”[25] Clearly the CMMGB had played a useful role during the German March Offensive.

That said, the vehicles were not without their drawbacks. After the German Offensive it was suggested that the vehicles should be equipped with “double drive” so that they could be driven from the front or rear. They could not leave a position without backing up, and maneuvering in sunken roads or on steep hills proved impossible. They were also restricted to keeping on roads, which meant that they were limited in the locations they could access. Also, the crews were incredibly vulnerable to enemy fire. During the 18 days that they were engaged, they suffered 25 killed, 118 wounded, and 11 missing. 352 men had been deployed to the Somme, which worked out to an obscene casualty rate of 43 percent.[26] Two armoured cars and many trucks had been destroyed.

The CMMGB’s maneuverability was an asset, and though they were not used as the offensive weapon envisaged in their creation, they found a role to play. However, in the end, because of the size of the small sized brigade, it could not have played a significant role in stopping the German attack. At best, they helped reinforce localized lines in the area they were operating in around the Somme. Also the heavy casualty rates the Brigade suffered would have completely destroyed this unit if they had been deployed any longer. Currie wrote: “It is difficult to appraise its [Canadian Motor Machine Gun Brigade] correct extent and influence, material and morale, that the forty machineguns of that unit had in the events which were then taking place. The losses suffered amounted to about seventy-five percent of the trench strength of the unit…”[27] Though the German Offensive during March and April began to show that motorized warfare could be effective, at least in a defensive role, there were still fatal flaws in the CMMGB.

With the relative success it had enjoyed that spring, the 1st CMMGB was not dismantled as had been planned in January. Both Brutinel and Currie had ideas of the potential that this unit could play in the future, apparently overlooking the

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24 LAC, RG9, Series III-D-3, 4987 “Canadian M.M.G.B Narrative H.F. Muerling”.

25 Cameron Pulsifer “Canada’s First Armoured Unit Raymond Brutinel and the Canadian Motor Machine Gun Brigades of the First World War”. – *Canadian Military History*, Vol. 10, Number 1, Winter 2001, p. 51.

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27 Ed. Mark Humphries. *The Selected papers of Sir Arthur Currie: Diaries, letters, and Report to the Ministry, 1917–1933.* Waterloo: Wilfrid Laurier University Press, 2008, p. 220.

staggering casualty rate or the limitations demonstrated by what type of terrain they could operate on (ie no cross country capability). Field Marshal Douglas Haig was also enamored with what the 1st Motor Machine Gun Brigade had done during March and April and wrote that: " the work of the 1st CMMG Brigade in recent operations has proved the value that can be obtained from such units, and recommends the formation of a 2nd Brigade be undertaken forthwith."[28] A second Motor Machinegun Brigade was duly raised in May. These two Brigades were incorporated into a newly authorized formation called the Canadian Independent Force, under the overall command of Brutinel. This force consisted of both Motor Machine Gun Brigades (four autocars for the first Brigade and two autocars for the 2nd Brigade, with no new cars being made), additional machine gun bearing trucks, around sixty motorcyclists, two trucks mounting trench mortars, a cyclist battalion (composed of 300 bicyclist) and various ancillary vehicles.[29]

In early August, the BEF began its massive offensive against German forces, and initially the Canadian Independent Force was used as its predecessor had been in 1916–1917. Dismounted they advanced with the infantry, delivering useful firepower, however, they were not utilizing the mechanization of their force. This was about to change. On August 24th, Haig informed Currie that the Canadian Corps would attack along the Scarpe, push through the heavily fortified Drocourt-Queant Line, and hopefully take Cambrai and beyond.[30]

On the 30th of August, Currie met with General Horne at First Army Headquarters and went through the final plans. The tactics drawn up by the Canadian Corps saw the Canadians ripping a hole in the Drocourt-Queant position. This would allow for a rapid breakout, and Canadian leadership had hopes that cavalry would be used. That said, Currie knew that the Germans still occupied a very fortified position, acknowledging in his diary that the "boche will fight us very hard."[31] The plan came apart 36 hours before the attack was to go in when the commander of the British 4th Division, then attached to the Canadian Corps, informed Corps headquarters that because of recent fighting heavy casualties had been suffered and they would not be able to protect the Corps' flank, necessitating the almost doubling the Canadian front. A two-brigade attack was whittled down to a 5-battalion attack.[32] Once the 12th Brigade took its objectives (the Red line on the crest of Mount Dury) on September 2nd with the support of full artillery coverage, the Canadian 11th Brigade, with a reserve battalion from the 12th Brigade, would carry out the breakout assault with the Canadian Independent Force. Currie realized that

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[28] John Wallace *Dragons of Steel: Canadian Armour in Two World Wars*. Ontario, 1995, p. 61.
[29] LAC, RG9 Series III-D-3, 4987 "2nd Motor Machinegun Brigade War Diary- June 1918".
[30] LAC MG 30 E100, Arthur Currie Papers, War Time Diary, 24th Aug 1918.
[31] Ibid., 29th Aug 1918.
[32] LAC RG 9 III D 3, V. 4945 "102nd Battalion War Diary, Amendment B to Operation Order No. 136".

this under strengthened force would limit the breakout potential, lamenting: "… [it] will interfere with the exploitation we expected to be able to do."[33] It was hoped that the Canadian Independent Force would pass through the gap torn by the advancing infantry and race down the Arras-Cambrai highway to seize a bridgehead across the Canal du Nord some 6 kilometers distance.

The Canadian Corps and the Independent Force were optimistic that this would be a success. It was assumed that once they passed through the gap, that the forces would only encounter: "a certain amount of resistance along the road".[34] In fact, Corps intelligence had informed Currie and his staff that it was bristling with German artillery and machinegun emplacements.[35] Orders nevertheless just mentioned that German forces be "dealt with the utmost vigor".[36] In what turned out to be optimistic terms the 11th Brigade's orders were written that they should: "exploit the success, seizing the high ground east of the Canal du Nord." As for the German defensive positions between the Drocourt-Queant line and the canal, they "should be thrown into confusion by the attack, [cut off]… and rapidly dealt with"[37] by the Canadian forces. Corps headquarters were so confident in this largely untried force that long range artillery fire would actually be suspended- not even smoke would be allowed- to allow the Independent Force to use the roads.[38] The Red line was at the extreme range for most of the supporting artillery pieces. There were serious consequences to this decision, the most crucial one being that German defences and artillery would (indeed, could not) be neutralized. This was going against Corps' doctrine of the last 3 years that focused heavily on artillery bombardment being able to disable German defences before an infantry attack was to go in. It is interesting that Currie and senior Canadian leadership, especially his chief of staff Norman Webber, would put so much stock in this largely untested technology and turn their back on what had proven successful in the past.

The 12th Brigade's attack attained its goals (though with heavy casualties) and the 11th Brigade began to move forward over the crest of Mount Dury and immediately began to come under intense fire from the strong German defences.

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34 LAC, RG9 Series III-D-3, 4987 "2nd Motor Machinegun Brigade War Diary- Canadian Independent Force report".

35 The underlying assumption was that the German resistance would be weak beyond the Red line (the Mount Dury ridge). In fact, it was extremely heavily garrisoned. Defended with warrens of bunkers, craters, sunken roads and machine gun and artillery posts spread across the zone where the 11th Brigade and Independent Force would be attacking.

36 LAC, RG9 Series III-D-3, 4987 "2nd Motor Machinegun Brigade War Diary- Canadian Independent Force report".

37 LAC, RG9 Series III-D-3, 4861 "11th Brigade War Diary, Operational Orders No. 150, 1st Sept 1918.

38 LAC, RG9 Series III-D-3, 4861 "4th Division War Diary, Report on Scarpe Operations/ Second Battle of Arras".

In his diary, Brigadier General Victor Odlum of the 11th Canadian Infantry Brigade, says of this: " It was evident that the enemy had appreciated the tactical value of Dury Hill and had recognized how easily troops pouring over it could be shot down."[39] The troops who had traditionally had cover from following closely behind artillery barrages turned to the Independent force for aid. The Independent Force was pushed into action several times that day to help alleviate the pressure on the troops getting torn apart by German fire, but all that happened was that the Independent Force was caught in the maelstrom of bullets and artillery. "From the shelling 3 officers and 6 other ranks became casualties… as the enemy fire was directed practically along the whole road it was very difficult to find any stretch not touched by this fire…"[40] It was viewed as suicidal to push this group forward, and later that day the depleted 11th Brigade would have the attack called off and they would pull back to their jump off lines.

The idea of using the Canadian Independent Force instead of artillery for neutralizing German Defenses was completely foolish thinking. The 11th Brigade was ripped apart and when it was realized that they needed aid, the Independent Force only could make halfhearted efforts, realizing that they too would just be ground down and would be largely ineffectual. It would take the Canadian Corps five days of continuous fighting with full artillery support to crack the Drocourt-Queant Line at the cost of 14,000 casualties, losses of 17 percent of the Canadian Corps' attacking force.[41] The plan calling for the Independent Brigade to play a primary role in the final stages was foolhardy. The limitation of the force was well-known and Canadian leadership during this time made serious errors of judgment by allowing it to play any significant part.

The Canadian Independent Force continued to play a supplementary role in the following two months of the war as the Canadian Corps pushed forward to Mons. An unpublished manuscript written on the Motor Machinegun Brigades in 1919 sum up some of the troubles faced by the Independent Force: "The Independent Force was unable to follow up the progress made by the Infantry. 4 large Mine Craters, approximately 40 feet in diameter and 12 feet in depth made the Valenciennes-Mons Road between Quarouble and Quievrain completely impassable to traffic."[42] In the instances that they could keep up with the advancing infantry they would deploy and lay down barrages to help protect the troops' flanks. By early November the roads and terrain had been so disrupted by German sabotage that the

[39] LAC, MG 30 E 300 Vol. 16, Odlum Papers "September 8th 1918".

[40] LAC, RG9 Series III-D-3, 4987 "2nd Motor Machinegun Brigade War Diary- Narrative Sept 2nd–5th".

[41] G.W.L. Nicholson *Canadian Expeditionary Force 1914–1919.* Ottawa, 1964, p. 441

[42] Cameron Pulsifer "Canada's First Armoured Unit Raymond Brutinel and the Canadian Motor Machine Gun Brigades of the First World War". – *Canadian Military History*, Vol. 10, No 1, Winter 2001, 53.

only component of this force that was truly mobile was the cavalry that had been attached to it.[43]

The Canadian Motor Machinegun Brigade and it successor, the Canadian Independent Force, were an interesting and innovative idea on how to utilize new technology on the battlefield. However, they fell well short of being effective units, as the vehicles were extremely limited in the terrain they could cover, so much so that in nearly all of the Canadian Corps operations the troops of this force would dismount from their vehicles and join the ranks of machinegun companies attached to the Divisions. In the rare case where they could utilize their mobility other fatal flaws became apparent. The March offensive did allow the 1st CMMGB to make use of its mobility, however, it showed the limitations in just where it could go and how vulnerable it was to enemy fire. Suffering a casualty rate of 43% had decimated this unit and it had to be reconstituted once it had been relieved in the spring of 1918. Also the tactics being utilized by this formation were basic at best, as the officers themselves explained they would just show up and fire their guns, and no real critical thinking had gone into how best to utilize these units both by unit commanders and senior Canadian Corps leadership.[44] In the end it was not worth the money, effort, or manpower to have this special force. The Canadian Corps would have been better served to have had these extra guns added to their machine gun companies.

[43] Ibid., p. 54
[44] LAC, RG9, Series III-D-3, 4987 "Canadian M.M.G.B Narrative H.F. Muerling".

Aurélien POILBOUT (France)

Strategic evolution and technologic transformation of French Air Force in Africa (1945–1978)

Introduction:

Is it possible to assume the security and military defence of a continent when it is not the top priority? After the Second World War, France was financially strapped. Despite the French major strategic interest in Africa, French Army and French Air Force had only few expeditionary forces in Africa. Actually, a small force of airplanes proved cheaper and more efficient than a large and cumbersome ground-force expedition. Air Force was already considered like the solution to police colonial obligation on the cheap. Aerial technologies were seen like the alternative of a large number of soldiers scattered throughout the continent. Modernisation of military forces, especially modern aircrafts, was a key stone of French strategy in Africa.

Since the beginning of aviation, authorities of the French colonial empire in Africa considered aircrafts like a tool to fill a gap in order to control huge parts of territories. The issue is to covering a considerable distance from France to Africa, or from French military position near the sea (Dakar in Senegal, Abidjan in Ivory Coast, Brazzaville in Congo) to get to the backward countries of colonial empire, in Sub-Sahara or Madagascar for instance. Frontiers of colonial empire were and sometime still are unstable countries. In case of political or ethnical unrest, it was necessary to act as soon as possible. France claimed his authority by a show of force in order to prevent or to suppress a violent rebellion. In any case, France had to deal swiftly with trouble in the colonies. The ability to join the far reaches of the Empire in a short time was a challenge. Aircrafts with their military strength, quickness and mobility are well adapted to this mission. However, the difficulties to go through desert, sand winds, tropical forest in little time can't be ignored.

The ability to keep under control a continent implied well-organised infrastructures. Because of weak performances of aircrafts, a dense network of airfields was necessary to assume a strong presence near unsecured zones. This organisation carried on after the Second World War, but it suffered a lack of technology. In 1950s and 1960s, French Air Force's priorities were decolonization wars (in Indochina and Algeria), but also integration in NATO and the activation of nuclear forces. French Air Force in Africa were equipped with the less recent technologies: old and worn-down aircrafts (Potez 25, Junker 52), inadequate to increasing missions. Moreover, they were dispatched all over the continent. So, French headquarters looked for better solutions: like the creation of Intervention Forces with jets (Vautour, F100). According to an air dogma, the solution should be a higher technology. According to headquarters and despite the lack of technology in African continent, this theory was always available. However, in many circumstances, French Air Force was forced to use old motor engine aircrafts.

Therefore, the issue of Air Force in Africa was double:

- How to use technology in context which is very different from Europe?
- How French air force could manage different form of conflicts from counter-insurgency to modern warfare?

Colonial heritage:

In the XIXth century, the French military expeditions in Africa, in technological terms, were close to the Conquistadors, the Spanish and Portuguese explorers and soldiers in the XVth century in South America. New firearms, gunboats and machine-guns were useful for the colonisation, but transports, logistics and moreover quickness of action were not so different.

In the XXth century, aircrafts changed the ability of France to maintain control in his colonial empire[1]. In 1933, the French Air Force organised an air raid over Africa: The "Croisière noire". It represented an achievement after twenty years of French military aviation in colonies. 28 aircrafts[2], led by general Vuillemin flew during 22 000 km[3]. French air force aimed to show she was strong. Local populations were overawed. They had not a clue of this technology. It's an example of air diplomacy. Airplanes were useful both for geographic explorations and for pacification campaigns. So, little groups of aircrafts were scattered all over the French colonial empire, from Senegal to French Somaliland, and from Niger to Congo and Madagascar[4]. It looks like the British air control doctrine, using air power for colonial control during interwar. According to Churchill's declaration in 1919, "the first duty of the Royal Air Force is to garrison the British Empire". Air control had been considered like "the less expansive solution for a financially strapped Britain"[5].

The counter insurgency:

Soon after the Second World War, in 1947, Madagascar tribes revolted against French authorities. Despite the Indochina war, France sent soldiers in order to stamp out the rebels[6]. Worn-down aircrafts were also used to suppress the rebel-

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1 Vital Ferry, *Ciels impériaux africains*, 1911–1940, éd. du Gerfaut, 2005

2 Potez 25

3 Jean-Baptiste Manchon, *D'une aviation coloniale à une aviation impériale : L'aéronautique militaire française outre-mer de 1911 à 1939.* thèse soutenue à Paris IV, ss dir. J. Frémeaux, 2008.

4 SHD/DAA, 3 E 1497, EMAA, 3e bureau, rapports d'inspection (1946–1966).

5 James S. Corum, *The Myth of Air Control Reassessing the History*, Aerospace Power Journal, Winter 2000.

6 EJ. Duval, *La révolte des sagaies*, L'Harmattan, 2002.

lion. French Air Force employed Junker 52, a military airlifter, design by Germany before the WWII. Built in France, with the name of "Toucan", they joined the fray. Toucan were used to dropping supplies to besieged outpost, performing reconnaissance missions over ground troops, but also in bombing tribesmen's villages who offered resistance[7]. This ad hoc bombing force was not very efficient. One cannot deny bombing accuracy was a myth.

However, against the guerrilla, it's about to disrupt population and force them to resign. Keeping the tribes from their livelihoods, burning villages, and destroying crops and livestock, for instance, were supposed to bring the rebels back into the line. The psychological effects of air power were supposed to break population's will. It refers to the theory of Italian General Douhet, the first airpower strategist[8]. This theory was a basis of total war and led to bombing cities and civilians.

These events show French Air Force's resourcefulness. Confronted with local population armed with only knives and assegai, this old worn-down aircrafts were sufficient. But it reveals the lack of offensive aircrafts in Africa[9]. Nevertheless, these worn-down aircrafts were probably not efficient confronted with a well-equipped rebellion. French headquarters knew strategic and technological changes were necessary.

High technology in Africa?

Before the Second World War, Africa was regarded as a labour pool, as a source of soldiers and raw material. But, with the World war experience, the expansion of communism, Africa became a strategic area. According to French strategists, the military defence of Africa was necessary[10]. For France, during the Cold War, Africa represented the south flank of NATO. A Soviet attack in the Middle East or in Africa would have rendered Europe vulnerable. For example the chief of staff of the French Air Force at the end of the 1940s, General Gerardot, had the idea of creating an air force in Africa. This group of aircraft, based in Africa, was intended to be able to intervene anywhere in Africa or in France[11]. Thus, even if French home territory was under attack, France could keep on fighting[12].

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7 Jean-Louis Promé, *Madagascar 1947–1948 : La campagne oubliée*, mars-juillet 1998, Le Fana de l'Aviation.

8 Giulio Douhet, *La maîtrise de l'air*, 1921, Economica, 2007.

9 SHD/DAA, E 1491, note du 2 avril 1947 ; C 2283, lettre du ministre de l'air au président du Conseil, du 28 juin 1947.

10 SHD/DAA, 6 C 2265 ; 5 C 2172.
Raoul Castex, *L'Afrique et la stratégie française*, Revue de défense nationale, n°92, mai 1952.

11 FACON Patrick, *Histoire de l'Armée de l'Air*, La Documentation Française, Paris, 2010.
P. Facon, Le *général Gérardot, un chef d'un état-major éphémère : septembre 1946 – février 1947,* Revue Historique des Armées, septembre 1993.

12 SHD/DAA, 0 E 4339.

In early 1950s, General Lechères, chief of staff, plan to use the most technological aircrafts, jets, in Africa, in order to realise quick interventions[13]. Modern jets could counterbalance the lack of the Army units in Africa. However, considering the short range of French jets, Vampire, there were not enough modern bases in Africa[14]. The F84-G could have been a solution. Theses jets had a higher range. However, they came from the NATO program. USA provided theses aircraft for defence of Europe only, and probably would not like France sent them in Africa. Washington disapproved their utilisation by French Air Force during Suez crisis in 1956. Anyway, without modern infrastructures (airfields, runway, tactical air navigation system, early warning radar), modern aircrafts would not be efficient[15]. However, modern infrastructures were too expansive. The French government couldn't finance it.

The alternative is to manage without infrastructures. Dassault, a French aircraft manufacturer, played a key role in resurgence of the French aviation industry. They designed the first French jet: the Ouragan. "The Barougan" was a version of this aircraft modified for rough-field operation with the two-wheel main landing gear with low-pressure tires retracting and a brake parachute. Barougan was a part of a NATO program. In 1953, European aircraft manufacturers were invited by NATO to submit aircraft for evaluation for the "LWSF" (*Light Weight Strike Fighter*) role[16]. These light weight strike fighters were designed to fight during nuclear warfare, and to take off from everywhere, if airfields were destroyed[17]. So, there is a paradox. These aircrafts designed for modern warfare in Europe measured up for African continent[18]. Nevertheless, the Light weight strike fighter program stopped in France at the end of the 1950s. General Bailly, chief of staff, was opposed to the versatility of aircraft. According to him, it's not a solution. Aircraft should be specialised. First, versatility is too expansive. Then, versatility prevents French Air Force from developing higher technology and to fight in modern wars in the long-term[19].

As a consequence, the technology didn't look to be the solution in Africa. French run trials but they didn't work. Despite many plans and prototypes, infra-

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13 SHD/DAA, E 1490 ; 5 C2169, lettre de l'inspecteur des forces terrestres outre-mer du 23 mai1952.

14 SHD/DAA, 5 C2169 ; K 18793 ; *La doctrine des forces aériennes françaises, 1912–1976*, ss dir J. de Lespinois, La documentation française, 2010.

15 SHD/DAA, 5 C 2172, note du général de Bufet, Air AOF du 19 novembre 1952.

16 Aeritalia G.91, Northrop F5, Dassault Étendard VI, Sud-Est Baroudeur

17 SHD – DITEEX – BTO ; série 7K ; Général P.-M. Gallois, *Le sablier du siècle*, L'âge d'homme, Lauzanne, 1999 ; SHD-DITEEX-BTO-série 7K, général Brohon n°146 ; général Pierre Gallois n°145, Bande 2 et 3 ; *Le marché du chasseur léger tactique Le concours OTAN de 1957*, le Fana de l'aviation, n°439, 2006

18 Northrop F5 were delivered by USA to Sudan and Kenya.

19 SHD/DAA, E 17149, archives du général Bailly.

structures costs and NATO obligations caused the stagnation of French Air Force in Africa in 1950s.

Sturdiness and proximity

Algerian War was a turning point for French air Forces in Africa. A lot of motor-engine aircraft squadrons were created in Algeria and in Sub-Saharan Africa. It was essential for France to stop nationalist movements in Africa. North-America T6, a single engine advance trainer aircraft equipped overseas squadrons[20]. Some other airplanes were used both for transport and for offensive missions, like the MD315 Flamant[21]. Squadrons were scattered over the continent. They aimed at helping army in guerrilla warfare in flying cover for convoys in ambush-prone area. Close air support was essential to fight against tough guerrillas. In most respects, one considered high technology didn't matters in counter-insurgency.

However between 1958 and 1960, France was confronted to the risk of anti-governmental riots quickly sped throughout. So, Paris decided a political shift. Most of parts of French colonies became independent. After decolonization in 1960–1961, most of the countries concerned maintained a strong relationship with France. The community of the 'Union Française' was transformed into a large number of bilateral diplomatic and military agreements[22]. Paris engaged in conserving borders and supporting the existing head of state. Most of overseas squadrons were dissolved. However, French Air Force helped African countries to create their own Air Force. According to Military technical assistance, France helps African countries to implement their own armies by the terms of defence agreements. French aircrafts were delivered to African countries and French pilots become instructors of African pilots. Some overseas squadrons became the framework of African Air services[23].

As a consequence, the local defence was transferred to African countries. However, France had to intervene if African Forces didn't succeed to manage crisis. For example, France intervened in Tibesti, north of Chad, from 1968 to 1973[24]. French Air Force in Chad made up of Skyraider, piston engine aircraft. Despite Vautour, modern bombers, were planned for interventions, they couldn't intervene in north of Chad from N'Djamena, because of their short range. Contrary to Vautour, Skyraider could take off from rough-field operation in north of Chad[25].

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20 SHD/DAA, 0 E 4177, note du général Bailly, CEMAA, du 5 février 1957.

21 SHD/DAA, 3 E 1497 EMAA, 3e bureau rapports d'inspection (1946–1966).

22 *Décret n°60–1230 du 23 novembre 1960 portant publication des accords particuliers conclus les 11, 13 et 15 août 1960, entre le Gouvernement de la République française d'une part et les Gouvernements respectifs de la République centrafricaine, de la République du Congo et de la République du Tchad d'autre part.*

23 SHD/DAA, 0 E 4308, 3 E 14743. *L'armée ivoirienne*, Revue historique de l'armée, n°4, 1966

24 J. Neau, *L'intervention de la France dans le conflit tchadien*, éd. Mémoire d'homme, 2006

25 SHD/DAA, 0 E 17142.

Intervention:

French policy of intervention became effective from the middle of the seventies to the end of the Cold War. At that point, the Soviet Union adopted a new strategy: the communization of Africa by direct or indirect interventions in former Portuguese colonies[26]. Moreover, the Soviet Union sold weapons, fighters and technologies to Algeria and Libya. Some African countries attempted to defend themselves initially, but, confronted with powerful weapons sold to their opponents by the Soviet Union, they had to call on France for help. In this situation, France had no choice but to intervene in order to justify her international political position[27].

The Suez crisis, in 1956, was the first French intervention in the Cold War. French Air Force proved its ability to intervene far away from France[28]. However, logistics took two month to be deployed[29]. A very long time, when the rapidity was considered like the most important factor. French headquarters wanted to develop the concept of intervention. In 1959, aircrafts flew from France to Ethiopia and Chad. The French Acrobatic Patrol made a demonstration in Western Africa the same year[30]. So, intervention of modern aircrafts became possible, even if it took one or two weeks. In 1962, the Intervention Force was created. Planning groups

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[26] G.-H. Soutou, *La guerre de cinquante ans*, Paris, Fayard, 2001.
J.-M. Dubouays*, La politique soviétique dans le Tiers monde*, Revue de défense nationale, Février 1976.
J.-L. Gahery, *La stratégie soviétique en 1978 : Cohérence et continuité*, Revue de défense nationale, mai 1978.

[27] Discours de Raymond Barre à l'IHEDN, *La politique de défense de la France*, du 11 sept 1980, Paris, Revue de défense nationale, novembre 1980.

[28] SHD-Air, C 2318, Directive du général Ely sur la composition du groupe de planning d'une intervention franco-britannique, 3 août 1956.
G.H. Soutou, *Les objectifs politico-stratégiques des responsables militaires français au lendemain du cessezle-feu : Algérie française ou défense de l'Occident?*, Colloque organisé par le SHD et l'UMR IRICE, *Les Occidentaux et la crise de Suez : une relecture politico-militaire*, novembre 2006.
M. Faivre, *Le général Ely et la politique de défense (1956–1961) : l'Algérie, l'OTAN, la bombe*, Economica, Paris, 1998.
Irwin Wall, *France, the United States and the Algerian War*, University of California Press, Los Angeles.

[29] SHD-DITEEX-BTO-série 7K, général R. Brohon, n°146, bande 45 A.
SHD/DAA, C 2305, JMO du GM-1 avec mission et historique de l'élément opérationnel, août–oct 1956 ; C2317, Rapport sur l'opération d'Egypte du général Beaufre, N°92/FA/CAB/S, 8 fév 1957 ; E 2320, Rapport du général Brohon sur la création, l'installation et l'activité du GM-1 à Chypre, n°281/GM1/OPS/TS, 27 novembre 1956.
P. Facon, *L'Armée de l'Air et l'affaire de Suez*, RHA, n°4, 1986.
A. Poilbout, *Les forces aériennes tactiques intégrées à l'OTAN et ses incidences sur la politique et la stratégie françaises de 1946 à 1966*, Master 2, ss dir. J.-P. Bled, 2007.

[30] SHD/DAA, E 1491.

were responsible for organization of interventions in Africa: to Dakar, Djibouti, Chad, and Congo[31]. Jets, F100, Vautour and above all SEPECAT Jaguar, were keystone for intervention. These jets flew in only few days from France to Sub-Saharan Africa because French aircrafts couldn't go through Algerian airspace.

Air Intervention Force was completed with Boeing KC 135 Stratotanker, an aerial refueling military aircraft. Theses aircrafts were delivered to French nuclear force in 1964. Stratotanker were initially tasked to refuel strategic bombers. But they were used for Intervention Force since the end of 1960s[32]. Aircrafts were not obliged to stop over in Canary Islands in Atlantic or Israel for refueling. As a consequence, aircrafts covered a considerable distance in only some hours and not some days. Jaguar and Stratotanker were employed many times for intervention in Africa and prompt reprisals in harsh area: Mauritania[33] or Chad[34] at the end of the 1970s. One can consider it was the perfect military tool of French interventionism policy in Africa during the 1980s.

Then, military transport aircrafts were modernized. Transall replaced Noratlas[35]. However, Transall C160 was designed by a consortium of French and German aircraft manufacturers. The C160 was originally conceived for Europe[36]. It's a middle range transport aircraft. From the 1970s, C160 have taken part of every intervention overseas. In 1978, an airborne operation in order to free French citizens, in Kolwezi, Congo, was very difficult to organise. So, France had, and still has a lack of military strategic airlifter[37]. Headquarters intended to buy six C141 Starlifter in order to fill the gap in strategic transport[38]. But France couldn't finance it. Today, French Air Force is always waiting for Airbus A400M, a transport aircraft able to fill a gap in strategic transport.

Conclusion:

To conclude, the importance of Africa in French strategy can't be denied during Cold War. For France, defense agreements, military presence and interventions represented an important part of her global defense.

In one hand, French Air Force was engaged in asymmetric conflicts, like in Madagascar, Cameroon or Chad, and in other hand some countries like Egypt,

[31] SHD/DAA, 0 E 4177, lettre du général Martin, CEMAA au ministre des armées, plan de renfort air à Dakar, Fort Lamy, Port Bouet, Niamey, Libreville, du 30 juin 1966.

[32] SHD/DAA, 3 E 14652.

[33] Opération Lamantin (1978–1979)

[34] Opérations Tacaud (1978–1979), Manta (1983–1984), Epervier (1986-today)

[35] SHD/DAA, 0 E 4082.

[36] SHD/DITEEX, général Georges Dreysse, interview n°963

[37] SHD/DAA, 85 E 24188, mémoire ESGA, LCL Dreyssé, « L'aviation de transport du futur ne serait plus attendu qu'en 2005–2010, dans quelle mesure la flotte de transport peut-elle assurer sa mission, en particulier face à l'évolution de la menace ? », 1986.

[38] SHD/DAA, 0 E 4301.

Ethiopia and Somalia became modern military powers during cold war. French officers were confronted to a technological and doctrinal dilemma. Was it realistic to keep cheap piston-engine aircrafts[39] sufficient in low intensity conflicts but to endanger its forces that could face modern jets in regional wars? Despite restricted armament, it was necessary for France to be prepared to defend her interests scattered throughout the African continent. French headquarters speculated on this question in 1940s, before they were confronted to the problem in 1960s, then solutions were used in operations since the end of the 1970s and in 1980s.

From a financial point of view, it was impossible to develop an air force dedicated to African theatre of operations, with specialized aircrafts. French officers were forced to adapt their military instrument. Mobility and capacity for adaptation were the solutions. Furthermore, French Air Force developed new programs of aircraft like SEPECAT Jaguar and Transall. According to these programs, aircrafts had to conform to a wide variety of conflicts from warfighting to peacekeeping mission, on many theatres of operations. These aircrafts were both modern and sturdy.

As a consequence, French Air Force had to be able to intervene everywhere and with reactivity in order to avoid a worsening of conflicts. Technologies like aerial-refuelling, well-equipped airbases, modern communications were necessary in crisis management like conflicts between Chad and Libya in 1980s where France took a part of it. Modern aircraft equipped with long-range, highly accurate standoff weapons played an important role in supporting Third World friends or pursuing limited military objectives in small wars. Military interventions in Africa were demonstration of capacity of the French Air Force to mobilise modern technology in a continent lacking of technologies.

If the technological leap from piston engine to jet was a consequence of cold war's arm race in African continent, it was also essential for the evolution of French strategy in Africa. Military presence strategy suitable to counter-insurgency was transformed in strategy of intervention able to a military response from low-intensity conflicts to modern wars.

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Major Rejane Pinto Costa (Brazil)
The Revolution in Military Affairs in the scope of military education

1. Introduction

The military post-modern era has brought new threats and challenges to the most relevant Armed Forces, mainly after the Cold War. (MOSKOS *et all,* 2000)

In the military, post-modernism refers to the new operational scenario framed by the Revolution in Military Affairs (RMA) (*op cit*), based upon technical and sociocultural changes that have been confronting military organizations today. Thus, amongst the main elements that characterize the RMA are the development and use of technical and technological means; interaction between civilians and military personnel; change of the missions from conventional combat operation to humanitarian missions with low intensity; multilateral actions under the auspices of international organisms; and internationalism of military forces. These facts have been proving that the tendency of war has really changed. (SMITH, 2008)

This study focuses on sociocultural changes required by this new operational context, emphasizing the role of education of military personnel in order to better benefit from technical and technological means. It also highlights that if influence of technology on tactics, operations, doctrine, planning, equipment and training of military formations is often to be considered dependant on financial possibilities, opportunity costs of developments and acquisitions; on the other hand, the impacts of technology on these issues are also dependent on investments in military education to develop and appropriately use technology and technical means to deploy in post-modern scenarios.

In developed countries, technological advances are based on educational systems that allows the transference of new studies and researches, products, information systems and knowledge into sociocultural, economical and scientific development. On the contrary, countries that choose not to face the challenges imposed by education are still under technological threat, dependency and decisions. China and India had chosen to invest in education and the positive results were already reported by the Central Intelligence Agency. (2006)

A possible way to provide educational opportunities for under-developing nations to face the challenges and fill in their educational gaps is to promote partnerships between civil and military Higher Educatonal Institutions (HEI). This innitiative fosters the development of projects and stimulate each other towards implementing sociocultural and technological advances that serve civilian and military purposes.

In Brazilian army this initiative had been already taken, thus civil and military HEI have been working on academic projects which aim to bring up civilians to discuss National Defence and Security with military personnel through official partnerships already established between Brazilian Ministry of Defence and Ministry of Education (BRASIL, 2005).

To face this challenge, the Brazilian army Command and General Staff College has just created an Institute named Instituto Meira Mattos (IMM), which will gather civil and military academicians willing to taking post-graduation on National Defence, therefore promoting academic partnerships to enrich and strengthen the debates on National Defence and Security within Brazilian society.

Since the need to establish these partnerships is already implemented, it is time to think about theoretical and methodological educational policies and practices to underpin these initiatives. In this direction, the framework of multiculturalism (MCLAREN, 1997; 2000) in military education should be considered to support post-modern environments in which soldiers operate today, mainly because as General James N. Mattis[1] had noticed "we have to diminish the idea that technology is going to change warfare. [because] War is primarily a human endeavor." (MATTIS *apud* BORUM, 2012, p. 35). Thus, human terrain and its sociocultural dimensions should be deeply considered in military educational arena to provide the development and better use of technical and technological means and their influence on tactics, operations and doctrine,

Curricular policies and practices as well as technology rely on cultural, political and conservative contexts, especially in military settings where decisions will directly influence on tactics, operations, doctrine and on individuals. Therefore, to convince high commanders of the need to implement sociocultural changes in military education has been a challenge for the organization to overcome, as pointed out in an interview I had with a Dutch soldier.

> *It has not always been easy to convince the military (from general to rank-and-file) of the need to include cultural training in the military curriculum. But after several military operations abroad (from 1992 onwards: Bosnia, Kosovo, Kampuchea, Ethiopia-Eritrea, Iraq and Afghanistan) the message is now well-understood. (2009)*

Guided by the theoretical framework of multiculturalism (MCLAREN, 1997; 2000) and peace studies (GALTUNG,1990), the present study emerged from my doctoral thesis (COSTA, 2009) and was guided by a qualitative research (DENZIN & LINCOLN, 2000) I had recently conducted.

This research relies on a case study developed at Brazilian Peacekeeping Operations Training Center (CI Op Paz), which was recently evolved into Peacekeep-

[1] U.S. Marine Corps, Commander, U.S. Joint Forces and NATO Supreme Allied Command.

ing Operations Joint Center (CCOPAB)[2], proving that the nature and demands of the missions today require more enlarged educational perspectives. To accomplish this research a documental and discoursive analyses were done, mainly interviews held with soldiers who deployed in different peacekeeping missions and the speeches of the actors who are in charge of their training.

The study had proved it is a need to (re) think the extent to which Brazilian army is preparing their human resources to face the sociocultural challenges for deploying in post-modern scenarios (COSTA & CANEN, 2008), chiefly military personnel prepared at CCOPAB, due to the multidimensional and multicultural demands of peace missions today.

As a result, this study sought to guide decision makers towards solving the opposing tension between invention and innovation in military education, pointing out the most appropriate educational practices to support soldiers to deal with the sociocultural challenges and demands required by the RMA.

In fact, Lastro & Cassiolato (2003) had highlighted that […] more serious than not having access to new technologies and information is not to have enough knowledge to use them." (p.12). However, the research problem I carry out is what if we have full access to knowledge and information, technologies and technical means, but do not deeply consider that

> *[...] understanding the human dimension of a conflict is critically important. There is much more to the human dimension than knowing an adversary's culture. Even a deep grasp of culture and social dynamics is not sufficient to win a war (though a* **deficient understanding** *may be enough* **to lose** *one). (BORUM, R., 2011, p.36, our marks)*

In broader educational terms, I argue it is also a need to consider that the lack of access to new information and technology for underdeveloping countries would increase the actual inequalities between developed and emerging countries and contributes even more to separate these countries in terms of technology and information (AROCENA & SUTZ, 2003), chiefly now when instant, surgical and segregated wars have been considered a privilege of technologically and economically dominant nations. (CASTELLS,1999).

In this direction, it is desirable to any national educational strategy seeking to minimizing social exclusion to promote education towards providing opportunities to learn, select and use appropriately not only information but technology and enlarging students` perceptions on human sociocultural dimensions. The partnerships between civil and military HEI that have been promoted by Brazilian Ministry of Defense and Education is an example of a fruitful avenue that may lead to minimize educational gaps in terms of technology, advances and transference as

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2 Available at: < http://www.ccopab.eb.mil.br/index.php/en/cioppaz/centre-creation>.

well as in terms of developing the better competences to provide their use in new operational scenarios.

2. Multiculturalism: A Methodological and Theoretical Approach for Military Education

As already mentioned, a qualitative research investigation directed our methodological path (DENZIN & LINCOLN, 2000), through a case study which relies on interviews and documental analyses. Interviews were held with military personnel who were in peacekeeping operations to know their perceptions acting within multidimensional/multicultural scenarios as well as those in charge of their training. This strategy of inquiry is especially relevant to research in educational fields because it allows acknowledging actors' and agents' different perspectives and voices. On the other hand, documental analysis provides information to the extent to which a Brazilian military educational institution that prepares troops for peacekeeping operations has taken into account their sociocultural needs, other than operational ones. This analysis has been undertaken so as to gauge how far the curriculum has been (or not) imbued with a multicultural direction.

That is arguably relevant due to the constant interaction of those troops with different nationalities, cultures, values and languages during military missions. As a result, it becomes important to draw special attention upon strategies and policies adopted to govern or manage the problems of culturally plural societies. In this case, educational strategies and policies for soldiers training to deploy in multicultural scenarios, aggravated by ethnical, religious, cultural conflicts and threats imposed upon those which are not technologically and economically dominant (CASTELLS, 1999).

This study was guided by McLaren's perspective (2000) towards critical multiculturalism (more recently referred to as post-colonial/revolutionary or emancipatory multiculturalism), which promotes concern about the danger of cultural homogenization in educational policies and practices, seeking to explore curricular and evaluative strategies which challenge ethnocentrism and prejudices. This way, multiculturalism is understood as minorities' responses to cultural homogenization.

The theoretical distinction between the terms *multicultural* and *multiculturalism* according to Hall (2000) is also considered in this study since it conceives that

> *[...] multi-cultural is used adjectivally. It describes the social characteristics and problems of governance posed by any society in which different cultural communities live together and attempt to build a common life while retaining something of their 'original' identity. By contrast, 'multiculturalism' is substantive. It references the strategies and policies adopted to govern or manage the problems of diversity and multiplicity which multi-cultural societies throw up. It is usually*

> *used in the singular, signifying the distinctive philosophy or doctrine which underpins multi-cultural strategies. 'Multi-cultural,' however, is by definition plural. (p. 209–210)*

The multicultural approach adopted here underpins Castell's interpretation of globalization which pinpoints that instead of developing efforts and results towards science and technology, globalization; on the contrary, has developed a national concentration of these activities which has been shared between those countries technologically advanced (CASTELL, 1999).

In this direction, education plays a special role, chiefly because as Castell (*op cit*) asserts, we have witnessed the effects of globalization which has deeply increased sociocultural and economical differences amongst countries and regions in place of minimizing them. Lastros & Cassiolato (2003) also throw lights on the need to invest in education, since they pinpoint the role of innovation and its impact on technical, institutional and social dimensions as a survival and competitive organizational strategy. However, these authors highlight that the process of innovation requires knowledge and ability to learn, incorporate and use it.

At this point, I argue a *Revolution in Military Education* is also required since the Revolution in Military Affairs has not deeply considered it yet; otherwise, military organizations will run the risk of being dependant on financial possibilities and opportunity costs of developments and acquisitions as well as on the evaluation of the extent to which new or modern pedagogical practices are innovative or inventive to accomplish contemporary military training. Therefore, military specialization to develop and use technology and technical means should be nurtured as well as military pedagogical and curricular policies / practices to confront the challenges imposed by new contexts.

In this horizon, educational practices should be especially developed to offer military personnel opportunities to rehearse political and intelectual competences, which are considered to be the main challenges imposed upon education since the end of the XX Century. (LIBÂNEO, 2001)

Align with this context, the commander of Brazilian army's general guidelines for 2011–2014 period (BRASIL, 2011), stressed the competences and skills expected from Brazilian soldiers, such as:

> *(...) to implement educational competences to contextualize the teaching in order to link knowledge and technologies to decisions and performances in a variety of situations (...) to criate courses for civilians at the staff college (...) to enlarge the exchange with civil academia. (BRASIL, 2011, p.19)*

With the release of these guidelines together with Brazilian National Defense Policy (2005) and Brazilian National Defense Strategy (2008), key words such as *integration* of Brazilian army with the nation, *interaction* with civil academic community and *interoperability* between the Armed Forces have been discussed in the military and some relevant initiatives have been taken to attend these needs.

As a result, the exchange between civil and military HEI should be nurtured to integrate military schools and training centers, seeking to provide sociocultural competenes and skills to better equip military formations in the 21st Century.

To prove this need some excerpts from a documental analysis of a military curriculum from CCOPAB and interviews held with military personnel directly involved with peacekeeping missions will be presented.

2.1. Brazilian Peacekeeping Operations Joint Center (CCOPAB): multicultural oriented concerns in the subject plan

The CCOPAB develops different courses for military personnel. Within the limits of this article, the focus will be on the preparation of soldiers, mainly troops, staff officers and military observers. The first ones because they represent a group that is always in touch with local population in a tense and stressing context, allowing us to witness their cultural difficulties and opportunities that arose in those situations. The other groups were chosen due to the fact that the real 'weapon' they carry in peakeeping missions is their ability to strategically negotiate and otherwise nonviolently respond to conflicts.

Those groups of soldiers need preparation for dealing with the multicultural dimensions of their missions, with all associated implications, having arguably to particularly acquire multicultural competencies that allow them to manage conflicts in a peaceful perspective.

The study realized that the curriculum of the referred Center is mostly operational in essence.

> *It is operational ... the focus on combat operations was higher ... we realized the troop should be prepared to the worst situation ... (interview with the Head of the Doctrine Division of CCOPAB, 10 mar. 2008)*

However, some parts of it do mention multicultural concerns. Below there are some excerpts of the curriculum that evidence some of the discourses presented in the documentation. In fact, the course has specific purposes, in which culturally oriented sensitivities emerge, such as:

> *... recognizing the importance of different cultural events in the peace operations; understanding the various cultural contexts; develop skills for working in multicultural environments; ... describe how to handle tense domestic situations amongst the team members in a multicultural and multinational environment; raise awareness of the situations that can happen when individuals from different cultural and political environments live for long periods together; explain the main concepts related to the multicultural environment; ... use appropriate language according to various situations. (CCOPAB's subject plan, 2009)*

In order to develop the curriculum, the Department of Peace Keeping Operations (DPKO) provides Standard Generic Training Modules (SGTM)[3] to all Centers in the world in charge of soldiers' preparation to peace operations. Due to the limits of this article, we will focus only on the subject plan; however, in previous work (COSTA & CANEN, 2008), we analyzed the intentions expressed in the SGTM which were intimately connected to our research theme.

Some of the curriculum topics of those modules seem to be clearly underlied by multicultural perspectives more aligned to a folkloric approach, valuing cultural diversity, but silencing cultural conflicts and prejudices, as expected in more critical, post-colonial multicultural perspectives. (MCLAREN, 2000; HALL, 2003; 2004)

Indeed, as could be noted in the documentation, some of the objectives clearly point to a multicultural awareness, emphasizing the need to understand cultural diversity in order to act in culturally disparate situations which touches on a broad multicultural perspective (MCLAREN, 1997; HALL, 2003). However, it does not seem to explicitly incorporate the discussions and concepts related to multiculturalism embedded by tensions present in critical, post-colonial and post-modernized perspectives, drawing upon an understanding of identity as an historic, social and cultural construction in contrast to an intrinsic character to be revealed. (MCLAREN, 2000)

It seems to be clear from the above excerpts that issues such as understanding of different cultures and languages, as well as a perspective of empathy towards 'the other' are present, indicating multicultural sensibilities (CANEN & COSTA, 2007; CANEN & CANEN, 2011). However, a more explicit and concrete mention of multicultural would be likely to contribute to a better understanding and incorporation of these instructions, arguably enriching and strengthening the preparation of military agents for peacekeeping missions and other operational missions.

By the above illustration, we can infer that the curriculum of CCOPAB has the potential for a multicultural training for soldiers; however, those excerpts seem to convey the idea that the curriculum touches on more abstract multicultural terms, even though at some points prejudices and discriminations are mentioned.

At least, at the level of intentions, the curriculum points out the importance of cultural issues in an era marked by the expansion and the complex nature of modern peace operations. It reminds its readers that peacekeepers represent the United Nations and their own countries; therefore, a positive or negative attitude will impact directly on the mission success.

2.2. Brazilian Peacekeeping Operations Joint Center (CCOPAB): multicultural potential and limits in soldiers' perspectives

The importance of mediation in conflict resolution is strictly connected to a

[3] These modules are now called Core Pre-Depolyment Module (CPTM) today. Available at: <http://www.ccopab.eb.mil.br/index.php/pt/ensino/cptm-online?view=docman>. In: 18 June 2012.

multicultural attitude towards those perceived as different, highlighting the straight imbrications of multiculturalism. Bearing that in mind, we have also analyzed how the curriculum of the CCOPAB has been mediated by those who were targeted by it. We have therefore tried to glean the sense made of that preparation by Brazilian military personnel who had experienced different peace missions, including the following ones: the United Nations Stabilization Mission in Haiti (MINUSTAH); the United Nations Angola Verification Mission (UNAVEM III); and the United Nations Protection Force (UNPROFOR), in Bosnia-Herzegovina. Interviews held were instrumental in conveying soldiers' feelings, needs and challenges. It is important to note that the interviewees included those who carry out given orders up to generals and commanding staff, in the political and strategic planning of the missions. For ethical reasons, their names were omitted in this narrative.

In the limits of this paper, some of the answers provided should give a glimpse of their ideas, concerning the extent to which they felt the curriculum of CCOPAB in the Brazilian army prepared them to act in disparate cultural contexts. Initially, most of them seemed to believe in the natural "knack" of Brazilian military agents towards understanding cultural diversity and effectively dealing with it (COSTA & CANEN, 2008), regardless of multicultural education:

> *... Brazilian people have always been a little bit extroverted ... it's not the characteristic of other people ... they are closed up ... actions such as social-civilian activities, contact with the people, day-by-day constant talking, helps to make them [the host country] feel Brazil as a friend country that is there [in Haiti] to help. (soldier 1, from MINUSTAH).*

Others; however, felt the need to express their feelings as related to the curriculum of the Center in terms of the extent to which they felt some aspects could be worked out more intensely for a multicultural perspective:

> *I think it would have been interesting if we had worked with those concepts [of respect, for instance] ... in the course, independently of the peace mission ... We should have known the reality [cultural one] we would have to face, and that really would have made things easier [...]. If one can make this preparation [cultural one] [...], it would be excellent. (soldier 1, from MINUSTAH)*

As shown by the above excerpts, it seems that despite having developed their own strategies to deal with cultural differences, the military personnel interviewed expressed their feelings about the relevancy of being adequately prepared to act in operations where they are exposed to cultural plurality. The above data seem to point out that a more structured preparation could boost their efficiency in dealing with diversity and could represent an asset to Brazilian Army curriculum development. Even though some of the topics the interviewees pointed as lacking in their preparation were present in the curriculum objectives, as briefly discussed before, it seems to be clear they were not highlighted in curriculum practices.

This seems to be understood by the subjects of the study, as plainly expressed in the following excerpts:

> … to listen is very difficult ... If everybody learns to listen, there won't be struggles ... It's country "a" wishing to impose itself on country "b"... think the idea that must underlie [our preparation] is exactly to accept the differences [...]. (soldier 1, from MINUSTAH)
>
> … I think the Army should develop a programme towards reinforcing this conception [respect and acceptance towards the different] ... not everybody has this experience of respecting another culture. In some ways, we could also integrate people's cultural backgrounds to the scientific ... knowledge. If we adjust these two factors, we can improve our performance in order to have the soldiers doing it consciously rather than unconsciously. (soldier 1, from MINUSTAH)

Other testimonies of soldiers about the curriculum can be important at this point:

> There is a 50 minute instruction. It is mainly theoretical ... There aren't practical exercises ... (soldier 1, from MINUTASH).
>
> I think soldiers should have been advised on the following lines: you are going to a mission where there are problems which you will not solve as you are used to, but you will have to solve them, even by not really solving ... (soldier 4 from MINUSTAH)
>
> ... I think we should have had a more complete study ... [of the] culture of the country where we have to act, the culture of the political parties there, we should know deeply the history of the conflict, all regional problems ... (soldier 7, of UNAVEM III)
>
> It would have been interesting … to talk to the trainees exactly what they are bound to face, in terms of challenges and cultural aspects … surely there are many aspects that won't be the same among the countries, but those pieces of information are important in order for us not to have a cultural shock. (soldier 5, from MINUSTAH)

As can be noted, even though the soldiers recognize the relevance of the techniques and the training received, they seem to wish that the curriculum should emphasize more the multicultural dimensions in a more concrete way. However, that seems to be on the way of improvement, as it was explained to me by the actual main mediator of the curriculum development in the the referred Center, in a recent visit. In fact, the following excerpts should be useful in providing an illustration of that progress, in terms of curriculum development, as explained by its main mediating actor:

> *We have come to the conclusion that ... soldier is not the only component: there also are the civilians, who are in the day-to-day peace keeping operation, who face the routines, the difficulty of the use of foreign language ... So, during the training, we set up 4 concurrent fiction case incidents in which we took civilian students from the International Relations Course of a University ... and journalists from another one ... In those simulated situations, when a soldier made a mistake, or took the wrong decision, got "shot" or "killed" the commander, the journalist was there to show the news, the international relations person to report and analyse, and, this way, all the wheel moved ... The exercise became smart. That made a very big change and, from there, with other troops, we worked the same way ... When you get the soldier to be the actor, even without wearing uniform, if I put him/her in front of a colonel, he/she has never seen ... he/she will make a mistake…but together with journalists, he/she will become coerced to question, even because the profile of the journalist is completely different. ... All of our exercise is on the street, is contextualized ... I think our ability to interact, of having several players ... should be a competitive advantage of our own, as compared to some of other centers that prepare soldiers to peacekeeping missions ... The evolution of the curriculum was done as much as things started to become more structured. (interview with the Head of the Education Division of CCOPAB, 10 mar. 2008)*

> *Some areas, some professionals who are doing research in masters and doctorate courses are researching something that we are interested in ... If this information get here tabulated ... I consider it extremely relevant. ... Suddenly, we are also going to contribute to the study of an academician ... it wil let him/her improves his/her research. (interview with the Head of the Doctrine Division of CCOPAB, 10 mar. 2008)*
>
> If it were to include a subject for those who are going to such mission environment, it would be towards the cultural dimension of that country. It makes things much easier ... to emphasize on the cultural history of that country … a class period, talking about cultural aspects of that country and giving tips that may be followed ... to have a really better relationship performance, taking care of cultural aspects, as some training centers outside Brazil already do ... focusing on culture. Point out cultural awareness aspects. Provide a lecture on cultural aspects of the country [referring to the relationship of those in mission with the local population). (interview with the Head of the Education Division of CCOPAB, 10 maio 2012)

The above excerpts seem to point out to a more integrated, cross-culturally informed curriculum practice, in line with many of the feelings previously expressed by the interviewees as related to the need to be culturally trained to face situations from different perspectives. Another excerpt from the above curriculum mediator also highlights the development of a more culturally informed approach to curriculum development, touching on other markers of identity, such as gender, as can be noted in the following discourse:

> *... gender and cultural awareness are discussed towards a more humanitarian approach ... The big focus now is on the humanitarian support, how to live with these guys ... (interview with the Head of the Education Division of CCOPAB, 10 mar. 2008)*

As depicted in the document analysis and interviews, it seems that albeit a concern with cultural issues and their implications for peace operations in the preparation of soldiers is present in the curriculum of the CCOPAB (undoubtedly a positive feature of the case study), there is still a need of a more structured, academic and systematic reflection. The fact that our last visits to that Center showed increased sensitivity to multicultural aspects is undoubtedly a very welcome and auspicious feature, but the importance of having military agents adequately and competently prepared for acting in multicultural scenarios is still a need.

As shown earlier, CCOPAB has been improving its curriculum in a multicultural sense, as briefly illustrated by the excerpts of two high level trainers earlier on in this paper. It seems to be much more aware of the relevance of multicultural issues in the preparation of military agents, which has contributed to the establishment of some partnerships between the referred Center and HEI, in order to help with culturally-contextualized activities during pre-deloyment. We consider that as a positive step we look forward to the strengthening of stronger partnerships that could take multiculturalism produced in the HEIs on board. That could surely help to promoting transformational educational practices both in military and civilian education contexts, towards a more multicultural and peaceful perspective.

3. Conclusion

This study focused on sociocultural changes required to prepare soldiers to face the challenges imposed by the Revolution in Military Affairs, pointing out the role of education and training of military personnel in a multicultural approach to better benefit from the development of technical and technological means. The study aimed at emphasizing the need to invest in education to develop and appropriately use technology and technical means to deploy in post-modern scenarios. Based on the collected data, it was noted it is a need to provide educational opportunities for Brazilian military personnel to face the challenges imposed by the new operational environment. One possible alternative is to promote partnerships between civil and military Higher Educatonal Institutions, since it fosters the development of projects and stimulate each other towards implementing sociocultural and technological advances that serve civilian and military purposes. Another way evidenced through the interviews held with military personnel was the need to develop a systematized cultural training for deployment of soldiers in multidimensional and multicultural scenarios,

In this direction, it was realized that a *Revolution in Military Education* is already taking place, mainly within Brazilian Process of the Transformation of the Army (BRASIL, 2011), as the guidelines of Brazilian Army Commander had highlighted. Therefore, it is the intention of this research to re-visit Brazilian Peacekeeping Operations Joint Center in the future. It is to figure out the extent to which its curriculum and the perception of the actors and agents directly involved with the preparation for peace missions have expanded towards a multicultural perspective in more engaged critical and post-colonial approaches. As a result, I intend to enlarge this research to operational environments, other than peacekeeping operations, mainly because as Sir Rupert Smith (2008) has highlighted "war amongst people is not a better paradigm than interstate industrial war, it is simply different – and understanding difference, and accepting it, must become a central part of our away ahead." (p. 374)

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Professor Dr. Chiharu Inaba (Japan)
Shadows of Submarine in the Russo-Japanese War, 1904–05

1. Information on Submarine Coming to the Surface: Introduction

Submarines took part in active combat during the First World War. It is deeply impressed on our brain that the German U-boats cut the British supply lines on the Atlantic effectively. In the Russo-Japanese War (1904–05), both the Russian and the Japanese navies deployed them in the Far Eastern waters. However, neither of them had been in active service at all. That is the reason why there is only little description of submarine in either Russian or Japanese official history of the war, although, the both navies paid a lot of attention to the enemy's submarine and tried to prepare operations against submarine attacks during the war.

In this article, I focus how the Russians and the Japanese collected the information on submarine, and how they introduced submarine technique and deployed them in battle waters. Moreover, how they established anti-submarine plans. Then I clarify why both of them were so afraid of the enemy's submarine during the war and collected information on it.

2. Submarine Development in Russia and Japan

A warship designed to operate completely submerged in the sea, equipped with a periscope, and armed with torpedoes was developed by John P. Holland in 1875. If the submarine torpedo boat would be launched in actual warfare, it would constitute a grave menace in the beginning of the Twentieth Century to keep the belief that large ships and superior firepower would bring victory.

In the world, France had already introduced submarines to compete with Great Britain in the 1890s. The Royal Navy built 5 submarines in 1901, though it had kept a negative mind against them as a good-for-nothing. The Russian navy also took active steps to build submarines. It bought some submarines from France in the 1890s, but organized a committee for building submarines in the Navy Ministry in 1900, started developing submarine technique in St. Petersburg, and dispatched technical officers to the *Holland* submarine torpedoboat company, the USA to acquire the detailed technical information in 1901. It built a *Holland* style submarine in 1902 and repeated experiments in the Baltic Sea in 1903. It was complete in May 1904 and named as the *Del'fin*: 19.6 m length, 113 ton displacement, 300 hp, and two torpedo tubes. That was transported from St. Petersburg to Vladivostok via the Trans-Siberian Railway in November 1904 in order to regain the naval domination in the Far East. It was launched on the Bay of Zolotoi Rog, Vladivostok in February 1905. The 140th model of submarine torpedoboat, one and a half bigger than the Del'fin, was also planned in the Balticheskii zavod (Baltic Shipyard), St. Petersburg in the end of 1903: 33 m length, 400 hp, and 4 torpedo tubes. The Russians decided to build 6 boats and the first one, named the *Kasatka*, was complete in the end of 1904 and immediately sent to Vladivostok. Up to the end of the Russo-Japanese War, four submarines were launched in the Far East, though they had just been anchored on the harbor but never been used in the battle waters during the war[1].

The Japanese Navy was interested in submarine development in the USA. A lieutenant studied in the US Naval Academy, reported to the Naval Staff, Tokyo in 1900 as follows: The Holland model submarine would be available to the actual fighting near future; it would be valuable to defense coast lines and harbors; the Japanese should introduce them in order to oppose predominant navies, at least should start an experiment on submarine sooner. In spite of the above report, the executives in Tokyo had not been embarked on the introduction of submarine[2].

3. Japanese Intelligence against the Russian Submarines

Japanese military attaché in Stockholm, who investigated the transportation of the Trans-Siberian Railway, telegraphed by chance in March 1904 that the Russian navy sent two submarines to Vladivostok and one to Port Arthur from St. Petersburg. But the Japanese Navy was not much interested in the military intelligence, because the naval authorities regarded a submarine as a white elephant. What Tokyo took action was only to order naval attachés to collect information on it.

On 15 May 1904, two newest battleships, the *Hatsuse* and the *Yashima*, struck mines off Port Arthur. Rear Admiral Tokioki Nashiba, commander of the first fleet on the *Hatsuse*, warned all warships under his command of the dangers of submarine. Immediately after the *Hastuse*'s sink, another warship alarmed that look like a submarine would have surfaced nearby, and fired in the water[3]. If Japanese officers would not have read intelligence reports on the Russian submarine, neither the commander alarmed nor the warship fired.

After the sink of the newest battleships, the Japanese Naval Staff was inclined to doubt that they would just have struck mines. Unless the mines, torpedo attacks by a submarine would have been most probable. New reports sent to Tokyo about submarines in Port Arthur, Vladivostok, St. Petersburg, and even New York, enlarged the doubt[4].

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1 *Russkie podvodnye lodki: Istoriia sozdaniia i ispol'zovaniia 1834–1923 gg.*, T.1, Ch. 1, (Sankt-Peterburg: Rubin, 1994), pp.47–92.

2 Lieutenant Kenji Ide, Washington DC to Yoriyuki Morooka, Tokyo, Report No.14 on 03.05.1900, *Meiji 33 nen gaikoku chuzaiin hokoku*, Vol.II, (Kai, Gaichuho, M30–4), Military History Research Center, Military Institute, Tokyo. *Nihon kaigun sensuikan-shi*, (Tokyo, 1979), pp.4–5, 17–23.

3 Julian S. Corbett, *Maritime Operations in the Russo-Japanese War 1904–1905*, Vol.I, (Annapolis, 1994), pp.234–5. The *Shikishima*'s log book on 15.05.1904, *Shikishima Senji nisshi Meiji 37 nen*, Vol.I, [11, Nichiro, M37–96], MHRC. Captain of Shikishima to C- in C-, Report No. 316 on 17.05.1904, *Hatsuse sonan toji sento gaiho oyobi shoho*, [11, Nichiro, M37–31], MHRC.

4 Naval Intelligence Reports in May – December 1904, *Daikaijo* No.165 – 335, [9. Chiyoda, 157–159], MHRC.

After the Second Russian Pacific Fleet started voyaging from the Baltic Sea to the Far East in the middle of October 1904, Tokyo paid great attention if submarines were to be included in the fleet. The Naval Staff ordered naval attachés and diplomatic missions to investigate a mother ship or a repair ship which would load submarines[5]. It also smuggled a naval officer to the Suez Canal in November. He reported from Port Said that a converted cruiser in the Russian Volunteer Fleet would load submarines[6].

In the beginning of January 1905, Japan occupied Port Arthur. Navy officers tried to find any submarine in all over the bay, but reported that there had been no submarine at all[7]. Tokyo finally confirmed that the sink of Japanese battleships in May 1904 was due not to torpedoes but to mines. The Naval Staff recognized itself to have been manipulated by the false information, and heaved a sigh of relief. After that there were not any more intelligence reports on Russian submarines.

4. The Russian and the Japanese Reactions to the Enemy's Submarine

In the early stage of the war, the *Petropavlovsk,* flagship of the Russian Pacific Fleet, struck a mine off Port Arthur in April 1904 and Vice-Admiral Stepan O. Makarov drowned. The Russian Naval Staff, had not been sure whether the flagship be struck by a mine or attacked by a torpedo. It, nevertheless, issued warnings about the enemy's submarines, and ordered to collect information and to prepare antisubmarine warfare. The Russian naval attaché in Washington DC reported that some American shipping agents secretly exported many kinds of submarine parts to Japan[8]. Vice-Admiral Zinovii P. Rozhestvenskii, Commander-in-Chief of the Russian Second Pacific Fleet (the Baltic Fleet), got extremely nervous at the Japanese submarine attack and always ordered to stretch anti-torpedo nets, when the fleet lay at anchor during his voyage to the Far East[9].

The Japanese Navy introduced the *Bakuhatsu soran*, an anti-submarine weapon, up to the end of 1904. It was an explosive with a float pulled by a torpedoboat.

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5 Vice-Chief of the Naval Staff to Vice-Minister of Foreign Affairs, dispatch No.261 on 26.10.1904, *Nichiro sen'eki kankei rokoku Baltic kantai toko kankei ikken*, Vol.1 [5.2.2.20], Diplomatic Archives, Tokyo.

6 Tanaka to Vice-Chief of the Vice-Minister of Navy, Report on 11.01.1905, *Meiji 38 nen Tonami chusa shutcho hokoku*, [10, Gaichuinho, M30–12], MHRC.

7 Gunreibu hen, *Meiji 37–8 nen kaisen-shi*, Vol.I, (Tokyo, 1934), pp.627–42.

8 F.H.Dunbar's letter, Quincy, Mass., Sept.15, 1904 [l.154], C.W.Webb's letter, Seattle on Nov.3, 1904 [l.194], *Materialy o pokupke i ispytanii podvodnykh lodok razlichnykh sistem, sformirovanii i polgotovke komand dlia nikh, ob otpravke podvodnykh lodok na Dal'nii Vostok i po drygim voprosam razvitiia podvodnogo korablestroeniia i plavaniia / raporty, zapiski, perepiska/*, Fond No.417, Opis' No.1, Delo No.2947, Rossiiskii Gosudarstvennyi Arkhiv Voenno-Morskogo Flota, Sankt-Peterburg.

9 Constantine Pleshakov, *The Tsar's Last Armada: The Epic Voyage to the Battle of Tsushima*, (New York, 2002), pp. 217–45.

When it would come in contact with the enemy's submarine in the sea, the torpedoboat turned on an electric switch and exploded it. That weapon was deployed in the Tokyo Bay[10].

Though the Japanese Navy had hesitated about building submarines for a long time, it decided to introduce the US technique developed by John P. Holland in June 1904. Five submarines were manufactured under the Holland license in Kobe. The first one was completed in August 1905. After the end of the war, the submarine flotilla was organized, but it was not deployed for war because of a lack of experimentation in the ocean[11].

Why did the Japanese and the Russian Naval Staff collect information on the enemy's submarine as much as possible? It would be sure that the staff officers stood in groundless fear of unknown new weapon. Either the Japanese or the Russians had not deployed any submarine flotilla in the Far East since the end of the Russo-Japanese War, September 1905. Their development of submarine was hidden underwater for a long time.

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[10] "Bakuhatsu soranwo mochii sensuitei kogekiho", in April 1905, *Meiji 37–8 nen senji shorui* Vol.139, [11. Nichiro sensho. M37/38–139], MHRC.

[11] *Nihon kaigun sensuikanshi*, (Tokyo, 1979), pp.26–34.

Professeur Jean David Avenel (France)
Le développement de la recherche durant la deuxième Guerre Mondiale

La recherche opérationnelle peut être définie de différentes manières. ; on peut simplement la considérer comme une branche des mathématiques ou comme l'application de méthodes scientifiques au contrôle et au pilotage de l'action organisée.[1] Dans cette seconde optique, nous reprenons ici la définition classique de Faure pour qui elle l'ensemble des méthodes et techniques rationnelles d'analyse et de synthèse des phénomènes d'organisation en vue d'élaborer de meilleures décisions.[2] Discipline transversale combinant les mathématiques appliquées, la statistique et l'informatique, elle est d'origine récente même si certains auteurs ont montré que l'application de modèles à l'action organisée existait déjà sous l'Antiquité : construction des pyramides, siège de Syracuse. Le savant français, Monge, avait également déterminé, au XVIII è siècle, une façon optimale d'organiser des travaux de déblayage et de remblayage pour minimiser le coût du charroi lors de l'aplanissement d'un terrain. Néanmoins, il est cependant convenu de placer l'origine de la discipline en Angleterre au début de la Deuxième Guerre mondiale. Elle a été développée lors de la bataille d'Angleterre et, toujours durant la guerre, aux Etats-Unis.

Les débuts de la recherche opérationnelle en Angleterre[3]

Le terme « recherche opérationnelle » (*Operational Research* en anglais) désigne la recherche scientifique du rendement optimum d'une « opération » militaire, d'où l'expression recherche opérationnelle, pendant le second conflit mondial. Dès 1938, le physicien Blackett, membre du groupe d'étude anglais fondé par M.Watson-Watt, réunit une équipe de chercheurs qui détermina l'implantation optimale des radars de surveillance britanniques sur le territoire ainsi que les interactions entre les impératifs de la défense anti-aérienne et ceux de l'intervention de la chasse (déploiement, modes de communication des résultats, coordination des observations radar et de type avion)[4]; les résultats obtenus devaient jouer un rôle déterminant lors de la bataille d'Angleterre. Peu après, en 1940, les responsables militaires et politiques anglais demandèrent à des groupes formés de scientifiques de haut niveau et d'officiers de préparer un certain nombre de décisions. Le plus

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[1] Moisdon J.-C., Nakhla M., *Recherche opérationnelle*, Presses des Mines, Paris, 2010

[2] Faure R., *Eléments de la recherche opérationnelle*, Gauthier-Villars, Paris, 1968

[3] On consultera sur ces points : Ministère de la Défense, *Introduction à la recherche opérationnelle, regard historique et applications actuelles*, Paris, 2011

[4] Nobert Y., Ouellet R., Parent R., *La recherche opérationnelle*, Gaëtan Morin, 2001

connu de ces groupes est le *Blackett's Circus* dirigé par ce même professeur Blackett à qui fut décerné le prix Nobel après la guerre. 7 000 personnes travaillèrent sur l'utilisation de la technologie du radar pour intercepter les avions. Un résultat spectaculaire fut obtenu en août 1940 lorsque le Blackett's Circus, placé sous la responsabilité du commandant en chef de la DCA anglaise, le général Pile et composé de trois physio logues, cinq physiciens et mathématiciens, un astronome, un topographe et un officier, recommanda le tir de DCA sur éléments fixes : il avait en effet constaté que les avions changeaient de cap pendant les tirs une fois sur quatre. Comme il fallait auparavant 20 000 coups de DCA pour abattre un avion, on parvint à obtenir le même résultat avec seulement 4 000 coups.

Un deuxième résultat fut obtenu à la même époque ; le groupe étudiait la corrélation existant entre les erreurs de pointage radar et la nature du terrain. Il détermina alors la taille idéale des treillis métalliques formant les systèmes de détection.

C'est à la suite de ces travaux qu'en reconnaissance de son importance le groupe de recherche fut dénommé *Army Operational Research Group* et organisé en huit sections : défense aérienne, radar, transmissions, infanterie, artillerie, appui aérien, armement, mines, obstacles et armes spéciales.

Blackett, muté courant 1941 au commandement côtier de l'Air (*Coastal Command*), appliqua ses précédents travaux sur le radar à la détection des sous-marins par avion. Il étudia ensuite l'organisation des convois qui traversaient l'Atlantique. Il compara le nombre de navires escortés avec le nombre de destroyers l'encadrant, la disposition de marche, la taille, l'itinéraire, la direction et la vitesse du convoi. Il démontra, en analysant la statistique relative aux pertes subies par les convois en 1942 et 1943 que, quelque soit le nombre de destroyers et le nombre d'attaques, le pourcentage de pertes de navires civils s'élevait à 2,6% lorsque le convoi comportait moins de 45 navires et de 1,7% lorsqu'il était supérieur à 45. Une formule arithmétique simple résume ces conclusions :[5]

Si L désigne le pourcentage de cargos coulés, S le nombre de cargos par convoi, E le nombre de destroyers et C une constante, on obtenait :

$$L = C / S.E$$

Il suffisait donc d'augmenter le nombre de cargos par convoi, ou de les espacer pour pouvoir en augmenter la taille et assurer leur défense par davantage de destroyers ; on retrouve ici un problème d'optimisation de processus. Accompagnées par des recommandations relatives aux itinéraires à suivre, à la disposition des navires marchands et à celle de l'escorte ainsi qu'aux modalités d'emploi des avions du *Coastal Command*, les recommandations de Blackett abaissèrent les résultats obtenus par les sous-marins allemands et se traduisirent par la victoire dans la bataille de l'Atlantique.

[5] Ibidem.

Toujours dans la guerre anti sous-marine, des études basées sur la statistique mathématique et le calcul des probabilités montrèrent que les mines anti sous marines causaient les dégâts optimaux lorsqu'elles se trouvaient à une profondeur de 15 à 25 pieds[6] et non de 50, profondeur comme c'était le cas pour les mines lancées par les avions anglais. Dans ces conditions, on dota les bombes d'un nouveau réglage et on ordonna aux pilotes de lancer leurs bombes sur un sous-marin dans un délai maximum d'une demi-minute après le repérage. Il en résulta une plus grande efficacité des attaques d'avions.

Une autre application de ces recherches concerne la détermination de la taille optimale d'une meute de sous-marins.[7] A priori, plus elle est grosse et plus les chances d'annihiler l'ennemi sont élevées ; en revanche, la taille engendre de nombreux problèmes car il est difficile de disposer de suffisamment de sous-marins au même moment dans des lieux différents et des problèmes de cohésion entre les sous-marins peuvent être importants. Les chercheurs déterminèrent donc une taille optimale en fonction de ces critères au moyen de méthodes d'optimisation sous contraintes. La taille en question était de trois sous-marins.

De manière analogue, on détermina la taille optimale des escadres de bombardiers envoyés sur les villes industrielles allemandes. L'analyse des statistiques relatives aux pertes subies pendant un nombre suffisamment élevé de missions étudiées par les chercheurs montrèrent que, pour un raid donné, le nombre de bombardiers abattus était inversement proportionnel au nombre de bombardiers envoyés en raison de la saturation des défenses anti-aériennes ; les calculs prouvèrent que le nombre optimal était de 1 000.

Conséquence de ces résultats spectaculaires, plus de 120 officiers et 355 savants anglais travaillèrent dans le domaine de la recherche opérationnelle. Blackett formalisa ses recherches dans deux mémorandums dans lesquels il recommandait de mener les études en situation réelle et en collaboration avec les opérationnels, de proposer avec précision des changements ou le maintien des solutions employées jusqu'alors et de mesurer l'efficacité des propositions. Les équipes poursuivirent leurs études après la guerre.

La recherche opérationnelle aux Etats-Unis à partir de 1941

La Mathématique était demeurée jusqu'à la guerre une science essentiellement théorique et deux écoles s'affrontaient, celle de la recherche théorique et celle de la recherche appliquée ; la guerre et les crédits accordés à la seconde lui permirent d'obtenir sa reconnaissance. C'est peu après l'entrée en guerre du pays que, suivant l'exemple britannique, le directeur de *l'Office of Scientific Research and Development, (OSRD*) Vannevar Bush, créa *l'Applied Mathematics Panel (AMP*)

[6] Un pied = 30,5 cm

[7] Nobert Y. et alii, La *recherche…,* op. cité

qui fut chargé de coordonner les travaux des mathématiciens américains pendant la guerre sous la direction de Warren Weaver. L'objectif de l'AMP était d'obtenir le rapprochement entre physiciens, mathématiciens, ingénieurs, économistes, responsables politiques et militaires pour résoudre rapidement des problèmes concrets et urgents nécessitant des procédures de rationalisation et de formalisation.[8] La conséquence fut la formation de grands laboratoires de guerre et la création de nouvelles institutions de recherche en dehors des universités et subventionnées par l'industrie : la *RAND Corporation*, *Radiation Laboratory* du MIT, Los Alamos par exemple. L'AMP fur dissous en 1946 et remplacé par l'Office of Naval Research qui fut chargé d'assurer la coopération entre les chercheurs civils et les militaires ; il fut très actif durant la guerre de Corée.

Le rôle de l'AMP entre 1942 et 1945 consista à mobiliser des mathématiciens sans qu'ils se trouvassent cependant dans un lieu précis. Décentralisé dans onze universités et plusieurs centres de recherche, il travaillait sur contrats et fournissait une aide mathématique aux militaires et aux autres chercheurs mobilisés pendant la guerre.[9] De fait, les trois composantes les plus actives du réseau furent :[10]

– *l'Applied Mathematic Group* (AMG) localisé à Columbia, puis transféré en raison d'une mauvaise gestion à la Northwestern University de Chicago,

– le *Statistical Research Group* (SRG) localisé lui aussi à Columbia et dans lequel le futur prix Nobel d'Economie, Milton Friedman, et de nombreux autres mathématiciens célèbres, tels Dantzig ou Koopmans, travaillèrent. Le SRG fut le groupe le plus actif. Il publia de nombreux travaux sur le contrôle des flux, les bombardements. Il est à l'origine des théories relatives à l'analyse des données. Il mena de nombreux travaux pour le compte de l'amiral Julius Furer, le *Navy's Coordinator of Research and Development*, qui lui commanda des études sur les bombardements et le contrôle de qualité des équipements. Koopmans modélisa la situation « dans laquelle, étant donné les offres de certains ports et la demande d'autres, il convient de construire un plan de transport et d'en minimiser les coûts »,

– le *Bombing Research Group* (BRG) installé également à Columbia.

On peut regrouper l'ensemble des travaux effectués selon trois axes principaux :[11]

– le premier concerne les questions soulevées par la mécanique des fluides, les ondes de choc, la théorie des explosions dans l'air et dans l'eau, la balistique sous-marine et les conséquences mathématiques des réactions nucléaires. Hermann Weyl présenta en 1943 ses recherches sur la dynamique des gaz. Il s'agit véritablement de mathématiques appliquées,

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[8] Bartocci C., Odifreddi P., *La Mathématique*, CNRS Edition, 2007

[9] Ibidem.

[10] Rowe D.E., McCleary J., *The History of Modern Mathematics*, Academic Press, 1989

[11] Bartocci C, et alii, *La Mathématique*, op.cité

– le deuxième axe se rapporte directement à ce que l'on appelle de nos jours la recherche opérationnelle et la statistique mathématique (étude des échantillons, théorie des tests) ;il concerne les problèmes statistiques liés à la défense anti-aérienne et à la gestion du matériel de guerre (études de qualité, files d'attente). Ces travaux relèvent du domaine de la programmation linéaire et non linéaire et des mathématiques de la décision,

– le troisième axe concerne la cybernétique : il s'agit de travaux portant sur certains systèmes de défense comportant à la fois des hommes et des machines.

Parmi les résultats obtenus, on peut citer celui relatif à la pose des mines sous-marines par les bombardiers B 29.[12] La pose s'effectuait auparavant au moyen de vols collectifs à haute altitude. Les recherches montrèrent qu'un raid mené par un seul bombardier à 1 500 mètres était plus efficace car il était plus difficilement détectable par l'ennemi, il n'existait pas de servitudes de vols en formation et l'écart balistique était réduit. On retrouve d'ailleurs des résultats comparables à ceux évoqués plus haut ; toujours est-il que les pertes furent réduites de 90%.

Un autre résultat intéressant concerne les défenses anti-kamikazes des navires américains dans le Pacifique. La question posée était de savoir si, en cas d'attaque, un navire devait virer brusquement et zigzaguer afin d'éviter le coup ou poursuivre sa course en ligne droite pour tirer le meilleur parti des canons anti-aériens rendus imprécis en raison des zigzags. L'analyse s'effectua à partir d'un échantillon de 447 attaques au terme desquelles 127 navires avaient été touchés et 27 coulés. Elle montra que les navires de gros tonnage devaient virer sur le champ puis zigzaguer tandis que ceux de petit tonnage devaient changer lentement de cap. Par la suite, seulement 29% des navires qui suivirent les recommandations furent touchés alors que 47% de ceux qui ne les suivirent pas furent touchés.

C'est également pendant la guerre que le Bureau de l'Aéronautique du Secrétariat de la Défense commanda une étude destinée à la conception des moteurs d'avion à réaction. Les travaux de Von Neumann et du groupe de travail de la New York University (Richard Courant, Kurt Friedrichs,…) aboutirent à la rédaction d'un important rapport sur l'étude des flots gazeux, *The Report on Supersonic Flow and Shock Waves*.

A Los Alamos, fut entrepris le *Manhattan Project* relatif à la modélisation et à la maîtrise des réactions nucléaires qui débouchera sur la mise en place de la bombe H. Une collaboration entre physiciens et mathématiciens était indispensable dans la mesure où les problèmes posés par la physique, fondés sur la théorie quantique, faisaient appel aux théories cinématiques, à la mécanique statistique et à la description des mouvements de grande échelle. Von Neumann modélisa le problème suivant : comment produire une réaction très rapide dans une petite quantité de matériau radioactif (uranium U 235 ou plutonium) en maximisant la quantité d'énergie libérée de façon

[12] Nobert Y. et alii, *La recherche..* ., Op.cité

Les recherches sur les réactions nucléaires permirent de développer une approche stochastique, c'est-à-dire où le hasard intervient comme difficulté principale, des équations différentielles et des équations analytiques. Ulam étudia les problèmes statistiques de la multiplication des particules.

L'usage des ordinateurs débuta en fait à la fin de 1940 et Peter Galison les utilisa pour les simulations de Monte Carlo dans le cas de la diffusion neutronique pour la mise au point de la bombe thermo-nucléaire. Il aboutit à la modélisation d'un processus de réactions. On retrouve ici le problème qui deviendra classique par la suite, à savoir la modélisation d'un problème stochastique complexe de façon à ce qu'il admette une solution calculable ; l'ordinateur simule une randomisation de nombres et la méthode de Monte Carlo permet d'obtenir des nombres aléatoires, c'est-à-dire obtenus à partir d'un processus physique obéissant lui-même au hasard.[13] Ces nombres simulent les faits physiques. Selon la méthode de Monte-Carlo, les neutrons et leurs comportements « aléatoires » sont remplacés par un ensemble convenablement choisi de nombres aléatoires obtenus pour simuler les faits physiques, ce qui signifie qu'ils décrivent l'histoire des neutrons : leur fission, leur fusion, leur multiplication dans le temps. Ces nombres sont correctement choisi parce qu'ils répondent à des règles précises d'échantillonnage statistique de réalisations du processus parmi un grand nombre de possibilités. On étudie ensuite les caractéristiques dans l'échantillon d'expériences à partir de ses propriétés statistiques et on trouve une solution. Pour conclure, on peut dire qu'il s'agit d'une nouvelle façon d'élaborer des connaissances dans lequel l'ordinateur joue le rôle d'un organisme restituant la dimension aléatoire de la Nature (ou environnement). Elle est à l'origine des travaux sur les flots supersoniques ou sur les réactions nucléaires.

La guerre posa le problème de l'optimisation de la défense par la meilleure utilisation possible des moyens limités disponibles. Elle obligea les scientifiques à déterminer un ensemble de décisions et de réalisations de façon à obtenir un résultat optimal, quoique pas nécessairement maximal. Les études que nous avons décrites permirent de le faire. Après la guerre, elles donnèrent naissance à trois domaines disciplinaires directement issus des recherches britanniques et étasuniennes :

–la programmation linéaire, conséquence directe des activités de planification de l'US Air Force et de la RAF destinées à coordonner les capacités d'acheminement des matériels et des hommes d'un continent à l'autre en 1943 et en 1944 ou entre l'Angleterre et la France en 1944 avec les capacités de production et de stockage dans les deux pays anglo-saxons ; on retrouve les travaux de Dantzig relatifs à l'obtention de la solution d'un système d'équations ou d'inéquations linéaires ou non linéaires (méthode du simplexe),

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13 Ils sont calculés en utilisant le théorème de Von Neumann ou des mid-squares ; on peut également utiliser les suites de Fibonacci.

– la théorie de la décision qui fut employée pour l'inspection des équipements militaires en vue d'éviter la perte des items. On retrouve la question fondamentale de la décision statistique qui sera à la base des études de contrôle de la qualité dans l'industrie jusqu'à nos jours (travaux de Wald) : quand faut'il arrêter de tester un échantillon ?

– la théorie de l'optimisation qui sera reprise par les économistes et les gestionnaires à partir des années 50 et qui a pour point de départ les problèmes de transport posés et résolus par Koopmans en 1942 et les analyses coût-bénéfice lors des bombardements aériens.

La recherche opérationnelle fut développée à partir des années 50 dans la plupart des pays industrialisés, en France et en U.R.S .S. notamment et dans de nombreuses activités économiques, comme la planification et le management des entreprises.

Vincent Arbaretier (France)

Technologie et art de la guerre : La radio et la campagne de 1940

Dans les questions posées par les évènements qui marquent l'histoire militaire, notamment dans la période contemporaine, viennent en premier lieu les interactions entre la stratégie d'un chef militaire (voire politique) et la perception des réalités du « champ de bataille[1] » que ce chef militaire peut avoir.

L'art de la guerre, un « art simple et tout d'exécution » selon Napoléon, est, semble-t-il, soumis aux contingences de la bataille et à la compréhension que le chef peut en avoir. Des « capteurs », plus ou moins élaborés, sont présents au contact de l'ennemi et donnent au chef une vision plus ou moins réelle de la situation. En fonction de cette situation, ce chef prend ensuite une décision et transmet ses ordres aux unités subordonnées chargées de les exécuter. Dans le processus ainsi décrit, il importe de refléter une situation réelle bien comprise (du subordonné vers le chef) et ensuite de donner des ordres exécutables par le subordonné dans les meilleurs délais avec le maximum de cohérence par rapport au déroulement de la situation. Ceci semble une évidence et fait que l'art de la guerre est « tout d'exécution ». Rien ne sert de donner un ordre génial en décalage par rapport à la situation, ou bien qui bride tellement l'initiative du subordonné, que ce dernier l'exécute à la lettre sans « éventuellement désobéir au chef », si la situation l'exigeait.

La deuxième Guerre mondiale a fait déjà l'objet de multiples ouvrages et études historiques ; les causes de la défaite de la France de mai–juin 1940, due selon le général de Gaulle, « à la supériorité mécanique des forces aériennes et terrestres » des Allemands, furent, elles aussi, étudiées en détails par de nombreux historiens et militaires.

Si l'armée allemande possédait, en effet, la maîtrise des airs et de l'emploi des grandes unités blindées et mécanisées, il n'en fut pas moins vrai que pour abattre l'armée française en moins d'un mois, qui passait alors pour la première armée au monde, et effectuer de vastes déplacements en très peu de temps, cela nécessita également une doctrine, des moyens de commandement et de transmissions adaptés à la guerre de mouvements.

C'est ainsi que, constatant que l'historiographie consacrée à cette époque n'avait pratiquement pas traité cet aspect de la défaite française, j'ai eu l'impression que l'inorganisation des forces françaises tenait surtout au manque de volonté stratégique et donc à l'inexistence d'un système de commandement digne de ce nom.

[1] Même lorsqu'il n'y a pas de bataille à proprement parler.

L'absence d'un réel système de commandement avait d'ailleurs pour conséquence essentielle l'inexistence d'un outil structuré de commandement qui aurait pu être une arme des transmissions bien réelle et dont l'emploi aurait été clairement défini, à l'image de celui des autres armes : infanterie, chars, etc... . En effet, outre les moyens déployés, l'armée de terre allemande semblait avoir tiré les leçons des échecs des percées de juillet 1918, en adaptant sa doctrine de commandement à la mobilité requise par une guerre de mouvements, fût-ce, avec les moyens de la première guerre mondiale. Les Français, au contraire, semblaient avoir caractérisé leur doctrine de commandement par un schéma défensif et statique où les chefs se tenaient à l'arrière, loin de leurs troupes au contact. D'ailleurs, peu de temps avant l'attaque éclair du 10 mai sur le front occidental, le GQG paraissait avoir quasi définitivement renoncé à une expédition militaire hors de notre territoire national (au Caucase, voire en Finlande), tant l'expédition de Norvège semblait être mal engagée[2].

Le général L.M Chassin écrivait ainsi en 1951, dans son Histoire militaire de la Seconde Guerre Mondiale : « Les progrès faits par les moyens de transmissions : radiotéléphonie, radiotélégraphie, radiodétection, ont transformé pendant cette guerre l'exercice du commandement. Alors que le général de 1918, comme d'ailleurs le général français de 1940, apprenait ce qui se passait sur le front avec un retard de vingt-quatre heures, le chef moderne est en mesure de prendre presqu'immédiatement les décisions qui s'imposent. Son tableau de la situation doit être toujours exactement tenu, ce qui est rendu nécessaire par la rapidité de déplacement des éléments d'attaque de l'adversaire. »

Ainsi le système de commandement français n'avait guère fondamentalement évolué depuis 1918, dans la mesure où les chefs français de 1940 continuaient à penser et à mener la guerre comme à la fin de la première guerre mondiale.

Au contraire, les chefs allemands (devenus en 1940 des « chefs modernes[3] ») possédaient des moyens de commander qui leur permettaient d'apprécier la situation et d'y réagir en conduisant la manœuvre en « temps quasi réel ».

Les Français, alors, ont-ils été vaincus à cause de leur retard technologique dans le domaine de leur système de commandement ? Ou bien, si les Allemands ont-ils réellement élaboré une doctrine en matière de commandement[4], qui leur a permis de vaincre si vite la première armée du monde de l'époque ?

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[2] Cf carnets d'une défaite de Paul de Villelume (Fayard 1956). L'auteur, colonel détaché au Quai d'Orsay à cette époque, témoigne des hésitations françaises en matière stratégique.

[3] Ou des « meneurs d'hommes » d'après Yves Durand dans son Histoire de la seconde guerre mondiale.

[4] Un « système de commandement » (expression volontairement anachronique) regroupe à la fois les chefs, les états-majors et les moyens matériels nécessaire à la réception et à la diffusion des ordres.

Dès le milieu des années trente, après la disparition du général Ferrié survenue en 1932, il semble clair que l'outil de commandement français va à vau-l'eau, sans but précis, au contraire des transmissions allemandes qui ont un chef, Fellgiebel, et un initiateur, le très connu Guderian.

Les Français, ainsi ont laissé leur doctrine végéter au gré des crises politiques ou économiques en négligeant de concevoir, dans le domaine des télécommunications militaires, comme dans celui de la motorisation, les outils indispensables à la gestion réactive et dynamique d'une situation militaire conflictuelle. Ils ont ignoré le pouvoir fécond de l'imagination et ont laissé s'instaurer la routine de l'esprit d'habitude d'une armée victorieuse et épuisée. Les moyens que réclamaient certains chefs lucides (dont le Maréchal Pétain dans les années trente d'après le Professeur Pédroncini[5]) ont été oubliés par des hommes politiques sans doute d'avantage préoccupés par la crise économique et leurs résultats aux différentes élections que par les prémisses de l'esprit de revanche allemand. La France, ainsi, sans s'en rendre compte allait cesser d'être une grande puissance.

Allait – on ainsi oublier ce qu'était le commandement d'une action militaire?

On avait oublié lors du conflit précédent que les chefs devaient être « charismatiques », et ainsi vus et connus de tous les combattants, notamment ceux de la première ligne. On avait oublié le pouvoir du petit chapeau et de la redingote grise du "petit tondu" ou la renommée du "père Bugeaud"et de sa fameuse casquette[6]. Les chefs étaient devenus (depuis la Première guerre mondiale) des « technocrates froids », opérant une alchimie, pas toujours bien comprise de leurs hommes, lors d'hécatombes sanglantes qui allaient ensuite peser sur le moral et la psychologie du peuple français.

Ensuite, on avait oublié qu'une action tactique pouvait être décisive et ainsi fausser les meilleurs calculs stratégiques. GAGNER DU TEMPS sur l'adversaire n'était plus le soucis de chefs d'avantage préoccupés de ne pas déplaire au pouvoir politique que de se battre contre un ennemi qu'il fallait battre sur le champ de bataille de façon décisive en lui imposant le choix du moment, quitte à faire prendre un risque au pouvoir politique.

Enfin, non seulement il fallait OSER mais aussi il fallait se doter d'un OUTIL permettant de suivre en temps réel l'évolution d'une situation en réagissant aux contre-temps imposés localement par un ennemi dont on connaissait déjà l'ampleur de la volonté et des moyens.

On pourrait ainsi imaginer le schéma suivant :

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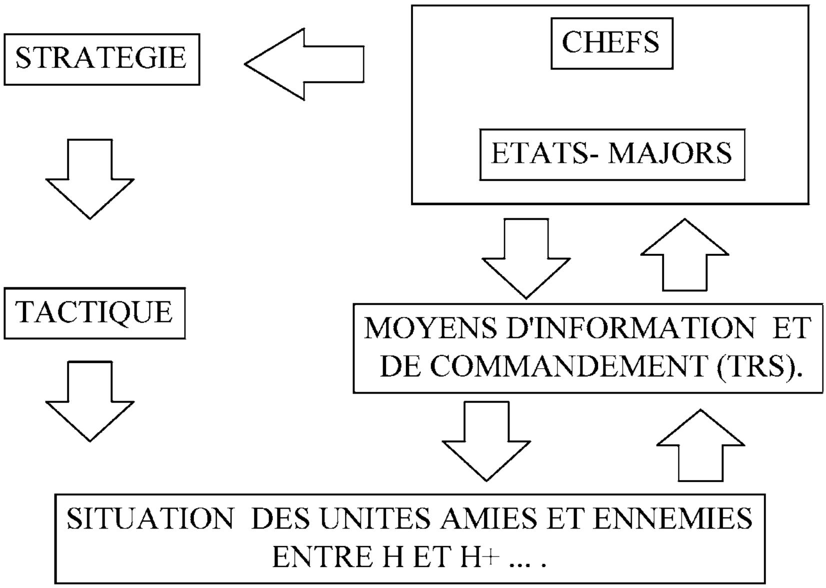
[5] Cf Pétain chef de guerre Perrin 1998.

[6] Cf le refrain de chasseurs bien connu.



Sur ce schéma, on observe ainsi que les « moyens d’information et de commandement » permettent aux chefs et aux états-majors d’exercer leur stratégie et leur sens tactique pour avoir une influence directe sur la situation entre les unités amies et ennemies. De fait, si ces moyens sont insuffisants pour à la fois décrire au chef une situation réelle et lui permettre de donner des ordres cohérents avec l’évolution de cette situation, alors les meilleurs chefs donnant les meilleurs ordres concernant une situation périmée ne pourront qu’être vaincus par un ennemi, qui, lui, sera en phase avec l’évolution aléatoire de la bataille.

En Allemagne, après la 1° guerre mondiale, les enseignements allaient être tout différents et notamment, devenir le fruit des réflexions d’un jeune capitaine de transmissions alors méconnu, le capitaine Fellgiebel, futur Commandant des Transmissions de la Wehrmacht!

Le capitaine Fellgiebel[7], en 1919 est un jeune officier, mais rempli des sou-

[7] En 1905 il s’engage au titre du 2° bataillon télégraphiste de Francfort sur l’Oder ; en 1907 il est sous-lieutenant ; au début de la guerre, en 1914, il est lieutenant, chef de la section de transmissions de la 4° division de cavalerie. En 1915, il devient capitaine ; en 1916/1917 il est officier des transmissions de la 8° armée (von Mackensen), dans les Balkans ; il est finalement fait « officier breveté de l’état-major général ». Dans la Reichswehr aprés une activité dans un emploi de corps de troupe il exerce un temps de commandant d’unité dans la deuxième section de transmissions de Stettin. En 1926 il fait un temps d’état-major à la 4° division ; en 1928 il est promu commandant ; en 1929 il est chef de la section chiffre du ministère de la Guerre ; en 1931 il est nommé chef de corps du 2° bataillon de transmissions ; en 1933 en tant que lieutenant-colonel, il devient chef de l’Inspection de l’arme des Transmissions ; dès le 1°octobre 1934 il devient Inspecteur des Transmissions et est promu colonel, puis général de brigade. En **1938 promu général de division**

venirs de son expérience de comandant d'unité télégraphiste. L'armée allemande, après la défaite de 1918, possédait déjà une arme des Transmissions et une composante « commandement » qui tentait de suivre le rythme de la manœuvre.

Dans les archives de l'Armée allemande, on retrouve ce qui allait prévaloir dans une **arme des Transmissions moderne et apte à suivre au plus près les évolutions de la manœuvre tactique** : [8]

L'arme des transmissions se situa sous une double mission, monter en puissance l'arme en fonction des développements continuels de la technique, et prendre en considération, que le commandement allemand sur le front occidental durant la première guerre mondiale n'avait pas utilisé pleinement les moyens de communication existants. Ainsi il s'agissait de dépasser le bond en avant réalisé par les transmetteurs des autres pays. La sélection de personnel non adéquat réalisée au début fut améliorée par des tests psychotechniques.

L'arme des transmissions augmenta de 7 détachements divisionnaires à 71 détachements organiques de divisions, de corps d'armée et de l'armée de terre en 1939. A l'exception des formations partiellement motorisées des divisions d'infanterie et de montagne, toutes les autres formations de transmissions étaient pleinement motorisées. Parmi les formations organiques de l'armée de terre étaient mises sur pied lors de la mobilisation deux régiments de transmissions de l'armée de terre responsables des liaisons du haut commandement.

La formation (motorisée) de transmissions du **corps d'armée** comprenait en général une compagnie téléphonique (construction et exploitation), deux compagnies filaires, une compagnie radio, et une colonne légère de soutien transmissions (matériel) ; une **formation de transmissions d'une division d'infanterie** était composée d'une compagnie téléphonique (en partie motorisée), d'une compagnie radio (complètement motorisée) avec une section de guerre électronique, et d'une colonne légère de soutien transmissions (matériel).

Dans les **divisions légères**, il n'y avait qu'une compagnie de transmissions. Le renseignement électromagnétique n'était effectué que par les stations d'infrastructure et les compagnies d'écoutes. Les officiers des transmissions et les commandants de formations transmissions du corps d'armée supervisaient l'instruction.

En dehors du domaine pur de l'arme des transmissions, chaque arme de l'armée de terre possédait un **élément de transmissions du corps de troupe** au sein de chaque unité. A travers ce principe furent incorporés ainsi en 1935–36 plus de **13% des soldats de l'armée de terre dans l'arme des transmissions**.

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et nommé Commandant des Transmissions de la Wehrmacht ; le 1° février 1940, il est promu général de corps d'armée ; le 1° août 1940 général d'armée de l'arme des Transmissions. A cause de sa participation morale à l'attentat du 20 juillet 1944 il fut emprisonné et exécuté le 4 septembre 1944. .

[8] Histoire de l'armée allemande Op. cit, Tome 6, P 357, Arme des transmissions

Pour permettre aux unités de l'armée de terre de se renforcer, certaines stations de transmissions « surpeuplées » furent démontées, ainsi en fut- il des sections de transmissions des bataillons d'infanterie qui furent réduits au niveau d'un groupe de transmissions par bataillon. On obtint également des économies en personnel grâce à la meilleure utilisation des matériels et à la discipline de réseau.

Avec **le colonel Fellgiebel, les transmissions eurent un inspecteur pour la première fois en 1934 qui venait des rangs de cette arme.** Ses connaissances techniques et sa grande puissance de travail contribuèrent à transformer les transmissions depuis un état d'imperfection notoire, comme le montraient les premières manœuvres, à celui d'une arme plus moderne que jamais par le passé.

Par ailleurs, les innovations techniques furent mises à profit, notamment dans le domaine de la **radio pour faciliter la souplesse tactique du commandement des unités** : [9]

Le développement technique se caractérisa par l'utilisation de nouveaux câbles de campagne, des appareils de portage de fréquences, des télétypes et des ondes très courtes. Ave l'installation de moyens radiotéléphoniques des grandes unités blindées fabriquées par elle, l'arme des transmissions eut une part considérable dans le succès des unités blindées. Déjà durant **les manœuvres d'hiver de 1937 dans le Mecklembourg, les grandes unités purent être conduites « à la voix » par radio**. Dans leur utilisation comme moyen mobile de commandement, des unités blindées, les transmissions purent accompagner les armes de mêlée en toute première ligne.

Mais le **moyen de communication le plus important continua à être la liaison filaire** dont la portée fut étendue grâce aux **liaisons de faisceaux hertziens**. En raison de la guerre de mouvement, la radio exploitable de façon permanente commença cependant à jouer un rôle de plus en plus important. Les moyens de transmissions par sémaphore, les pigeons voyageurs et les chiens de liaison perdirent leur signification dans les années 30. En principe l'autorité de commandement supérieure était responsable des liaisons des unités subordonnées et de liaisons latérales entre elles. En général, l'unité de transmissions des divisions construisait une ossature de liaison principale sur l'axe principal de progression. Lors de progressions ultérieures elles utilisaient cette liaison pour les liaisons vers les services de l'arrière. **Les liaisons transmissions de plus en plus importantes eurent pour effet de limiter de façon essentielle le champ de décision du commandement de l'avant au profit du haut commandement**, ce qui constituait par conséquence le revers de la médaille des performances de l'arme des transmissions de l'armée allemande.

De plus, d'après Werner Niehaus[10], depuis le 1° avril 1933, le Lieutenant-colonel Erich Fellgiebel (chef d'état-major de l'inspecteur des transmissions, le

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[9] Rommel, Op. cit.

[10] Histoire des transmissions de l'armée allemande de Werner Niehaus (*Motorbuchverlag*). P34

général de division von Kluge), travailla à augmenter le nombre et l'instruction des transmetteurs. En outre, jusqu'à l'autonne 1935, il créa 12 régiments de transmissions de corps d'armée et 36 formations de transmissions divisionnaires.

Ses **principes** sont les suivants :

1 – Les liaisons des transmissions ne sont pas un but en soi. Elles ont pour **but de servir le commandement** et relèvent de son domaine. Il est absolument nécessaire que les transmetteurs aient une **parfaite compréhension du domaine tactico-opératif**, sinon les commandants de grandes unités et les officiers de l'état-major général seraient obligés de dominer parfaitement le domaine des transmissions, pour pouvoir se servir des moyens de commandement mis à leur disposition.

Le besoin en liaisons et les capacités des transmissions doivent correspondre au degré d'efficacité tactique.

2 – Les **COMTRANS**[11] (« *Nachrichtenführer* ») doivent constamment se tenir informés de la situation tactique et de son évolution prévisible ; ils doivent prévoir pour mettre en œuvre leurs moyens au bon moment.

3 –**Peu de liaisons, mais des liaisons sûres et disponibles prises à temps valent mieux que des liaisons nombreuses et sujettes aux coupures**. Les liaisons à longue distance ont une importance toute particulière.

4 – Il faut compter maintenant avec **des mouvements rapides sur des distances importantes** et par là même, sur des exigences toujours plus grandes demandées aux transmetteurs. **Le commandement des petites, comme des grandes unités ne pourra maintenant ne se faire que par la radio**.

5 – Les **liaisons doivent être obtenues rapidement et de façon fiable**....

Ainsi, les principes hérités de l'expérience de Fellgiebell durant la premier conflit mondial, joints à la volonté de Hitler, ont-ils permis à l'armée allemande de s'équiper de matériels cohérents et modernes tout en adoptant une doctrine résolument tournée vers l'avenir.

Les **règlements allemands[12] en matière de transmissions** sont par ailleurs très précis:

Il n'y a pas un moyen de transmissions idéal, mais il y a des moyens qui se complètent; en conséquence, il faut **toujours établir plusieurs moyens de transmissions en superposition**.

On doit toujours choisir et réaliser en première urgence le moyen de transmissions assurant la liaison la plus rapide et la plus sûre.

L'économie des forces est nécessaire en matière de transmissions.

Les COMTRANS des GU[13] doivent être tenus minutieusement au courant de la situation et des intentions du commandement, de manière à ce qu'ils puissent

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[11] COMTRANS : abréviation de commandant des transmissions

[12] « Les règles générales d'emploi (*H Dv /300 Truppenführung* chap 18 et *AVN Ausbildungsvorschrift für die Nachrichtentruppe*)

[13] GU : grande unité ; brigade, division ou plus ...

prendre en temps utile toutes les dispositions nécessaires pour assurer la continuité du fonctionnement des réseaux.

Dans le choix des PC, il faut tenir compte des possibilités de liaison ; il faut changer les PC le moins souvent possible et en avertir à temps le service des transmissions pour que le nouveau PC soit prêt avant le début du déplacement.

Une liaison téléphonique doit subsister à l'ancien PC avec une fraction arrière de l'état-major aussi longtemps que la liaison n'est pas assurée avec le nouveau PC et que celui-ci n'est pas effectivement occupé.

Le « Tarnungsbetrieb » destiné à induire l'ennemi en erreur est coordonné à une direction d'ensemble. »

Ainsi, Eddy Bauer ajoute [14]:

*« Nous avons vu la **riche dotation d'appareils de transmissions mise à la disposition des corps de troupe**, figurant à l'ordre de bataille de la grande unité mécanique allemande. A l'échelon divisionnaire, on trouve un bataillon de transmissions, formé de 2 compagnies motorisées, l'une de téléphonistes et l'autre de radios, plus une colonne de transport....Relevons encore l'emploi par tous les chefs de Kommandowagen, du type d'automitrailleuse à 8 roues, convenablement blindées et aménagées pour l'envoi et le réception d'ordres....**Les Kleist, les Guderian et les Rommel disposent ainsi de PC roulants, toujours prêts à fonctionner et indépendants des localités, au lieu que les QG français seront bien souvent écrasés sous les bombes de stukas, dans leurs châteaux, leurs hôtels ou leurs écoles**... ».*

Plus loin [15]:

*« L'instruction de la troupe correspond à la richesse du matériel. En Yougoslavie, les pionniers d'une DB posent en 8 jours 265 km de câbles et en replient 310. **A la cadence de la guerre-éclair, les liaisons par fil viendraient souvent trop tard. La radio y supplée brillamment** ».*

Ainsi, outre les moyens de transmissions disponibles de part et d'autre du Rhin, et des doctrines d'emploi dissemblables, la véritable différence entre Français et Allemands semble surtout provenir de l'opposition fondamentale des styles de commandement en vigueur dans ces deux pays, bientôt ennemis. Alors qu'en Allemagne, la technique et l'emploi de moyens souples et modernes permettent au chef tactique, voire opératif, d'acquérir une autonomie dans l'action, la France, au contraire, possède un système de commandement très centralisé qui semble suppléer à la rigidité de nos systèmes de communication. Le rythme de la manœuvre n'est pas adapté aux moyens modernes motorisés, mais encore à un dispositif fixe, où il n'est **question que de combler des brèches**, mais **pas de manœuvrer sur une grande échelle**. Les Allemands contemplent la situation sur le terrain et réa-

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[14] Dans La guerre des blindés (T1) (Payot 1962) ; P47 (Armée allemande).

[15] Eddy Bauer, Op. Cit.

gissent en connaissance de cause, les Français planifient l'action depuis l'arrière et sur la carte, sans laisser aux échelons subordonnés la liberté d'action nécessaire à la réalisation du succès.

Pour finir, on pourrait se rappeler que **le succès des armes dépend d'une conduite de l'avant, au contact des évènements du champ de bataille et que dans toutes les guerres, les chefs victorieux ont été ceux là même qui ont su avoir une influence sur la fluidité des évènements.**

Ainsi n'est-ce aujourd'hui pas un hasard si nos alliés américains conçoivent un système de commandement de brigade où le chef dispose d'un poste de commandement très léger, secondé à l'arrière par un poste beaucoup plus lourd où afflue un nombre toujours plus important d'informations. Le chef devient ainsi libre de ses mouvements tout en restant au contact des évènements du champ de bataille : **la réalité du chef de guerre prend ainsi toute sa dimension.**

Roberto Trajkovski
(FYR of Macedonia)

The exploitation of the narrow gauges in the Vardar part of Macedonia built during the First World War

Abstract: The article elaborates on the exploitation of the narrow gauge in the Vardar part in Macedonia built during the First World War, the period between the two world wars, during the Second World War and after it finished, up until their complete abolition in 1966, as well as their geo-political, war-strategic and economic importance.

Keywords: narrow gauges 600 mm, Vardar part of Macedonia, exploitation.

Taking into consideration the fact that through Macedonia passes the shortest artery (The Vardar valley) which links Central Europe to the Aegean Sea, almost all the European powers, as well as the Balkan countries, in the end of XIX century and the first decades of the XX century, had plans for modernization and exploitation of its traffic infrastructure, which at that time was tightly connected to the technological development of the railway infrastructure. The advantage of the railway traffic compared to the other means of transport will enhance the first railway route in Macedonia in 1873, in times when the railway traffic was dramatically spreading in the Europe and all over the world.[1]

The first railway route, Skopje-Thessaloniki was put into practice in length of around

250 km. In the period that follows, another route was in use, Thessaloniki-Bitola in length of around 218 km, as well as some other smaller and shorter railway pathways. These facts are not mentioned irrationally, they have great significance because during the First World War or more precisely between 1916 and 1918, Bulgaria will invest in the construction of a railway infrastructure on the territory of Macedonia in length of around 617 km, or, to put it more precisely, it did more than it had been done in the last 50 years in Macedonia.[2] How did this happen?

After the Bulgarian successful breakthrough in the Vardar part of Macedonia, in October-November 1915, and with the start of the implementation of the British-French troops in North Greece in the beginning of 1916, the new front on the Balkan Peninsula was created, which extended from the Lake Ohrid to the Stry-

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[1] Данчо Зогравски, Економски и Стратешки аспекти на железницата во Македонија до крајот на Првата светска војна. „Гласник“ на ИНИ (ГИНИ), XXXIII/1, Скопје, 1989, 31–39.

[2] Ангел Симеонов Джонев, Македония в железопътната политика на България (1878–1918 г.). Автореферат на дисертация за присъждането на образователен научен степен “доктор”. София, 2007, 25.

monian Gulf, known as the Macedonian, or the Thessaloniki front. Contrary to the Allied Powers whose primal strategic and logistic base became the Thessaloniki sea port on the Aegean Sea, the Central Powers due to the bad infrastructure and the mountain terrain in Macedonia faced great difficulties to enable their forces with the necessary military weapons and equipment. As a result to that crucial reason commander in chief of the Bulgarian Army, lieutenant general Nikola Zhekov, and the Chief of the General Staff of the Army major general Konstantin Zhostov look for way out in the construction of the military railway narrow gauges with threshold width of 600 mm which was accepted by the Germans, too.[3]

Otherwise, the abuse of the railway traffic for military purposes from the war opponents in that phase of the First World War was not surprising at all, as a matter of fact, the railway traffic was seen as a very applicable detail that may have a crucial role in the outcome of the gigantic war conflict.[4]

The system of the narrow gauges in this exact case was not accidentally used. It comes out as a result of their cheaper price, simpler construction and that is why the narrow gauge makes smaller radius on the curves which enables better conditions for passing through the difficult mountain areas. Till the end of the First World War, two roadbeds were built in the Vardar part in Macedonia: "**Central route"**, which started from Gradsko, over Pletvar Mountain, towards Prilep and around Bitola's suburbs in a valley of approximately 120 km and "**Western route"**, which started from Skopje's suburbs, through Gostivar and Kicevo, towards Ohrid's suburbs in length of 224 km. The two routes represent a complex railway system that consists of: highlands and lowlands, iron and wooden bridges; sand and stone embankments; as well as artificial tunnels which were built in the shortest period possible and thanks to them, the great massive heights were no longer a burden (Gradsko 170 m, Pletvar 1106 m, Bukovik 1180 m, Preseka 1086 m).[5] All in all, that was an epochal militaryengineer achievement of the Bulgarian army, with military-strategic, ethnographic, political and economic importance in which the Macedonians and Germans were actively included.[6]

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3 Ангел Симеонов Джонев, Македония в железопътната политика на България (1878–1918 г.)…20–21.

4 Edwin A. Pratt, The Rrise of reil-power in war and conquest 1833–1914. P.S. King & Son LTD, London, 1915, 7.

5 For the construction of narrow gauges in the Vardar part of Macedonia during the First World War see more: Tetzlaff, Walter: Die deutschen Eisenbahntruppen auf dem Mazedonischen Kriegsschauplatz. Selbstverlag, Berlin, 1924., Ангел Симеонов Джонев, Македония в железопътната политика на България (1878–1918 г.). Регионален исторически музей 'Акад. Йордан Иванов' – Кюстендил, Кюстендил, 2008., Тренко Стојановски, Историја на теснолинејката Скопје-Охрид-Подмолје-Струга-Ташмаруништа. Графокомерц,
Скопје, 2001.

6 For the exploitation of the narrow gauges in the Vardar part in Macedonia during the First World War see more: Ангел Симеонов Джонев, Македония в железопътната политика на България

After the First World War finished, the Vardar part of Macedonia fell under the State of Slovenes, Croats and Serbs/ The Kingdom of Yugoslavia (Kingdom SCS). For the newly formed state of Macedonia was seen as a transit territory because of the belief in those days that the Vardar part in Macedonia is the key to the strategic influence on the Balkans. In that sense, the already existing narrow gauges in the Vardar part of Macedonia have great influence in protecting the military and strategic interests of the Kingdom SCS in relation to the other states.

The reconstruction of the narrow gauges in the Vardar part of Macedonia lasted from 1918 until 1924. In 1920 the routes Gostivar-Kicevo and Prilep-Gradsko were rebuilt. The following year, the route towards Ohrid was also rebuilt and, actually, the traffic was established up to the suburbs of Skopje, and the Lake Ohrid. The same year a consolidation of the bridges and viaducts which were replaced with permanent constructions when, the next summer, only the "**Western route"** started being used, leading form v. Podmolje to Struga and v. Tashamarunishte till the Albanian border, and this confirms the statement that the Kingdom SCS perceived the narrow gauges in the Vardar part of Macedonia as objects of military-strategic importance.[7]

In the same time when the reconstruction of the narrow gauges in the Vardar part of Macedonia took place, the project-suggestion for building a railway route Veles-Prilep-Bitola was accepted. The route would pass through v. Bogomila with normal gauge, which will lead to an end for the "**Central route"** of the narrow gauge and a negative influence on the economic and demographic development of Mariovo and Tikvesh areas, because they gravitated towards Prilep- v. Pletvar-Gradsko narrow gauge. Likely or not, the construction of the railway route Veles-Prilep- Bitola was late, so parts of the central route will be used until 1936/37, when the narrow gauge Gradsko-Prilep-Bitola shall finally be demolished.

According to the plan, the dissembled railway material from the railway route Gradsko-Drenovo should be used for the construction of the narrow gauge Shtip-Strumica, but this route shall never see the light.[8]

The level of economic exploitation for the narrow gauges was undeveloped between the two world wars in accordance with the low economy and the half-colonial status that the Vardar part of Macedonia had in a newly created Yugoslav state, however, the economic export from the Kingdom of SCS to Albania went through the "**Western route"**, taking into consideration that fact, the Vardar part of Macedonia played an important role by being the honest mediator between the

(1878–1918 г.). Регионален исторически музей 'Акад. Йордан Иванов' – Кюстендил, Кюстендил, 2008.

7 Владан Јовановић, Саобраћајна модернизација југа Краљевине СХС. Историја 20. Века. 1/2002. Инситут савремене историје, Београд, 2002, 61.

8 Историја на железниците во Македонија 1873–1973. Скопје, 183–184.

two states.[9] The amount of the freighting transport on the narrow gauges between the two world wars was in constant oscillations. It reached its highest point in 1931 when 115.215 tones were transferred while; in the years that follow it will eventually be halved due to the disassembling of the central route.[10]

The condition of the passenger traffic was no better though. The main disadvantage was the insufficient number of passenger wagons. The passengers were divided into privileged and unprivileged. The privileged were people from the military, the politics and the state organs. Their local character could be determined by the number of passengers and goods. The number of railway equipment in these two routes was constantly declining, while the number of passengers and goods vehicles was rising disproportionally. As a result, the trains could not reach higher speed (the average speed was 8/9 km/h), so a travel from Skopje to Ohrid lasted 19 hours and 20 minutes. The largest number of passengers ever conveyed was in 1939 or, more precisely 313.000 passengers.[11]

After the German invasion of Yugoslavia in 1941 and the collapse of Kingdom of Yugoslavia, the "**Western route**" of the narrow gauge from v. Sarashinci (Tetovo) to v. Mesheishta (Ohrid) would go under the Fascist Italy authorities. Bulgaria would take approximately 47 km, from Gorno Skopje to v. Sarashinci (Skopje) and from Ohrid to v. Mesheishta. During the Second World War this narrow gauge was most exploited for transport of chromium mineral from the v. Radusha and v. Lojane mines.

When the armed uprising in Western Macedonia started, the narrow gauge became a primal goal to the Provincial Committee of the Communist Party in Jugoslavia for Macedonia, where they committed more sabotages, diversions and military actions against the trains. After Italy's capitulation in September 1943, the "Western route" of the narrow gauge from v. Bukovik (Kicevo) to v. Botun (Ohrid), in the length of 101 km, out of which 25 km were unavailable for traffic, was controlling the National Liberation Army of Macedonia (NLAM) and it was most often used for reshuffling the units from one place to another. NLAM in that short period has 11 locomotives and 50 passenger and goods vehicles.[12]

With the intention to overtake and ensure the traffic communications (the road and railway net) which connected Albania and the upper part of the Vardar valley, and by doing it to overtake the "**Western route**" of the narrow gauge, the Command of German XXI mountain army corps, which was situated in Albania, Western Macedonia and Kosovo, will bring a decision to overtake one military op-

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9 Владан Јовановић, Саобраћајна модернизација југа Краљевине СХС. Историја 20. Века. 1/2002...68.

10 Историја на железниците во Македонија 1873–1973...189.

11 Ibidem…189.

12 Тренко Стојановски, Историја на теснолинејката Скопје-Охрид-Подмолје-Струга-Ташмаруништа…59.

erations under the name “Edelweis” against the units of NLAM in Western Macedonia.[13] After the success that the operation “Edelweis” achieved, the Command of German XXI mountain army corps will take some actions for making the narrow gauge capable again and its protection of eventual sabotages and diversions by NLAM with establishing security checkpoints.[14] The Germans wanted to improve the supplying for their units in Albania with the mentioned activities, still, because of the whipping of the war in Western Macedonia between the NLAM and the German army, as well as the Albanian nationalist groups in the summer of 1944, that will not fulfill from the exploitation of the narrow gauge till the retreat of the German Army from Vardar part of Macedonia in November 1944 was totally neglected. Due to the severity of the military actions in that part of Macedonia, the narrow gauge suffered lots of damage on the track ways, the shunts and the bigger bridges. So, the bridges over the Vardar River around v. Saraj (Skopje), Gostivar and the Drim River, near Struga were destroyed, along with 29 shunts.[15] Out of the existing 144 locomotives for narrow tracks, only 2 were in use after the end of the war.[16]

After the end of the Second World War, the Vardar part of Macedonia will enter in the new Yugoslav Federation as a separate federal state under the name Socialist Republic of Macedonia. The new federal state had a specially state-owned company whose primal activity was the exploitation of the railway traffic, which was part of the federal state-owned company “Yugoslav railways” until the independence of the Republic of Macedonia. Under the authority of the newly established”Main office–Railways Skopje“, which in the period that follows will change its name several times, will consist of 264 km of narrow track railway.[17] That was all about the railway route Skopje-Ohrid built during the First World War and some of its subsidiary branch lines.

The reconstruction of the “Western route” of the narrow gauge started before the German Army final retreat from Vardar part of Macedonia in November 1944 and finished in January 1945, when the first train arrived from Ohrid in Skopje.[18]

The narrow gauge in the following period owned these characteristics: allowed speed from 14 to 20 km/h; the largest ascent, measured in length of 300 m, was in v. Berikovo (Kicevo) and was 36%, while the descent near v. Zrkce (Ohrid) was 29%; the greatest number of enabled hubs were 60; the loading of the railway

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13 Kriegstagebuch Nr. 3 Gen. Kdo. XXI (Geb.) A.K. von 1.11.–30.11.43. Ia. Bundesarchiv-Militärarchiv Freuburg im Breisgau Deutshland (BAMAF). RH-24/21/86.

14 Generalkommando XXI. Geb. A. K. Abt. Ia Nr. 8858/43 geh. Btr.: Inbetriebnahme der Bahn Skoplje-Struga. K.H.Qu., den 15. 12. 1943. BAMAF. RH-24/21/89.

15 Историја на железниците во Македонија 1873–1973...311.

16 Ibidem…315.

17 Ibidem…322.

18 Ibidem…350–351.

engines was in accordance with the descent of the determined railway route; the number of regular lines was 17, out of which 15 were for goods and 2 for passengers; the travel from Skopje to Ohrid lasted 17 hours and 37 minutes.[19] 70 % of the railway lines on this railway route derived from the First World War, as well as the locomotives. In that postwar period in Socialist Republic of Macedonia, the narrow gauge Gorno Skopje-Ohrid was the most important traffic connection in Western Macedonia, even with all the restricted characteristics.

On the **"Western route"** of the narrow gauge, starting from 1952, the transport is decreasing and what is more to it is due to the newly built railway route with normal track Gjorce Petrov (former gen. Zhostov) – Gostivar which began it be built in 1948. The transport of passengers on the narrow gauge culminated in 1950 when 593.742 passengers were conveyed. Although the Gjorce Petrov- Gostivar route was nearly twice the size of the other part of the narrow gauge, its participation in the transport of goods and passengers was 2–3 times larger. That was a consequence of the biggest cities in Western Macedonia, Gostivar and Tetovo gravitated to the administrative centre of the Republic of Macedonia, Skopje.[20] This situation was the reason why the traction park that was part of this railway route from 1952 and on, was constantly decreasing. There were 65 locomotives and 6.500 wagons in 1954, while in 1964 there were 40 locomotives and 4.000 wagons.[21] In 1961 the exploitation of the western route of the narrow gauge was given to the newly established company by the decision of the Executive Council (The Government) of the Socialist Republic of Macedonia, under the name "Railway transport company Gostivar".

The annulment of the western route of the narrow gauge from Gostivar to Ohrid in the length of 167 km in 1966, in the Republic of Macedonia is quite controversial even nowadays. All those controversies came out because this route never had a substitution. According to the official documents the main reason for the annulment of the narrow gauge from Gostivar to Ohrid was the unprofitable railway line, as a result of the increased prices for the materials and the overempolyment in the company which was responsible for it. Its importance in the wider social, economic, political and ethnographic context was never taken into consideration and, what is even more symptoatically, that Executive Council of S.R. Macedonia did not participate at all in the process of the decision for annulment of one of the most influentian objects of strategic importance in the Vardar part of Macedonia at that time.

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[19] Возен ред 50 за линијата Горно Скопје-Охрид-Подмолје-Струга. Главна дирекција за експлоатацијата на железницата, Скопје, 1948, 3–30.

[20] Историја на железниците во Македонија 1873–1973...463.

[21] Тренко Стојановски, Историја на теснолинејката Скопје-Охрид-Подмолје-СтругаТашмаруништа…123.

On March 26th, 1966 the Labour council (The administrative body) of the Railway transport company Skopje (RTC Skopje) brought a decision ”For official and public invitation to referendum for annulment of the working unit- The Complex plant Skopje (CPS)“, a company which leads the economy of the narrow gauge Gostivar-Ohrid at that time. The voting was secretive on a voting sheets, claiming “FOR” or “AGEINST”. The voting on the referendum was done in the whole territory that is under the “Railway transport company Skopje” on April 12th, 1966.[22]

On the referendum for the annulment of the narrow gauge Gostivar-Kicevo-Ohrid voted only 2.5% more railway workers or, in other words, 52,5% were FOR, while 47,5% voted AGAINST. One has to stress here that those railway companie workers which worked on the narrow gauges, voted 2,21% “FOR”, which made its annulment even more controversial.[23]

The “West route” of the narrow gauge built during the First World War, from-Gostivar to Ohrid in the length of 167 km stopped functioning on May 15th, 1966 which left unbearable consequences for the economic and demographic development in that Western Macedonia.[24]

The annulment of the narrow gauge was received with severe worry and revolt by the population where it passed. From that period on, the migration of the rural population from that part of Vardar Macedonia accelerated, looking for a better life in the bigger cities or abroad; this directly influenced the economic development on that territory. The population of that part was tightly related to the narrow gauge which can be even proved by the great number of published texts and poems written especially for it, representing some kind of a resistance against the decision for its annulment. Such poems for the narrow gauge were: “On Preseka”, “Iron soldier” and “Ballade for little train”.[25]

At the end, that would be everything that should be said concerning this emotional issue. Part of the routes of the narrow gauges with width of 600 mm, built during the First World War by the Bulgarian army in the Vardar part of Macedonia for transporting soldiers and military supplies necessary to the Bulgarian-German units situated on the north of Macedonian front line existed for 47 years. Along its length, while it existed, over 500.000 railway compositions passed, weighting over 8.000.000 tones of used freight. In that period of 47 years, the narrow gauges had an immense economic, social and cultural significance for the Macedonian population.

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[22] Одлука за распишување на референдум за укинување на работната единица – „Комплексен погон Гостивар“. Тренко Стојановски, Историја на теснолинејката Скопје-Охрид-Подмолје-Струга-Ташмаруништа…153–154.

[23] Ibidem…156.

[24] Одлука за запирање на сообраќајот на теснолинејката. Ibidem…160–161.

[25] Ibidem…208–210.

Daniel Fuhrer (Switzerland)
From AirLand Battle to Effects-Based Operations: US military strategy and the end of the Cold War

Ladies and Gentlemen, I am pleased to speak to you on the technological advances which led to doctrinal changes in the US Armed Forces beginning in the 1980s. I will try to show this with the concepts of AirLand Battle and Effects-Based Operations as two of the prevailing ideas on warfare in the last 20 years of the 20th century.

As you can see on this slide, I will start in the late 1970s, just after the Vietnam experience. Especially the United States Army wanted to concentrate preparedness on a massive conventional war in Europe and leave the Vietnam War behind. The war against the Warsaw pact should be the Army's big focus for the time being.

I am trying to take a look at the debate on modern conventional war and how to fight this type of war, focusing on Army and Air Force concepts and technology.

In 1973 General William E. DePuy took over the newly established US Army Training and Doctrine Command, TRADOC. He intended to readjust the Army's way of war to fight a big land war in Europe after the Vietnam experience, having been G3, or Operations officer, in General Westmoreland's staff. To this effect he wanted to rewrite the Field Manual 100-5, Operations, the Army's basic doctrine document. But not only Vietnam, much more the Arab-Israeli War of 1973 and the presupposed superiority of Soviet doctrine and its masses of modern weapons systems influenced the new manual, which accordingly was called Active Defense in 1976.[1]

The 1973 war showed modern anti-tank weapons and surface-to-air-missiles to be very effective. Modern war was quick and deadly. To avoid being overrun by Warsaw pact forces in central Europe, new technologies and drill should help US forces together with their NATO allies to hold the line; Active defense wanted to concentrate forces on a narrow front, where analysts thought Warsaw pact forces would try to break through with mass and velocity. New weapons and superior training should help stop these massed attacks. A scientific approach to war saw US tank gunners destroy Soviet tanks at a huge rate. But field exercises revealed weaknesses, when they resulted in uncoordinated combat, predictable tactics and piecemeal destruction of defending forces, which sought to maneuver to counter enemy breakthroughs.

In 1977, General Don A. Starry took over TRADOC; he had seen Active

[1] Headquarters, Department of the Army, Field Manual 100-5, Operations, Washington, DC, 1976.

Defense's weaknesses by his own eyes, while commanding the V corps in Europe in 1976. Under his guidance Field Manual 100-5 was re-written again to become the 1982 edition eventually; now soft things like moral and mental agility came into focus. The new concept was dubbed AirLand Battle, because it wanted to synchronize the Army and Air Force for a giant Deep Battle or Deep Attack against follow-on and rear echelon Soviet forces.[2] The perceived masses of Warsaw pact forces had to be attacked and destroyed long before they reached the battle zone; Air Force assets should bring their firepower deep into the battlefield. But there was skepticism among fighter pilots who did not want to work for Army corps commanders with their limited view on the battlefield.

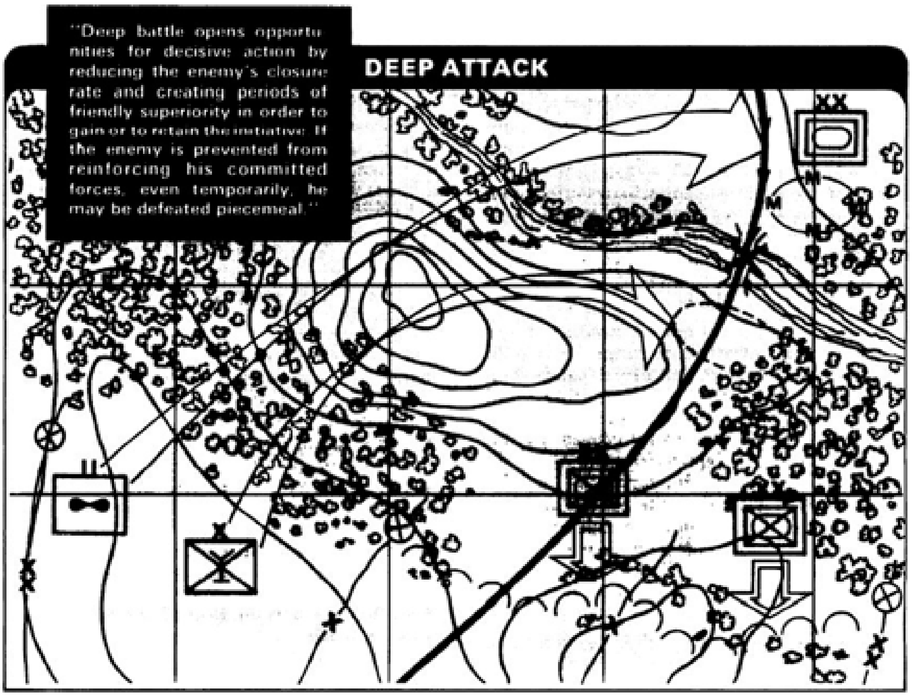

Fig. 1. *Deep* Attack. Field Manual 100-5, Operations, 1982, p. 7–14.

The Warsaw pact's numerical superiority in central Europe should be balanced with enhanced weapons drill and modern weapons systems, then called the „big five", composed of five weapon systems: the main battle tank M1 Abrams,

[2] Headquarters, Department of the Army: Field Manual 100-5, Operations, Washington, DC, 1982; Headquarters, Department of the Army: Field Manual 100-5, Operations, Washington, DC, 1986; and Headquarters, US Army Training & Doctrine Command: US Army Operational Concepts, TRADOC Pamphlet 525- 5 The AirLand Battle and Corps 86, 25 March 1981.

the medium transport helicopter Blackhawk, the attack helicopter Apache, the infantry fighting vehicle Bradley and the air defense system Patriot. The Abrams main battle tank entered service in 1980; it was initially protected by armor based on the British-designed Chobham armor, later versions received improved armor packages which incorporated depleted uranium mesh. The earlier 105 mm rifled tank gun was later substituted by a 120 mm smoothbore gun. The M1 is equipped with a ballistic fire-control computer and powered by a multi-fuel gas turbine. His companion, the M2 Bradley, was developed largely in response to the Soviet BMP family of infantry fighting vehicles to serve as both an Armored Personnel Carrier and a tank-killer. It is equipped with a chain gun as its main weapon, and with anti-tank missiles which are capable of destroying most tanks. This vehicle mix, which today still dominates heavy mechanized forces in the US Army, should be accompanied in the air by another tank-buster. The AH-64 Apache attack helicopter features a nose-mounted sensor suite for target acquisition and night vision systems, is also armed with a Chain Gun and has four hardpoints mounted on stub-wing pylons, typically carrying a mixture of guided anti-tank missiles and unguided rockets. Its cockpit and rotor blades are designed to sustain hits from medium caliber anti-aircraft artillery. Another new aircraft should help move troops, artillery and supplies on the battlefield. The UH-60 Black Hawk medium-lift utility helicopter entered service with the Army in 1979 and is able to perform a wide array of missions, including the tactical transport of troops, electronic warfare, and aeromedical evacuation. It can move a squad of 11 combat troops at once. The last of the Big Five systems is the Patriot surface-to-air missile system which was deployed for the first time in 1984. It has a passive electronically scanned array radar, electronic counter-countermeasure and track-via-missile guidance subsystems. Patriot is somewhat unique in that it is a „detection-to-kill" system, even capable of downing short- or medium-range ballistic missiles.

How technology shaped the way we look at conventional war today, we have to consider some other weapons systems which were also developed according to requirements defined in the 1970s or earlier. The first US military technology development agency was and is still the DARPA or Defense Advanced Research Projects Agency. It pushed other systems which should help stop Warsaw pact forces. The Multiple Launch Rocket System or MLRS is an armored, self-propelled, multiple rocket launcher. The first were delivered to the U.S. Army in 1983. The MLRS can fire guided and unguided projectiles up to 42 Kilometer. Firing ballistic missiles such as the Army Tactical Missile System or ATACMS, it can hit targets 300 Kilometer away. The MLRS can be used in shoot-and-scoot tactics, firing its rockets rapidly, then moving away to avoid counter-battery fire. This system fits perfectly to the idea of a battle in depth. But apart from firing ground-based missiles into the depth of the battlefield, Air Force fighter planes should bear much of the work to be done to destroy the Warsaw Pact's second echelon forces. So there were also new jetfighters developed in these years, only one of them to be mentioned here. The A-10 „Thunderbolt II" or „Warthog" was designed to answer a US Air Force requirement to provide close air support for ground forces by means of attacking tanks, armored vehicles, and other ground targets with a limited air interdiction capability. It is the first US Air Force aircraft designed solely for close air support, built around the Avenger, a heavy 30mm Gatling gun which forms the aircraft's primary armament. The aircraft's hull incorporates over 1200 pounds of armor and is designed to guarantee survivability, with protective measures in place which enable the aircraft to continue flying even after having suffered significant damage. The first series of A-10 flew in 1975, and deliveries to the Air Force commenced in 1976. Other newly developed weapons systems were not weapons or munitions as such, but should help the Army and Air Force to locate the enemy in the so-called „deep battle". The E-8 Joint Surveillance Target Attack Radar System or Joint STARS is a battle management and command and control aircraft. It tracks ground vehicles, collects imagery, and relays tactical pictures to ground and air theater commanders. Joint STARS evolved from separate US Army and Air Force programs to develop, detect, locate and attack enemy armor at ranges beyond the forward area of troops. It can look from a long range, which the military refers to as a high standoff capability. The two development aircraft were deployed in 1991 to participate in Operation Desert Storm, even though they were still in development. Another way to monitor targets from great distance is using space-based platforms. The KH-11, also referenced by the codename „Key Hole", is a type of reconnaissance satellite launched by the American National Reconnaissance Office since December 1976. Data is transmitted through a network of communications satellites to earth. Older reconnaissance satellites had to send their images back to earth via a reentry device. So real-time battlefield surveillance could finally take place.

The Gulf War in 1991 was a showcase for the mentioned and other modern weapons systems. The „Big Five" were effectively brought to bear on the Iraqi armed forces, as was the new generation of jet fighters including the stealth bomber F-117. Together with the Stealth Fighter, the laser guided bomb or LGB proved its worth as a precision guided munitions platform, many times portrayed in the accompanying media campaign. A laser-guided bomb uses semi-active laser homing to strike a designated target with greater accuracy than an unguided bomb. Laser-guided weapons were first developed in the United States in the early 1960s, leading to the development of the Paveway series, which was used operationally in Vietnam starting in 1968. While LGB are highly accurate under ideal conditions, they present several challenges for successful use, making them somewhat less the „silver bullet" than sometimes suggested. To ensure accurate guidance, the target must be illuminated by a laser designator and the pilot must deliver the weapon within the „weapon basket", the zone in which the weapon seeker can observe the laser target marker and the weapon has sufficient energy to guide to the target. Laser illumination can be interrupted by smoke, fog, or clouds, limiting the usefulness of LGB in poor weather or very dusty conditions. In desert warfare, such as the 1991 Gulf War, laser designation sometimes reflects off sand, causing weapons to home on false targets. Furthermore, the need to provide designation may leave the aircraft dangerously exposed to ground fire or enemy air support. Making matters worse in 1991, there were not really many aircraft suited as LGB launch platforms. Most of the weapons delivered by aircraft were in fact unguided dumb bombs, thus speaking of a „precision air campaign" would be far from correct. Another modern and so-called intelligent or precision guided weapon which was successfully used in Desert Storm for the first time was the Cruise Missile. Apart from the Tomahawk, there was the combat debut of the CALCM or Conventional Air-Launched Cruise Missile. The CALCM is a subsonic air-launched cruise missile which was developed to increase the effectiveness and survivability of the venerable B-52 bombers. The CALCM carries a conventional blast/fragmentation payload rather than a nuclear payload. It uses an onboard GPS system coupled with its inertial navigation system to navigate in flight. This allows the missile to guide itself to the target with pinpoint accuracy. The CALCM became operational in January 1991 at the onset of Operation Desert Storm. B-52 Bombers did so called „round-robin" missions which are the longest known aircraft combat sorties in history, comprising more than 14'000 miles and 35 hours of flight. Another precision weapon delivery vehicle was the mentioned Stealth Fighter. The F-117 was born after combat experience in the Vietnam War when increasingly sophisticated Soviet surface-to-air missiles downed many US aircraft. A product of Lockheed's secret and innovative „Skunk Works" and a result of the „Have Blue" technology demonstrator, it became the first operational aircraft designed around stealth technology. It is shaped to deflect radar signals and equipped with sophisticated navigation and attack systems integrated into a digital avionics suite. Targets are acquired by an infrared system, slaved to a laser that determines the range and designates targets for laser-guided bombs. The F-117's first flight was in 1981, and it achieved initial operating capability in October 1983. It was officially „acknowledged" and revealed to the world in November 1988; and finally widely publicized during the Persian Gulf War of 1991. Apart from these modern precision attack systems, the Global Positioning System or GPS helped ground and air forces to position themselves on the battlefield. GPS is a space-based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS satellites. It is maintained by the United States government and is (normally) accessible to anyone with a GPS receiver. The GPS project was developed in 1973 to overcome the limitations of previous navigation systems. Not entirely operational, GPS was used for the first time in 1991. GPS receivers were sometimes taped into the cockpits of aircraft, and many were commercially or off-the-shelf bought by the Army to equip combat vehicles. Today, many western guided weapons rely on GPS.

Now, all these new technologies and a militarily overwhelming victory against Saddam Hussein in 1991 pushed a discussion about modern warfare. Soviet military leaders had already in the 1970s acknowledged US technological developments leading to new forms of warfare. Marshal of the Soviet Union Nikolai Vasilyevich Ogarkov is generally credited with recognising that US superiority in information technology in the 1970s was leading to a „military-technical revolution". In the 1980s the Soviets saw US precision weapons to be sort of similar in their effect as nuclear weapons; networked with modern sensor and target acquisition systems, this lead to the Reconnaissance Strike Complex. But US analysts quickly found an exclusively technological focus too limiting and the military-technical revolution evolved into the more holistic concept of a Revolution in Military Affairs, incorporating organizational and doctrinal changes as well. Andrew Krepinevich was the first to discuss the Military-Technical Revolution in a 1992 assessment.[3] He saw three central areas of technological progression which could lay the foundation for a revolution in warfare. First, there was a growing ability to gather, process, and disseminate information far more rapidly than before. Krepinevich considered an advantage if this information was to be used to identify, prioritize, and attack effectively an enemy's „centers of gravity". Second, Krepinevich spoke about major improvements in range, accuracy, and lethality of conventional munitions that may allow armed forces to destroy large numbers of targets in an extended theater of operations. And third, new technologies would allow the armed forces to identify and gain a better understanding of one's own centers of gravity through simulation and other forms of analysis. Krepinevich's visions of a networked military led then to the concept of network-centric warfare mainly promoted by US Navy Admiral Arthur Cebrowski.

As the US Army was still working on the AirLand Battle Future concept to incorporate the Attack Helicopter and Multiple-launch rocket system into a much wider battlefield, the idea of attacking „centers of gravity" with networked and precise weapons systems was especially popular among Air Force proponents, who saw Airpower as the branch of Armed Forces which shaped the outcome of Operation Desert Storm. The Air Force Doctrine Document 1-1 of 1997 states very clearly, that modern Airpower is „singularly able to launch an attack from widely dispersed locations and mass combat power at the objective. Moreover, from an airman's perspective, mass is not based only on the quantity of forces and materiel committed. […] Mass is an effect that air and space forces achieve through efficiency of attack. Today's air and space forces have altered the concept of massed forces. […] a single precision weapon that is targeted using superior battlespace awareness can often cause the destructive effect that in the past took hundreds of

[3] Andrew F. Krepinevich, The Military-Technical Revolution: A Preliminary Assessment, Washington (1992) 2002.

bombs."[4] In modern warfare, the enemy could be stopped in the so-called „Halt Phase" even before own ground troops arrived in the theater of operations: „In this view of warfare, the halt phase may be planned as the conflict's decisive phase, not as a precursor necessary for a build-up of ground forces. The point of the 'decisive halt' is to force the enemy beyond their culminating point through the early and sustained overwhelming application of air and space power."[5], which means the use of space-based communications as well as target identifying and tracking systems.

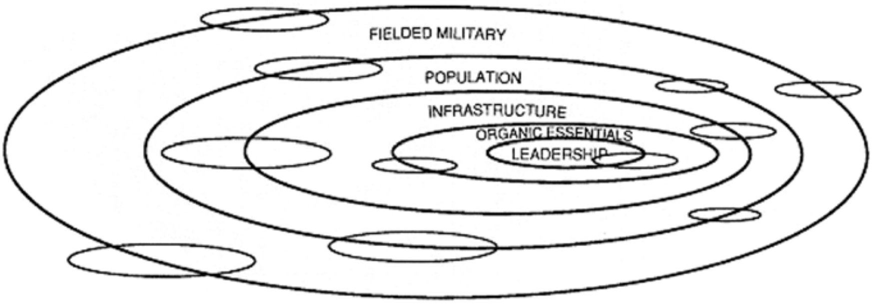

Fig. 2. *Five Ring Model*. Warden, John A.: The Enemy as a System, Airpower Journal, April 1995.

This renewed idea of strategic attack by airpower was pushed by Air Force Colonel John Warden who described in a 1995 article the „enemy as a system". Warden imagined the US to use its technological advantages like stealth aircraft and precision-guided munitions to bring down an enemy's „system" by attacking centers of gravity in a so-called „five-ring model". Warden used parts of a human corpse as well as a state to describe these five rings; as you may see on this slide, there is the leadership or brain at the very center, with organic essentials or vital organs, the infrastructure or bones, blood vessels and muscles, population or cells and the fighting mechanism or leukocytes comprising the other rings. These rings could now be attacked using the strategy of parallel warfare. To quote Warden, „Technology has made possible the near simultaneous attack on every strategic- and operational-level vulnerability of the enemy. This parallel process of war, as opposed to the old serial form, makes very real what Clausewitz called the ideal form of war, the striking of blows everywhere at the same time."[6]

Late Lieutenant General David A. Deptula, who was like Warden one of the planners of the strategic air campaign against Saddam Hussein in the Gulf War

[4] United States Air Force, Air Force Doctrine Document 1, September 1997, p. 16.
[5] Ibid., p. 42f.
[6] John A. Warden III., The enemy as a system, in: Airpower Journal, Spring 1995.

1991, brought this idea further to the concept of Effects-Based Operations, which in his eyes would make massive amounts of ground troops unnecessary. To quote Deptula: „Simply put, rather than the operative means to inhibit enemy activity, destruction should be viewed as one means to achieve control over an enemy. In this approach, destruction is used to achieve effects on each of the systems the enemy organization relies on to conduct operations or exert influence—not to destroy the systems, but to prevent them from being used as the adversary desires."[7] Warden saw Air Force assets paralyzing the enemy: „The capacity for a simultaneous attack on the entire array of high value objectives with little or no need to suppress enemy air defenses opens the door to monumental changes in the conduct of war—enables surprise at the tactical level, a larger span of influence, fewer casualties, paralyzing effects, and shorter time to impose effective control over the enemy. […] Leadership facilities, key essentials such as refined oil and electricity, transportation nets, connectivity between the leadership and the population, and fielded military forces are attacked at the same time." This simultaneous attack stood in contrast to the so-called serial approach: „The serial approach targets those elements of an adversary's defenses that restrict access to targets of critical value. For example, early warning radars, air defense systems, command and control nodes, and airfields are hit before production, government, and leadership facilities." But in Deptula's concept of modern war, „The ideal application of force [is] a parallel attack strategy to achieve rapid dominance [which] involves the application of force against all targets in each target system at one time."[8] Deptula went as far as to say: „Surface forces will always be an essential part of the military, but massing surface forces to overwhelm an enemy is no longer an absolute prerequisite to impose control over the enemy. As an illustration, it requires more aircraft to transport a light infantry division than to move the total number of PGMs delivered during the Gulf War."[9] Airpower was now able to act decisively on an enemy without first having to deploy ground troops, as the Air Force also suggested in the 1997 doctrine document. We have to look at these suggestions and ideas with the 1990s in our mind: the Warsaw pact as menacing enemy power was gone, and the fight for what was left from shrinking budgets was on. Air Force proponents therefore frequently argued their tools to be more effective and more efficient as the Army's heavy cold war divisions. This „American Way of War" would make it possible to US leaders to fight limited wars or to intervene in the Balkans or in Libya last year without having to commit ground forces. But the Operation Iraqi Freedom or the ongoing operation in Afghanistan show the limits of this type of warfare. Thank you very much for your attention!

7 David A. Deptula, Effects-based operations: Change in the nature of warfare, Arlington, 2001, p. 4f.

8 Ibid., p. 14.

9 Ibid., p. 18.

Davide Borsani (Italy)
Beyond Military Technology: the Cultural Dimension of Counterinsurgency Doctrines

In the last two decades, the expression "asymmetric warfare" has been generally adopted with an innovative dimension by the popular imagery to point out the disparity between military means (and tactics) used by conventional and unconventional forces in a low-intensity conflict. Hence, public opinion often links the "new" wars to two warfare phases – the insurgency and the counterinsurgency – not so truly "new"[1]. It is no coincidence that principles to win these wars were identified since the end of the XIXth century[2], and they did not specifically concern military technology and its innovations.

The aim of this paper is to highlight briefly the continuity lines among the most important counterinsurgency military doctrines[3], which pave the road for today's doctrines. The focus will be on the cultural dimension, which is here supposed to be one of the main keys to achieve victory.

§1. Small Wars

Important ancestors of the current counterinsurgency operations are the British "small wars" between the XIXth and the XXth centuries. The expression "small wars" was initially used in 1896 by Colonel Charles Callwell[4], who fought in the Second Anglo-Afghan War and the Boer Wars, to title his manual: *Small Wars: Their Principles and Practice*[5]. What are the "small wars"? According to Callwell, they are «campaigns other than those where both the opposing sides consist of regular troops […] where organized armies are struggling against opponents who will not meet them in the open field […] operations very varying in their scope and

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1 A common vision is embodied in Sheila Jackson Lee's words (a US Democratic congresswoman), who declared in 2002 that «the new wars of the 21st century will be fought differently from World War II. In fact, there will be probably more wars of terrorism». US Congressional Record, House of Representatives, v. 148, Pt. 13 (Washington: from 20 September to 1 October 2002) H6551 <http://www.gpo.gov/fdsys/pkg/CREC-2002-09-24/pdf/CREC-2002-09-24-pt1-PgH6549.pdf>

2 See Gianluca Pastori, "L'Occidente in guerra con gli «altri»: lezioni storiche" in Massimo de Leonardis and Gianluca Pastori (eds.), *Le nuove sfide per la forza militare e la diplomazia. Il ruolo della NATO* (Bologna 2007) 35–48

3 British and in particular American doctrines.

4 John P. Sullivan Jr., *The Marine Corps' Small Wars Manual and Colonel C.E. Callwell's Small Wars – Relevant to the Twenty-First Century or Irrelevant Anachronisms?* (Quantico AY 05-06) http://smallwarsjournal.com/documents/swjmag/v6/sullivan%20w%20bib.pdf

5 Charles E. Callwell, *Small wars: their principles and practice* (Lincoln 1996). Originally published in 1896. The third edition was published in 1906 by His Majesty's Stationery Office, London.

in their conditions […] operations of regular armies against irregular, or comparatively speaking irregular, forces»[6].

How could the Westphalian actor win these wars «conceived in uncertainty, conducted often with precarious responsibility and doubtful authority»[7] to settle «conquered or annexed territory»[8]? Of course, the overall strategy required to preserve the tactical initiative by maintaining «a dominant bearing», and of course «the troops must get at their adversaries and give them a lesson which they will not forget»[9] by exploiting their own points of strength. But, in Callwell's view, the insurgents (or the irregular forces) were able to maintain the strategic advantage if opposed to a conventional approach. Compared with the Westphalian wars, and agreeing with Carl von Clausewitz's "people's war", the "fog of war" in "small wars" was indeed thicker and the flow of information poorer. As a solution, troops should comprehensively know and understand the theatre of operations and its actors. In this sense, Callwell noted that regular forces should be familiar with – in Victorian language – the «savages and semi-civilised races»[10] or with – in politically correct terms – local cultures and customs to defeat the irregular enemy once for all[11]. So, he deduced «a most important military lesson [... :] in small wars the habits, the customs, and the mode of action on the battlefield of the enemy should be studied in advance. […] all officers should know what nature of opposition they must expect, and should understand how best to overcome it»[12]. In sum, more than a century ago and with a completely different international context, a British Colonel did not only focus on tactical approaches or technological superiority of regular forces to gain victory in an low-intensity conflict, but he stressed the respective importance of cultural aspects in elaborating military strategies, even though without a mandatory prescription.

On the other side of the Atlantic, in 1940 the US Marine Corps codified in its own *Small Wars Manual*[13] the lessons learned from Banana Wars and Philippines insurgency[14]. Even by adopting substantially Callwell's military approach,

6 Ibid., 21
7 Ibid.
8 Ibid., 25
9 Ibid., 395
10 Ibid., 21
11 Nicholas J. Schlosser, "The Marine Corps' Small Wars Manual: An Old Solution to a New Challenge?" in *Fortitudine, Bulletin of the Marine Corps Historical Program,* vol. 35, n. 1 (2010) 4–9
12 Callwell, *Small wars: their principles and practice*, 33
13 United States Marine Corps, *Small Wars Manual*, (Washington DC 1940). Reprinted in 2010 at New York.
14 Keith F. Kopets, "Why Small Wars Theory Still Matters: The Extension of the Principles on Irregular Warfare and Non-Traditional Missions of the Small Wars Manual to the Contemporary Battlespace" in *SmallWarsJournal.com* (2006) http://smallwarsjournal.com/documents/swjmag/v6/kopets.pdf

the most important innovation concerned the interdependence between military and civilian aspects of the strategy, where military force was combined with diplomatic pressure and political intervention to stabilize a government which was «inadequate or unsatisfactory for the preservation of life and of such interests as are determined by the foreign policy of our Nation»[15]. The key points of a successful strategy were four.

I. Secure the most important areas and cities by deploying an adequate and, if needed, huge amount of troops.
II. Attack steadily the enemy in order to maintain the tactical initiative.
III. Create, train and mentor the national Armed Forces of the "liberated" country, meanwhile a central and democratic government was institutionalized, obviously according to American interests.
IV. Withdrawal of the US Forces.

The overall process consisted in the "nationalization" of reconstruction and stabilization phases. Thus, on the one hand, the US – the Department of State and the military apparatus – had to work side-by-side with local security forces and civilian bodies; on the other hand, Americans had to prepare national institutions to take care of the country on their own. How to work together if not in presence of a mutual understanding? The manual indeed required that «all ranks be familiar with the language, the geography, and the political, social, and economic factors involved in the country in which they are operating. Poor judgment […] is certain to involve the commander of the force in unnecessary military difficulties and cause publicity adverse to the public interests of the United States»[16].

As this paper is going to figure out, the above-mentioned principles are simply essential for today's counterinsurgents. But, after the Second World War, both "small wars" manuals progressively sank into oblivion and they only became a suggested reading.

§2. The Age of Globalization

After the end of the Cold War and the opening of the "unipolar season", an interesting update to the doctrine was made by US General Charles Krulak. In his concept, due to the globalization and the worldwide diffusion of new media technologies, the so-called "new" wars were characterized by three "blocks" of operations: humanitarian assistance, peace-keeping and traditional war fighting. In his own words, «in one moment in time, our service members will be feeding and clothing displaced refugees […]. In the next moment, they will be holding two warring tribes apart […] and finally they will be fighting a highly lethal mid-intensity battle – all on the same day, all within three city blocks»[17].

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[15] US Marine Corps, *Small Wars Manual*, 1

[16] Ibid., 41

[17] Charles C. Krulak, quoted in Joseph J. Collins, "Afghanistan: Winning a Three Block War" in *The Journal of Conflict Studies*, vol. 24, n. 2 (Winter 2004) 61–77

Because of the globalized and increased impact of media on Armed Forces, the soldier became the immediate symbol of US foreign policy: a sort of ambassador. As a consequence, he had to make the «right decision at the right time at the point of contact without the direct supervision of senior leadership»[18]. In other terms, soldiers had to cultivate an intuitive decision-making and be prepared to react in front of cameras by responding properly to a direct threat and minimizing the risk of obsessive media scrutiny. Therefore, they had to be differently trained to face the overall and enlarged pressure[19]. Krulak focused his analysis on the reactivity and on the intuitive human decision-making of troops, which must learn and show on the battleground «integrity, courage, initiative, decisiveness, mental agility, and personal accountability»[20]. It was all about speed: stimulus and human response. According to Krulak, «technological or scientific solutions alone will not be adequate to resolve these conflicts; nor will they be able to lift what Clausewitz called "the fog of war"»[21]: a century later, Callwell's echo was still strong. However, Krulak's analysis was not complete; there was indeed no emphasis on preparing soldiers to cultural aspects of the three block war. A warning that, during the 1990s, something lacked in this field. Perhaps a legacy of the "Vietnam syndrome" or just a reminder of the traditional "American way of war"[22].

American General James Mattis and Colonel Frank Hoffman completed Krulak's concept in 2005 when their article *Future Warfare: The Rise of Hybrid Wars*[23] was published on the *US Naval Institute* magazine. The so-called "hybrid wars" were those wars where «we can expect to simultaneously deal with the fall out of a failed state that owned but lost control of some biological agents or missiles, while combating an ethnically motivated paramilitary force, and a set of radi-

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[18] Charles C. Krulak, "The Strategic Corporal: Leadership in the Three Block War" in *Marines Magazine* (January 1999)
http://www.au.af.mil/au/awc/awcgate/usmc/strategic_corporal.htm

[19] A. Walter Dorn and Michael Varey, "The rise and demise of "Three Block War"" in *Canadian Military Journal*, vol. 10, n. 1 (2009) 38–45

[20] Krulak, *The Strategic Corporal: Leadership in the Three Block War*

[21] Charles C. Krulak, "Cultivating Intuitive Decision-making" in *Marine Corps Gazette* (May 1999)
http://www.au.af.mil/au/awc/awcgate/usmc/cultivating_intuitive_d-m.htm

[22] «That phrase – popularized by the military historian Russell Weigley in his 1973 book – has come to refer to a grinding strategy of attrition: the strategy employed by Ulysses S. Grant to destroy Robert E. Lee's army in 1864–65, by John J. Pershing to wear down the German army in 1918, and by the U.S. Army Air Force to pulverize all the major cities of Germany and Japan in 1944–45. In this view, the Civil War, World War I, and World War II were won not by tactical or strategic brilliance but by the sheer weight of numbers – the awesome destructive power that only a fully mobilized and highly industrialized democracy can bring to bear. In all these conflicts, U.S. armies composed of citizen-soldiers suffered and inflicted massive casualties». Max Boot, "The New American Way of War" in *Foreign Affairs*, vol. 82, no. 4 (July/August 2003) 41–58

[23] James N. Mattis and Frank Hoffman, "Future Warfare: The Rise of Hybrid Wars" in *US Naval Institute Proceedings*, vol. 131, n. 1 (2005) 18–19

cal terrorists who have now been displaced»[24]. These could be considered, in many ways, as the new "small wars" of the XXI[st] century. In general and compared with Callwell's era, the international context is obviously changed, but military force still remains essential.

Mattis and Hoffman noted that these "hybrid wars", like the old "small wars", could not be won on the battlefield by focusing only (or mostly) on military technology. They found a key factor in extending the three block war by adding a fourth block: cultural training. They completed Krulak's approach by moving the attention from a reactive perspective to a proactive one: information about language, habits and psychology of local population were put at the core of military training. It is intuitive that this affected the way how troops, both "sensors" and "transmitters" of information in an age when the time dimension is dramatically reduced, promptly communicate and broadcast their message on the battlefield and indirectly to public opinion. The Mattis' and Hoffman's goal was to make certain that troops were as good «at reading the cultural terrain of an area as they are at reading a traditional map of the physical terrain»[25]. In sum, the fourth block aimed at increasing the "intellectual firepower" to deal with the interactions between Western forces and civilian populations. It wanted to influence local people and offer them a substantial alternative to the ideology promoted by insurgents.

When General David Petraeus enacted his famous doctrine – the so-called "COIN", the natural acronym of "counter-insurgency" – to tackle Iraqi insurgents in 2006, he finally incorporated in his manual all the above-mentioned principles from "small wars" to "hybrid wars"[26]. It is possible to summarize the doctrine in eight milestones.

I. Create a national, legitimate and democratic government able to run the country on its own legs.
II. Coordinate both military and civilian efforts in order to move together toward a same goal.
III. Subordinate tactical and military goals to political and strategic ones.
IV. Study in advance local cultures in order to understand and interact with local societies.
V. Win hearts and minds of local people.
VI. Prefer the use of intelligence to the use of force.
VII. Spread widely the perception of security by getting from law the legitimacy of military action.
VIII. Commit Armed Forces without time barriers because «the insurgent wins if he does not lose. The counterinsurgent loses if he does not win»[27].

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24 Ibid.
25 Ibid.
26 Headquarters Department of the Army, *Counterinsurgency* (FM 3-24 MCWP 3-33.5), December 2006 http://www.fas.org/irp/doddir/army/fm3-24.pdf
27 Eliot Cohen, Conrad Crane, Jan Horvath and John Nagl, "Principles, Imperatives, and Paradoxes of Counterinsurgency" in *Military Review* (March/April 2006) 49–53

In a very important article published on *Military Review*, the journal of Fort Leavenworth[28], academics and military personnel analysed Petraeus' approach. They very cleverly highlighted, this time with a mandatory prescription, that: «soldiers and Marines must understand demographics, history, and the causes, ideologies, aims, organizations, capabilities, approaches, and supporting entities for every player in the conflict. The interconnected politico-military nature of insurgency requires the counterinsurgent to immerse himself in the lives of the people in order to achieve victory»[29]. From this perspective, it became axiomatic that undertaking any military operation, without a comprehensive understanding of society and culture of the country where counterinsurgents fight, is extremely dangerous.

§3. The Adaptation of NATO

The North Atlantic Treaty Organization (NATO) and its involvement in Afghanistan, the today's most important Western military operation, represent a significant case study to realize the "state of the art" of the doctrine.

In 1999 NATO adopted the Peace Support Operations (PSO) framework, detailed in the *Allied Joint Publication* (AJP) 3.4.1[30], to legitimize its operations "out of area", also called "non-article 5". This document distinguished the PSO in six different categories: conflict prevention, peace making, peace keeping, peace enforcement, peace building and humanitarian operations. For the purpose of this paper, it is not necessary to deepen this categorisation. However, it is useful to stress that this AJP chose a higher level of analysis than the military doctrines above-reported, and it often preferred a too squared approach to these operations. So, the counterinsurgency dimension is very weak, and the document, like the next two similar ones[31], should not be considered essential to conduct comprehensively a low-intensity conflict in the XXI[st] century. It was no coincidence that, when NATO took the lead of the international security mission in Afghanistan in 2003, there was no proper approach ready to be applied; in retrospect, the unpreparedness was clear. Recently, the then Deputy Secretary General, Alessandro Minuto Rizzo, has remarked that in his book[32]. Only in 2008, the Commander of the International Security Assistance Force (ISAF) David McKiernan gave troops a first *Joint Campaign Plan*[33] and, one year later, his successor Stanley McChrys-

28 The place where "COIN" was officially born.
29 Ibid.
30 NATO Military Agency for Standardisation, *Peace Support Operations* AJP-3.4.1 (July 2001)
31 AJP-3.4.2, *Allied Joint Doctrine for Non-Combatant Evacuation Operations* and AJP-3.4.3, *Allied Joint Doctrine for Support to Civil Authorities.*
32 Alessandro Minuto Rizzo, *La strada per Kabul: la comunità internazionale e le crisi in Asia Centrale* (Roma and Bologna 2009)
33 See Steve Bowman and Catherine Dale, *War in Afghanistan: Strategy, Military Operations, and Issues for Congress*, Congressional Report Service (Washington 3 December 2009) 10

tal released a *Counterinsurgency Guidance*[34], both readjusted on the basis of the handbook previously delivered by Petraeus to soldiers in Iraq[35].

In 2011 NATO filled up this gap and issued the AJP 3.4.4 named *Allied Joint Doctrine For Counterinsurgency*[36], which can only be applied outside the territory of member States. Inside the document, there is a specific definition – even though very approximate – of "counterinsurgency" for the Alliance as a whole: it is «the set of political, economic, social, military, law enforcement, civil and psychological activities with the aim to defeat insurgency and address any core grievances»[37]. So, here the starting point is a synergistic approach or – in NATO language – a "comprehensive approach", where «the human factor predominates»[38] and military force «plays a vital but essentially supporting role»[39]. The role of technology is recognized as vital too, but only to collect and deliver information. In this sense, technology and information allow NATO forces just to "know" rather than to "understand" the complex environment. Consequently, what a successful strategy requires is a military personnel able to read and channel several information, and provide a proper interpretation of the events and, then, a competing, «transparent, timely, open, honest, verifiable and accessible»[40] narrative against the insurgent one. According to the doctrine, «Understanding the population is to successful COIN what understanding physical terrain is to successful conventional land operations»[41]. As a consequence, «an efficient training program is essential»[42], and, prior to the deployment, «adequate time needs to be allocated to cultural aware-

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[34] «We need to understand the people and see things through their eyes. [...] We will not win simply by killing insurgents. [...] While a conventional approach is instinctive, that behavior is self-defeating. [...] an insurgency cannot be defeated by attrition [...] The intricate familial, clan and tribal connections of Afghan society turns «attrition math» on its head. From a conventional standpoint, the killing of two insurgents in a group of ten leaves eight remaining: 10 – 2 = 8. From the insurgent standpoint, those two killed were likely related to many other who will want vengeance [...]: 10 minus 2 equals 20 (or more) [...] to win we need to much more than simply kill or capture militants. [...] The will of the people is the Objective. [...] We must know the people, their environment and aspirations, and work together with them to meet their needs. [...] Success requires communication, collaboration, and cooperation (with tribal, community, and religious leaders». *International Security Assistance Force (ISAF) Commander's Counterinsurgency Guidance* (Kabul 2009) http://www.nato.int/isaf/docu/official_texts/counterinsurgency_guidance.pdf

[35] *Multi-National Force in Iraq (MNF-I) Commander's Counterinsurgency Guidance* http://council.smallwarsjournal.com/attachment.php?attachmentid=438&d=1208996210

[36] It was initiated in 2008. NATO Military Agency for Standardisation, *Allied Joint Doctrine For Counterinsurgency* AJP-3.4.4 (February 2011)

[37] Ibid., 1–2

[38] Ibid., 5–1

[39] Ibid., 3–18

[40] Ibid., 3–21

[41] Ibid., 3–18

[42] Ibid., 3–27

ness»[43] and language skills. If there was a lack of them, once troops are deployed, a perceived cultural insensitivity toward local habits, traditions and tribal structures would increase the risk of isolation and provide to the enemy opportunities for propaganda and exploitation.

Moreover, NATO doctrine affirms that this "cultural awareness" has to be a link between military and political decision-makers; for this purpose, a cooperation and a mutual exchange of information have to be institutionalized. For instance, since the planning of operations, «a picture as clear as possible is required from government authorities to determine not just insurgent strengths but other cultural nuances and influences which can be brought to bear and have potential influence and effect to aid a military commander»[44].

§4. Conclusions

After more than a century of experience, Western counterinsurgency doctrines have identified and codified – maybe definitely – the principle that military technology is not the main aspect to win the old or new "small wars". Instead, emphasis has to be put on the soldier as human being able to study, understand and interact with different environments and cultures.

NATO counterinsurgency doctrine finally prescripts what Callwell already (but only) suggested, that is: prior to the deployment, a selected training is necessary to improve individual and collective cultural understanding and language skills. And this has to concern both military and civilian authorities, bound to work together to read the overall terrain and uplift the "fog of war". This mainly now, in a globalized "information age", when «the new variants have a velocity that previous historical insurgencies never possessed»[45]. So counterinsurgency, information warfare and psychological operations, conducted through cultural means, overlap (and should overlap) more and more.

In addition, on the battlefield, commanders and soldiers must avoid mistakes such as those already made during the Vietnam war by General William Westmoreland and repeated by the George W. Bush administration, in particular by the Pentagon and the Secretary of Defense Donald Rumsfeld in Iraq, that were: the extreme faith put on military technology and the adoption of a *seek and destroy* approach to tackle insurgencies, instead of one characterized by the use of force, of course, but above all mutual understanding, cooperation and openness toward local population[46].

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43 Ibid., 2–7

44 Ibid.

45 Cohen, Crane, Horvath and Nagl, *Principles, Imperatives, and Paradoxes of Counterinsurgency*

46 An anecdote, told the author two years ago by an American officer who served in Iraq during the hardest phases of insurgency, is very interesting. What saved his life – he said – was not bullets and "smart" bombs, but cups of tea drunk with Iraqi tribes.

In sum, only a harmonized synergy, comprehensive of a cultural understanding, can lead a “small war” to an ultimate victory. And this must be planned before undertaking any military campaigns, particularly now for the West in the current international strategic context. Otherwise, today’s results speak for themselves.

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Military Space Race during the Cold War

Military Space race between the USA and the Soviet Union began with the start of a Space Era. Behind the civilian exploration of the outer space were hidden strategic political and military goals for armament superiority between two superpowers. The development of space technologies for military purposes was a consequence of a bipolar nuclear confrontation and the growth of the Soviet and the American strategic nuclear arms during the Cold War.

The Cold War reality emerged the need of creating the entirely new concept for military strategy. The development of atomic bombs and the improvement of ballistic missile technologies during the 50's, gave this new way to warfare which turned into a continuing contest between the USA and the USSR for supremacy between offensive and defensive weapons[1]. The next step came with the advancement of technologies and the race for conquering the outer space. Thus, the outer space became a new scene for arm race which continue till the end of the Cold war. The most interesting point was that new space technologies and weapons were used by Cold war policy-makers more as a tool of diplomacy than for military purposes. Their applications, in most of the cases, were used to protect the national security and détente. This paper examines the processes of militarization and weaponization of outer space during the Cold war and how the military space activities contributed to the USA and the USSR competition in that field. It will discuss some of the military space projects developed by the both superpowers, their political importance as well as the rapid growth of the significance of the space sector in military strategy during that period.

The Cold war divided the world into democracy West and communist East. The two country leaders – the Soviet Union and America carried struggle for supremacy on all fronts – political, economical, technological, etc. Domination of each of these sectors guaranteed their position as party leader in the agreements with their foreign allies – in the NATO for the USA and in the Warsaw Pact for the USSR. Both superpowers protected their predominance, as well as their national security, from position of supremacy. That leaded to the need of arm superiority notably after the USA lost its monopoly on atomic bomb technology in 1949. In that way the arm race between the superpowers became crucial for their national security strategies and military planning processes. In political environment of bipolar world both superpowers were engaged in a competition to acquire greater

[1] Alexander Flax. "Ballistic Missle Defence: Concepts and History". – In: *Weapons in Space,* Vol. I, pp. 33–52.

arsenals of increasingly sophisticated weapons for mass destruction[2]. This leads to the development of the so called "space weapons growth" with the beginning of the military uses of the outer space.

The space military systems might be divided into several categories: 1/ weapons which are based on earth and are aimed at targets on earth, but which pass through space on their way; 2/ weapons which are based on earth and are aimed at targets in space; 3/ weapons which are based in space and may be directed to targets on earth; 4/ weapons which are based in space and may be aimed at targets in space; 5/ weapons which represent a combination of two or more of these types.[3]

The first category included ballistic missiles. The fact that they could be armed with a nuclear warhead transformed them into perfect delivery system for atomic bomb to a long distance. The destructive power of nuclear weapons was so enormous, and their means of delivery so swift and effective, that much doctrine in the nuclear age had postulated a virtually permanent advantage for offense[4]. For that reason the importance of ballistic missiles started to increase at the begging of 50's.

After 1945 both superpowers proceeded a long research process for creation of long and middle range ballistic missiles, first based on the technology of Nazi rocket V-2. The efforts were directed to the creation of operational ballistic missile technologies which were capable of carrying nuclear/thermonuclear warhead as well as ballistic missiles capable of protecting strategic targets from direct attack. The American ballistic missile rocket Redstone and the Soviet R-5 were first generation ballistic missiles whose designs were firmly rooted in the technology of the mid-1940s, but their basic design became standard for the second generation of missiles[5]. Different innovations were used to improve missile technologies during 50's – gimbaled engines, inertial guidance, separable warheads, more potent fuels (LOX in America, nitric acid and kerosene in the Soviet's)[6]. The second generation ballistic missiles were represented by the American Thor and Jupiter and the Soviet – R-12 and R-14. Examining these first ballistic missiles, we could conclude that both superpowers were relevantly equal in the development of that technology. In the Cold war environment such military equality established the balance of powers. This balance was shifted with the announcement for launching the Soviet satellite "Sputnik" – 04 October 1957. The launching vehicle – ballistic missile

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2 Christoph Bluth. "*Soviet Strategic Arms Policy Before SALT Soviet and East European Studies"*. Cambridge University Press, 1992.

3 Robert Woetzel. "Comments on US and Soviet Viewpoints Regarding the Legal Aspects of Military Uses of Space". – In: *Law and Conflict: Changing Patterns and Contemporary Challenges*, pp. 195–207, American Society of International Law.

4 Flax. "Ballistic Missle Defence: Concepts and History", pp. 33–52.

5 A. Bowdoin Van Riper. "*Rockets and missiles : the life story of a technology"*. Greenwood Publishing Group, Inc 2004.

6 Ibid.

R-7 – that put the Sputnik in orbit was the first successfully launched Intercontinental ballistic missile (ICBM). That event led to the most dramatic competition for influence and prestige, conducted by two societies whose different ideologies both stressed the crucial importance of competition[7] – space race. Although, the space activities were worldwide proclaimed by both superpowers as beneficial for all mankind, the military potential of the space was recognized immediately.

The strategic importance of the outer space and development of the advanced space technologies took position in military strategy at the beginning of the 50's. The application of space technologies for military purposes for the USA resulted from the disproved perception in intelligence reports that the Soviets were placing their major effort toward developing strategic missiles against which, once launched, there was no defense[8]. This statement was denied after the collapse of Soviet Union. The post-Cold War publications revealed that the ratio between the US and the USSR strategic nuclear forces was 20, 2:1[9] at the early 60's. However, in that particular moment, the perception about the Soviet "missile gap" caused the necessity of protection against such kind of power threat to be build. Development of the advancement space technologies which could guarantee superiority over the opponents were the next step and for both superpowers. They had to ensure not only the protection for the territory of their country but also the surveillance over the deployment of strategic military capabilities and troops.

The aims of the early space military projects were creation of operational reconnaissance, communication and navigation satellite systems, early warning systems, anti-satellite capabilities, etc. The satellite technologies gave an opportunity to every part of the bipolar world for legal surveillance over the other behind the "Iron Curtain". Another reason for development of the satellite technology was the decreased efficiency of spy flight after a few unsuccessful attempts of British and the American aircrafts to collect the information for the Soviet military facilities during 50's and early 60's. The British special Canberra reconnaissance aircraft attempted to photograph the Kapustin Yar test center in 1953 but it was damaged and almost shot down by the Soviet fighters. Other technical collection efforts included radar intercepted telemetry, and finally the U-2 photography was also failed[10]. The Cold war new warfare required development of the technology invulnerable to direct attack.

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7 Michael Sheehan. "*The international politics of space*". (Routledge 2007), pp. 10–11.

8 John Bird and Joan Bird. "Penetrating the Iron Curtain: Resolvind the Missile Gap with Technology", Presented at Symposium "Penetrating the Iron Curtain: Resolvind the Missile Gap with Technology".

9 Борис Черток. „*Ракеты и люди. Лунная гонка"* (Vol. IV). Москва: Машиностроение 1999, с. 17–18

10 John Bird and Joan Bird, "Penetrating the Iron Curtain: Penetrating the Iron Curtain: Resolving the Missile Gap with Technology.

The US and the USSR started the implementation of satellite technology in their military strategy at the early 50's. It was possible because of the development of most powerful ballistic missiles technologies. During that time the different organizations prepared reports on feasibility and application of military reconnaissance satellites. The American Air Force signed study contracts concerning R&D work with North American Aviation, Bendix Aviation, Allis-Chalmers, Virto Corporation and Westinghouse Electric[11]. In the USSR the whole R&D process was managed by different Scientific Research Institutes (NII)[12]. The managers of these NII prepared reports for the Soviet decision-makers. At the beginning of 50's the Soviet engineer M. Tikhonravov prepared a detailed paper for the application of the multi-stage missiles as launch vehicles for the satellites, based on scientific reports. The report, titled "On the Possibility of Achieving First Cosmic Velocity and Creating an Artificial Satellite with the Aid of a Multi-Stage Missile Using the Current Level of Technology", was not supported by the scientific community[13]. Later, the paper was developed together with the Chief designer S. P. Korolev and on 26 May 1954 it was presented again in front of the Council of Ministers and the Central Committee of the Communist Party of the Soviet Union. That report called "Research on the development of Artificial Earth Satellite" played a fundamental role for the development of the early Soviet satellites.

These early Soviet and American initiatives illustrated mostly theoretical and research process of space technologies. Real implementation of space technology in military strategy characterized the end of the 50's and early 60's. At that time started to form the first military space projects and institutions.

The USA divided its military and civilian space sector when NASA appeared (1958). Military decisions processes were managed by the Department of Defense, the US State Department. Private contractors were Ballistic Missile Defense Organization and the Air Force Space Command[14]. In the USSR there was no clear border between civilian and military space projects, as well as institutions. Space sector was supervised extremely by the Ministry of Defense and the Council of Ministers. The coordination and planning of military R&D was managed by the Military-Industrial Commission (VPK: Voenno-promyshlenniia kommissiia)[15].

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[11] Raimo Vayrynen. "Military Uses of Satellite Communication" in: *Instant Research on Peace and Violence,* Vol. 3 (1), pp. 44–49.

[12] Владимир Фаворский & Иван Мещеряков. „*Космонавтика и ракетно-космическая промышленность. Зарождение и становление (1946–1975)"*. Москва: Машиностроенение, 2003.

[13] Asif Siddique. "Challenge to Apollo: The Soviet Union and the Space race. 1945–1974. The NASA History Series, 2000, pp. 86.

[14] Christopher Bosso & Kay, W. ADVOCACY COALITIONS AND SPACE POLICY. (E. Sadeh, Ed.). *Space politics and Policy*, 2002, pp. 43–61.

[15] Bluth. "*Soviet Strategic Arms Policy Before SALT Soviet and East European Studies",* pp. 26–27.

The defense industry of the Soviet Union was controlled by 9 ministers. Crucial role in the whole process had the Experimental Design Bureaus (OKB: Опытное конструкторское бюро).

Separation of civilian and military space project played an important role for superiority in the field at the first years of the space race. In the USSR more powerful modified ballistic missiles were used, such as launched vehicles, which gave an opportunity to put in orbit more sophisticated satellites. Eisenhower's decision to forbid the use of military boosters for the International geophysical year (IGY) scientific program led to the choice of the Vanguard, a small relatively undeveloped launch vehicle. If the Eisenhower administration had chosen the more advanced Army Orbiter project, with its Redstone (later known as Jupiter) rocket, the USA would have been the first country in the outer space[16].

Nevertheless, both superpowers divided their space activities on civilian and military ones. They often used the data gathered from their civilian satellites for military purposes. The secrecy of military space projects required that they should be hidden behind civilian ones. In that context after the demand of Eisenhower, National Reconnaissance Office (1960), part of CIA, created its own project for reconnaissance satellite, under the codename Corona. It used the US Air Force's Discoverer program to orbit photo-reconnaissance satellites over the Soviet Union[17]. Officially the purpose of Discoverer was biomedical research. R&D began in 1956 and it was operational till the end of 1960s. It supported traditional American strategic intelligence objectives.

Very similar case we could find in Chertok's memories where he mentions a decree that placed OKB-1 in charge of the development of an automatic spy satellite (Vostok-1 and Zenit-2), declared as an urgent defense mission. Three of the main figures in the Soviet Space programs – Mstislav Keldysh, Konstantin Rudnev and Sergey Korolev – used their political influence to add to the decree that the new satellites could also be used for human flights.[18]

The American reconnaissance system and its counterpart Soviet Zenit captured and geo-referenced high-resolution imagery for the entire globe. For the time they were operated many of their devices were replaced or modernized. As a result, they evolved into a sophisticated system for earth science imagery and data acquisition, analysis and management[19].

For a short period of time, the number of functions performed by satellites technologies contributed to their implementation as effective tools for modern

[16] Paul Stares. " U.S. and Soviet Military Space Programs: A Comparative Assessment". – In: *Daedalus,* pp. 127–145.

[17] Sheehan. "*The international politics of space",* pp. 43–44

[18] Boris Chertok. "*Rockets and People"* Vol. III. The NASA History Series, 2009, pp. 19–20

[19] John Cloud. "Imaging the World in a Barrel: CORONA and the Clandestine Convergence of the Earth Sciences". – In: *Social Studies of Science,* pp. 231–251.

warfare. They were broadly used by Navy and Army for gathering visual and photographic data, overheating signals and collecting radar defense information. With the advancement of the technology were developed more accurate systems for communication and navigation for location and detection of ground based targets or movements of the troops. Even satellites which appear to be harmless could be threatening. The collected data from communications satellites for example, provided information about geographically dispersed forces or location of nuclear submarines. Submarines, in turn used the navigation satellites to update their inertial guidance systems, which improved the accuracy of their ballistic missiles. Meteorological satellites could also improve the effectiveness of military forces by providing information, guiding a range of missiles or weapons to their targets, etc[20].

The reconnaissance, navigational and communication satellite systems ensure the regional security and help the policy makers, the economists and the military in taking adequate decisions in many situations[21]. In the Cold War environment and permanent threat from nuclear attack the important part of the military defense strategy had early-warning satellite systems. Such function had the American Midas (Missile Defense Alarm Satellite) and Samos type satellites. Midas had a capability to provide continuous screening of worldwide launching of ballistic missiles after they were detected. Satellite "reported" to a ground station which relayed the data to the appropriate operational forces, maximum warning could be obtained regarding a hostile missile attack[22]. For the 50's and early 60's military tactics, the increasing of the amount of the warning time allowed the superpowers to move away from the "hair-trigger" alert postures[23]. The satellite technologies have undoubtedly accelerated effectiveness of warfare during the Cold War. They provided the military forces with far greater intelligence information about enemy force dispositions, for example. The evidence for the statement that their role became crucial to military activities was that since 1973 the numbers of satellites for military purposes were more than 80% of the total number of all launched American satellites[24]. The satellites represented the passive systems of the space technologies and so called process of the militarization of the outer space. However, they had passive function and were not weapons, very often satellites provided data which made active weapons operate more efficiently.

The process of weaponization of space included deployment of the conven-

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[20] Stares. " U.S. and Soviet Military Space Programs: A Comparative Assessment", pp. 127–145.

[21] Robert Zimmerman. "*Leaving Earth: Space Stations, Rival Superpowers, and the Quest for Interplanetary Travel"*, Joseph Henry Press. 2003.

[22] P. K. Menon & W. Strover. "Demilitarization of Outer Space". – *International Journal on World Peace*, 127–150.

[23] Sheehan. "*The international politics of space"*, pp. 93

[24] Vayrynen. "Military Uses of Satellite Communication", pp. 44–49.

tional weapons and weapons for mass destruction and devices which could be used for direct attack on targets based on the ground or in the space. These kinds of active space technologies illustrated mostly the rivalry between both superpowers. They were product of the advancement of the space technologies. Unlike broad utilization of the satellites because of their dual nature which permit to use them both for military purposes and for commercial or scientific ones, the active space technologies could be used if they emerged a credible scenario for nuclear war. Deployment of weapons for mass destruction in space was a controversial problem for international diplomacy during the Cold War. The international community concerned that weaponization of the outer space could jeopardize firm balance between the two superpowers. Every innovation in the military technology would only tend to destabilize the balance, and every perceived advantage would lead to fear of first strike capability. These might provoke temptation at a time of severe crisis so as to launch a preemptive attack[25]. That caused the need for their limitations which led to a few international treaties. 1967 Outer Space Treaty banned placement "in orbit around the Earth any objects carrying nuclear weapons or any other kind of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in other space in any other manner"[26]. The effect of the Treaty over the international relationship was that it showed the will in both superpowers to sign the agreement which limited armament and strengthened the worldwide proclaimed peaceful image of their outer space activities. This agreement, and the others signed after that played a crucial part in underpinning confidence-building regimes[27]. Notably, the treaty did not restrict the use of space for passive military purposes, as well as deployment of conventional weapons in Earth orbit. The differences of its interpretation enabled the two superpowers to evade it.

The active space systems developed during the Cold War directed its logic. They provided offensive and defensive capabilities and included build-up of Antiballistic missile systems (ABM's), Ballistic missile defense (BMD), Anti-Satellite systems (ASAT), Directed Energy Weapons (DEW), etc. Such kinds of weapons were assembled of different sophisticated, often far ambitions technological devices. Because of that, some of the projects from that period remained on experimental or test level. Active space weapons would be used for solving national security problems, as well as international conflicts. Most often their deployments were used only as a tool for defense.

ASAT systems could be based in the space or on the ground and had capabilities to destroy enemy devices placed in orbit. The development of particular ASAT systems led to the necessity to be countered the particular weapon invention of the

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[25] Menon& Strover. "Demilitarization of Outer Space", pp. 127–150.

[26] Outer Space Treaty – http://www.opanal.org/Docs/Desarme/TD/OuterSpace_Treaty.pdf (last seen 25.08.2012).

[27] Sheehan. "*The international politics of space",* pp. 93

opponent side. ASAT systems were more effective against far more fragile satellites than equipped, nuclear warhead. The reasons for that were that the satellites followed predictable trajectory, they were considerably larger than a warhead and their intercept time could be chosen[28].

The interest to that kind of space technologies was different, depended on the political course of leader headed the country at particular moment. For example, the Eisenhower's and Kennedy's administrations rejected development of ASAT systems argued that they would destroy the "peaceful" image of the American space programs[29]. That delayed the development of the American ASAT systems for almost a decade. In contrast, the Soviet political line followed under N. Khrushchev highly supported space programs and strategic missiles which offered a way to reduce the size of conventional forces[30]. During that period (1964) the USSR created its own operational satellite killer – with the task to destroy enemy satellites[31].

During the 70's and the early 80's the Soviet Union increased their military space activities. They developed second and third generation space technologies based on the modernization of already existing ones or creation of more sophisticated space systems. During the 70's were tested "Yantar – 4K, and – 2K", new series of satellite "Zenit", space-based radio surveillance system "Tselina", etc. The main activities concerned satellite interceptor tests[32]. That provoked a reaction in the American policy-makers and, as a result, one of the last acts authorized by Gerald Ford's administration was the authorization of a new US anti-satellite system. It contained three separate projects, including the Miniature Homing Interceptor Vehicle Systems. The same policy line with the ASAT R&D program was followed by Jimmy Carter[33]. That balanced the generated imbalance in the Soviet-US ASAT's capabilities. The arguments for the new policy course were that the warfare became increasingly dependent on the various functions of satellites and that little provision had been made for satellite survival in wartime.[34]

Products of the Cold War defense strategy in both superpowers were ABM systems. In the mid-1960's the improvement of the ballistic missile technology emerged the need of adequate defenses. Early ABM systems had the extreme ambition to hit and destroy intercepted enemy missile during the first two minutes of

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28 Richard Garwin. "Space Weapons or Space Arms Control?". – In: *Proceedings of the American Philosophical Society*, pp. 243–259.

29 Stares. "U.S. and Soviet Military Space Programs: A Comparative Assessment", pp. 127–145.

30 Ibid, 127–145.

31 Sheehan. " *The international politics of space"*.

32 Владимир Фаворский & Иван Мещеряков. „*Космонавтика и ракетно-космическая промышленость. Развитие отрасли (1976–1992). Сотрудничество в космосе"*. Машиностроение, 2003, s. 40–42.

33 Stares. „U.S. and Soviet Military Space Programs: A Comparative Assessment", pp. 127–145.

34 Sheehan. „*The international politics of space"*, pp. 97.

its flight. That led to the deployment of ground based launch sites which protected strategic national objects. Initial American activities started in the mid-1960's with the development of Sentinel ABM. Sentinel used ground launched nuclear missiles to defend American cities. President Nixon and his administration changed its name to *Safeguard* and limited its deployment – to protect some American ICBM sites[35]. The Soviet ABM programs operated till the end of the Cold War. One of them used Soviet nuclear SA-5 missiles first to protect Moscow, then during the 1980's, other Soviet cities. It was known as *Galosh.* The "Galosh" missiles could fly to altitudes of up to several hundred kilometers guided by radars. The warheads detonated when they were close enough to their targets. The SA-5 missiles could destroy satellites[36].

During the 1970's the USSR and the USA signed bilateral agreements SALT I (1972) and SALT II (1979). SALT I concerned deployment of ABM systems. The two countries agreed that each may have only one deployment area so that it cannot provide a nationwide ABM defense or become the basis of developing one[37]. The USSR chose Moscow. The USA protected Grand Forks, North Dakota ICBM launch site. Thus, each country was leaving most of its territory and population completely invulnerable to a nuclear strike by the other one. According to M. Sheehan the terrible logic behind this strategy was that with its people so totally unprotected neither of the countries would ever have any incentive to attack, and peace and strategic nuclear stability would be assured. Space-based defensive systems were specifically banned by the treaty[38]. SALT II provided for equal numbers of strategic delivery vehicles for the USA and the USSR. It imposed restriction on technical developments which could violate agreements[39].

The Soviet-US relationships changed significantly after the announcement of the new American BMD project – known as '*Star Wars*'. It was initiated by the will of President Reagan to protect all American citizens from nuclear attacks. President Reagan's Strategic Defence Initiative, looked forward to rendering the enemy's nuclear weapons impotent and obsolete so that security and stability might be enhanced by a system that could intercept and destroy ballistic missiles before they reached the United States or their allies' territories. The program envisaged the development of a BMD system based on particle beams, lasers, and satellites, with the dual role of carrying on ASAT and ABM functions. A particle beam might be able to strike down an enemy ICBM in the boost phase within a

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[35] Ibid, pp. 100.

[36] Ashton Carter. "The Relationship of ASAT and BMD Systems". – In: *Daedalus*, pp. 171–189.

[37] Egon Schwelb. "The Nuclear Test Ban Treaty and International Law". – *the American Journal of International Law*, pp. 642–670.

[38] Sheehan. "*The international politics of space",* pp. 101.

[39] R. Cargil Hall. "*Military Space and National Policy: Record and Interpretation"*. George Marshall Institute, 2006.

few minutes of blastoff. The BMD system, based on lasers, involved two concepts: The first is a pure space-based system in which high energy lasers are orbited to deliver direct attack on the targets; the second is a combined space and earth based system in which lasers are dispersed on the earth and fired at huge mirrors installed on satellites. These lasers would be reflected off and refocused by these mirrors on targets.[40] The Soviet Union insisted on banning the tests with all space weapons but the US rejected such kind of restrictions before at least testing their new system. After the negotiations, proposal for the so-called "umbrella" space weapons or the space weapons used for protection were accepted by the US.

As summarized, the development of space technology undoubtedly accelerated the armed race between the USA and the USSR during the Cold War. Opposite to the statement, that both superpowers have developed space systems in accordance with their own terrestrial security requirements, rather than in response to activities of the other[41], the examination of military space project pointed that it was a process of action from one side that lead respectively re-action from the other. The military space projects developed from the two superpowers followed the principle to be relevantly equal to the opponent's capabilities. This principle was emerged by uncertainty, which played vital role in the balance of power by restraining states through the fear of third-party interference in Cold War relationship[42]. The supremacy in armaments played crucial role to be defended balance between the superpowers in the bipolar world. For that reason the space technologies were implemented into military strategy and tactic planning very quickly. The satellites or technologies with passive functions were used for observation, surveillance and analysis and improved the warfare into a ratio of dependence. That led to the tensions in policy-makers for the vulnerability of the technology which caused the need of the invention of adequate defense system represented by the ASAT systems. The reconnaissance had vital importance for the Cold War policy. Knowing the enemy and his intention, especially behind the "Iron Curtain" was more than vital for policy decisions. This knowledge however was very specific, complex and in a certain sense paradoxical – the reconnaissance could not simply be improved or weapons could not be produced faster or in greater amounts, even risky if there were used conventional intelligence methods[43]. The intelligence by the satellite technologies, otherwise, such as signals interception, satellite imagery, and measurement analysis decreased that risk and provided much more comprehensive information, "delivered" in time.

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40 Menon & Strover. "Demilitarization of Outer Space", pp. 127–150.

41 Stares. " U.S. and Soviet Military Space Programs: A Comparative Assessment", pp. 127–145

42 Julian Schofield. "Arms Control Failure and the Balance of Power". – *Cnadian Journal of Political Science,* Vol. 33, No. 4, pp. 747–777

43 Eva Horn and Sara Ogger. "Knowing the Enemy: The Epistemology of Secret Intelligence". – In: The MIT Press, No. 11, pp. 58–85.

The warfare changed dramatically after the implementation of the space technologies in it. That affected also the military strategy and political decision-making process. There was a close connection between development of the specific weapon system and the specific strategic threat. The creation of the strategic weapon systems required long R&D process and planning. Undoubtedly, the Cold War atmosphere of mistrust between the superpowers accelerated these processes and provided them great arsenal of more sophisticated weapons. For that reason, the supremacy in armament for the each side of the bipolar world depended no longer on its quantitative but on its qualitative capabilities and the strategy planning of their deployment. Opposite to the tenses that the weaponization of outer space could provoke a military conflict between the superpowers it ensured the relevant stability into the international relationships. The fears that the one side of bipolar world could use its military arsenal against the other ensured the world peace during whole period. That of course, cost a lot of diplomatically endeavors.

The weaponization of the outer space reflected on the relationship between the superpowers. Uncertainty emerged by the concerns that the increased military arsenal could be disposed in the outer space led to the series of the international measures aimed to limit these processes. Although the agreements signed during the Cold War achieved a degree of limitation of the weaponization, they did not proceed with the disarmament of the space. However, that illustrated the will of the USA and the USSR to cooperate with each other to defeat the world peace. The arms control agreements contributed to building up the peaceful image of their space activities in front of their allies and tried to illustrate that they aimed to prevent the war not to provoke the conflicts.

In conclusion, the study of the military space race during the Cold War helps to understand the complex process of the implementation of the innovative space technologies in strategic policy of the two superpowers. The study proves the importance of space technologies as engine of the arms race between the USA and the USSR and how that contributes to establish the stability and peaceful relationship between them.

Wednesday, 29 August 2012

Mercredi, le 29 Août

Professeur Mamadou Dialo, Colonel Birama Thioune (Senegal) Le rôle du chemin de fer dans la conquête de l'Hinterland Sénégalais

Introduction Generale

Si l'Afrique est présente (écrits) dans l'histoire du monde depuis les temps bibliques, l'Amérique, elle n'y fit irruption qu'au lendemain de l'odyssée colombienne si on peut dire (à la fin du 15ème siècle 1492).

L'interconnexion des deux continents s'est faite grâce aux européens et à leurs entreprises de conquête, et surtout à l'occasion du funeste « commerce triangulaire » qui pendant plus de trois siècles, allait asseoir la suprématie de l'Europe à travers : conquêtes, exploitation des ressources, échanges inégaux où le « bois d'ébène » c'est-à-dire les esclaves occupent hélas le haut du pavé.

C'est dans ce contexte général que se situe la présence européenne au Sénégal et plus particulièrement celle des français.

Durant le XVIème siècle, les possessions portugaises et espagnoles d'Amérique commencent à fournir sucre, café qui entrent dans les habitudes du consommateur en Europe. Valoriser les terres des possessions d'Amérique, exploiter les mines exigent une main-d'œuvre toujours plus importante ; l'Afrique va faire les frais de cette demande sans cesse croissante de main d'œuvre. Portugais, Hollandais, Anglais, Français et indirectement Espagnols vont se lancer dans le « commerce triangulaire » marqué par l'interconnexion de l'Europe, de l'Amérique et de l'Afrique, avec l'esclave comme produit de base. Cela a pu faire écrire à B. BARRY *« Que dans la seconde moitié du XVIIe siècle avec le développement de l'industrie sucrière, on assiste à la formation de compagnies privilégiées pour le commerce triangulaire dans lequel le commerce des noirs aura une part non négligeable dans l'économie de l'Europe mercantiliste qui édifiera le capitalisme moderne ».*

Les rôles étaient avec ce commerce bien campés : l'Amérique est la zone d'exploitation, l'Afrique le réservoir de main-d'œuvre, l'Europe la zone de production manufacturière.

Dans cette perspective, on comprend aisément cette dynamique active d'installation côtière des Européens par le truchement de comptoirs commerciaux d'abord, de points de défense par la suite, et de colonies à la fin.

I. Aux Origines du Senegal Colonial

I.1. Saint-Louis comme pied à terre des Français

Dès 1461, les Portugais s'installent à Arguin au Nord, de l'embouchure du Sénégal. Premiers arrivés sur les côtes Africaines, sans concurrents les Portugais créent des établissements commerciaux en vue de drainer les produits africains vers l'Europe notamment l'or. Avec la traite Atlantique à partir de la fin du XVe et surtout les débuts du XVIe, et la concurrence qui se manifeste (Anglais, Hollandais, Français) débute une nouvelle ère avec la construction de comptoirs certes, mais de plus en plus de forts. En effet, dès 1461, les Portugais avaient construit un comptoir à Arguin au nord de l'embouchure du Fleuve Sénégal.

Du côté des Français si certains récits mentionnent une présence fixe des Français à l'embouchure du fleuve Sénégal dès 1363 ou 1364 avec la présence de marins Dieppois, la construction du premier établissement ne survient qu'en 1638 avec le capitaine Lambert car le commerce français était directement menacé par la présence des Hollandais à Gorée et Arguin (B. BARRY1985). 1668 marque ainsi la date de la première habitation fixe des Français à l'embouchure du Sénégal à l'île de Bocos. La prise en compte des contraintes naturelles, les problèmes d'accès et de sécurité vont entraîner entre 1638 et 1658 le transfert du comptoir de l'île de Bocos à l'île actuelle de Saint-Louis après plusieurs péripéties (BARRY). Mais c'est en 1659 un an plus tard qu'on peut parler du Fort de Saint-Louis. Ainsi de par sa position géographique privilégiée, Saint-Louis ou NDAR est considéré comme la porte d'entrée de la colonisation française en Afrique Noire. En effet, la ville fondée en 1659 allait devenir jusqu'à la fin du XIXe siècle la ville la plus importante de la colonie du Sénégal. Pendant longtemps, le port de Saint-Louis est resté parmi les comptoirs les plus importants du commerce triangulaire, d'où les appétits qu'il a suscités, notamment de la part de l'Angleterre qui, à plusieurs reprises aura à l'occuper (1693, 1758 à 1779, enfin de 1809 à 1817). La rivalité entre la France et l'Angleterre trouve son fondement dans son rôle de zone de polarisation de l'activité économique de l'hinterland, avec l'intensification de la traite. Pôle d'attraction des populations centre d'échanges, la ville va donner naissance à une société multiculturelle et multiraciale qui va donner à Saint-Louis un cachet particulier mais aussi un rôle spécifique par la suite.

Négociants européens, signares, femmes autochtones mariées à la « mode du pays » avec les Blancs traitants métis, indigènes musulmans, esclaves, forment ainsi une société cosmopolite. Le fleuve qui était la voie normale des échanges draine à Saint-Louis or, gomme arabique, ivoire, cuir, esclaves où les indigènes notamment les femmes jouent un rôle important d'intermédiation (J. Boulegue 1968).

Ainsi en 1817, la main-mise française sur Saint-Louis est réelle et définitive ; centre politique et économique elle s'est déjà signalée lors des Etats généraux de la révolution française de 1789 en envoyant un cahier de doléances.

I.2. « De Gorée la « Bonne Rade » à Dakar la Grande Rade » ou « Grande terre »

Ce sont les Portugais qui occupèrent les premiers l'île de Gorée qui servira par la suite d'entrepôt pour les esclaves. Son excellence stratégique en fera un objet de convoitise qui changera de mains au gré des conflits intereuropéens. Portugaise, l'île devient hollandaise, lorsque le Portugal est tombé sous la domination de l'Espagne (1581–1640) (E. MAKEDONSKI 1987), elle devient française en 1677 après la prise de l'île par le vice amiral d'Estree. En réalité Gorée connaîtra près de six occupations anglaises et ne deviendra possession française définitive qu'en 1814 avec le traité de Paris qui met fin aux guerres napoléoniennes. Comme Saint-Louis au Nord, Gorée devient un centre d'échanges, et un creuset racial et culturel où s'édifie une nouvelle société née du métissage entre négociants, fonctionnaires blancs et populations indigènes.

En face de l'île sur la côte, se dresse la presqu'île du Cap Vert et le village Lébou des pêcheurs NDakaru, le futur Dakar. Prévue depuis le XVIIe siècle (P. Biarnes 1987) mais maintes fois renvoyée jusque-là malgré l'existence de traités avec les Lébous, la construction de Dakar allait avoir un début de réalisation.

Mais bientôt, la rade de Gorée avec le développement de la ligne maritime France-Brésil montra ses limites. La rade de Dakar insuffisante, la construction du port s'impose. L'anse de Dakar va l'abriter. Autorisés, en 1860, entamés en 1861, les travaux du port seront terminés fin 1863. C'est ce noyau qui va donner naissance par améliorations successives au port moderne de Dakar en 1903. Ainsi, Saint-Louis au Nord sur l'embouchure du Fleuve et Gorée, Dakar dans la Presqu'île du Cap Vert vont constituer les deux premiers établissements français en Afrique Noire, avec statut particulier. Tournée pendant longtemps vers l'utilitarisme, la doctrine coloniale française surtout sous l'Empire n'accorde que peu d'importance au statut politique des possessions. Saint-Louis et Gorée vont faire exception et à l'instar de la Guadeloupe, de la Guyane, de la Martinique et de la Réunion, connaissent l'existence de structures et d'assemblées qui vont favoriser l'éclosion d'une vie politique active. Très tôt, Saint-Louis et Gorée ont des maires nommés. « Le Conseil Général » pouvoir local influent voit le jour à Saint-Louis dès le 7 Septembre 1840 alors que la députation institution la plus prestigieuse voit Durant Valentin occuper le poste après les élections de 1848.

L'évolution politique de la colonie du Sénégal est intervenue ainsi dans le sillage de la Révolution Française de 1789 et de ses nombreuses conséquences.

« A la faveur de l'idéologie républicaine des droits universels du sexe masculin, énoncés d'abord au cours de la Révolution Française, puis en 1848, la citoyenneté est élargie aux populations de Saint-Louis et de Gorée puis à celles de Dakar et Rufisque » (S. Dieng 2010).

II. Le chemin de fer entre conquete et pacification

Depuis 1817 qui marque au lendemain du traité de Paris de 1815 le « retour « du Sénégal à la France, il y a un dilemme concernant l'avenir de la colonie du Sénégal : colonie de comptoirs, colonie de plantation. Si le commerce de la gomme constitua pendant plusieurs décennies la principale richesse de la colonie l'introduction de la culture de l'arachide dans les années trente dans l'arrière pays saint-louisien par les commerçants bordelais, l'exportation pour la première fois d'une cargaison en France, puis en 1840 d'un bateau plein et en 1854 de 5000 tonnes consacraient la spécialisation du Sénégal comme « terre de l'arachide ».

Si Saint-Louis au Nord est le centre d'impulsion politique et économique de la colonie, lieu de résidence des gouverneurs du Sénégal : une vingtaine de gouverneurs, « de Renauld de Saint Germain au début de la monarchie de Juillet à Prôtet au début de Second Empire, Gorée plus au Sud abrite le centre de commandement de toute l'action navale de la France dans le Golfe de Guinée de 1840–1850).

Saint-Louis la capitale politique Gorée – Dakar le port en eau profonde étaient séparés de près de 300 km. Entre les deux des royaumes traditionnels aux modes de gestion de pouvoir aussi divers que variés, à cela il fallait ajouter les contraintes naturelles : topographies, forêts,n faunes sauvages, maladies tropicales.

Si c'est Pinet Laprade constructeur du Port de Dakar qui forma le projet de relier par voie ferrée Dakar à Saint-Louis, d'abord puis Saint-Louis à Médine et au Fleuve Niger, c'est le gouverneur Faidherbe qui fut celui qui en permit la réalisation par la conquête de l'hinterland sénégalais.

II.1. De Dakar – Saint-Louis : du rêve à la réalisation

II.1.1. Le « Proconsulat de Faidherbe » (1854–1861; 1863–1865)

Là où les gouverneurs faisaient des séjours de deux ans au plus, Louis C. Faidherbe passa près de dix ans à la tête de la colonie. Ce long séjour subdivisé en deux périodes de 7 ans et de 3 ans allait permettre à la colonisation française de prendre son véritable envol au Sénégal ; Le chef de bataillon, Louis Faidherbe quand il est nommé gouverneur en 1854 est en service dans la colonie depuis deux ans, et participé à différentes campagnes militaires le long du fleuve Sénégal. Il partageait avec les Saint-Louisiens, leur point de vue, détaillé dans le plaidoyer envoyé à Paris pour sa nomination que *« le Sénégal est difficile à gouverner, car le Sénégal n'est pas un comptoir comme on affecte dédaigneusement de le dire, mais bien une véritable colonie comme la Martinique, la Guadeloupe et la Réunion où l'on a qu'une administration intérieure d'une importance limitée, mais une colonie qui commande à un vaste continent ».* Le Sénégal colonie pilote sera le viatique de Faidherbe et explique l'essentiel de ses actions pour la colonie le faisant percevoir comme le « père » du Sénégal moderne. Tous ses efforts vont tendre à pacifier et unifier la colonie.

Faidherbe va se donner les moyens de son ambition : Par le décret du 21 Juillet 1857 de Napoléon III sur instigation de Faidherbe naissent véritablement les troupes noires sous l'appellation de « Tirailleurs Sénégalais ». Ils seront les fers de lance de l'expansion militaire française. Entre 1854 et 1858 par des campagnes militaires, il va délivrer les escales du Fleuve Sénégal de la tutelle des Maures. A partir de 1860 grâce à des fortins sur le long du fleuve, Faidherbe par une flottille de bateaux armés, sécurise le haut fleuve. Au Sud, la présence française s'imposa à travers des opérations sur la côte et à l'intérieur afin de donner plus d'air à Dakar pour pouvoir la relier à Saint-Louis par une voie sécurisée. Ce sera fait entre 1859 et 1861 à travers différents traités avec les chefs locaux.

Au plan économique et financier, il y a la naissance de sociétés anonymes par actions, consolidation du port de Dakar, construction de quais et de ponts à Saint-Louis, mise en service d'une ligne commerciale le long du fleuve Sénégal et construction d'un axe Saint-Louis – Dakar doté d'un télégraphe et de forts pour garantir la sécurité (E. Makedonsky).

Sécuriser la colonie c'est assurer son développement surtout avec la culture de l'arachide qui se développe et dont la demande est de plus en plus importante en Métropole. Pour cela, il fallait consolider le lieu ombilical entre Saint-Louis et le nouveau port en eau profonde de Dakar : Il y a un hic et un obstacle de poids c'est le royaume du Cayor qui se dresse comme une muraille entre les deux centres. Pour venir à bout de cet obstacle, les Français proposant au Damel (Roi) Birima du Cayor (1859) l'occupation d'une bande de 10 km de large le long de la côte pour construire une route et une ligne télégraphique, des relais fortifiés et des rails. Acceptée la proposition ne put voir le jour avec le décès de Birima : P. BIARNES.

Les Français devront guerroyer encore pendant 25 ans pour asseoir leur projet de relier Saint-Louis à Dakar, surtout qu'entre temps le projet de chemin de fer de Pinet Lapade le maître d'œuvre du port de Dakar s'est imposé. En 1860 après le damel Macodou se dressa contre l'installation française « un adversaire intelligent et opiniâtre » selon P. BIARNES qui contrecarra les plans français pendant 20 ans, par une résistance farouche et déterminée. Il va incarner la résistance à la conquête du Sénégal par son refus de la construction du chemin de fer.

II. 1.2. Lat Dior et le refus du chemin de fer

De 1860 à 1886 date de sa mort au combat contre les Français entre compromis voire compromissions et guerres ; le Damel du Cayor a symbolisé la résistance à la conquête française à travers la construction du chemin de fer Saint-Louis – Dakar. A travers son apostrophe célèbre « l'étranger ne construit pas » sous entendu chez ses hôtes sinon qu'il veut s'installer définitivement, il montre sa détermination à ne pas accepter le rail, actualisation de la main-mise française.

Mais comme l'écrit (A. SOW 1986) *« la position géopolitique stratégique du Cayor, qui occupait toute la côte comprise entre Saint-Louis et Gorée sur une longueur de 40 lieues et une largeur de 25…faisait dépendre les relations entre les deux établissements au bon vouloir du Damel…* ». Il fallait donc mettre fin à cela.

Dès lors, *« la défaite du Cayor et son occupation ne pouvaient que faciliter la liaison du fleuve Sénégal au fleuve Niger : le chemin de fer en constituait un maillon* » (A. SOW). Entre utilisation de la force militaire, traités de paix, échanges commerciaux, grâce à la culture de l'arachide, mais aussi divisions des autorités traditionnelles la France va arriver à ses fins : le 26 octobre 1886, Lat Dior dernier Damel du Cayor livra l'ultime combat de sa vie, en allant à la rencontre de la mort à Dekhelé. Il entra ainsi dans la légende. Le dernier opposant au Cayor vaincu le chemin de fer allait se concrétiser.

II. 1–3. Le Dakar – Saint-Louis : « Le rail de l'arachide »

Le Dakar – Saint-Louis sera construit effectivement entre 1882 et 1885 sur une distance de 262 km et aura coûté 22 244 000 francs soient 84 600 f le km. S. NJAAY 1977. Cette ligne de chemin de fer allait être l'épine dorsale du commerce sénégalais. De prime abord, les objectifs économiques peuvent paraître être à la base de sa réalisation, mais il y en a d'autres non moins importants à caractère militaire et stratégique.

Certes avec l'économie dite de traite reposant sur la déprédation ou le prélèvement des ressources locales aux seules fins des besoins et intérêts de la Métropole, l'objectif économique semble prendre le pas sur les autres. Le Dakar -Saint-Louis draine tous les produits de l'Hinterland vers les ports pour alimenter les industries de la Métropole. L'infrastructure ferroviaire va constituer ainsi la base de l'exploitation des richesses de l'Afrique pour l'Europe.

A côté de l'objectif économique, il y a d'autres objectifs qui semblent parfois prendre le pas. En effet au lendemain du Congrès de Berlin 1884–1885, le modus vivendi sur l'Afrique fixait les règles pour le futur partage du « gâteau africain ». Le signal était ainsi donné pour une *« course effrénée pour l'augmentation du capital – colonie entre* les *puissances européennes ».* S. NJAAY.

Le chemin de fer va révéler son rôle stratégique et névralgique dans ce cadre en permettant le transport rapide des troupes pour venir à bout des troupes et populations insoumises. Ce sera le cas dans le Cayor et les autres régions du Sénégal. Ce n'est pas hasard si J. Chautard écrit du Dakar – Saint-Louis à sa finition *« La construction de cette voie au travers d'un pays armé et encore frémissant avait été une œuvre admirable d'audace et d'énergie »,* (S. NJAAY) le Gouverneur Brière de l'Isle disait avant de faire voter les crédits pour la construction du Dakar – Saint-Louis *« Il s'agit de profiter de l'assagissement provisoire de Lat Dior pour construire un chemin de fer qui permettra d'assurer le maintien de l'ordre dans le Cayor, et évitera ainsi le cas échéant, de stériles dépenses militaires : le rail ne dépend plus de l'ordre, c'est l'ordre qui va dépendre du rail »* (S. NJAAY).

Ce qui est sûr c'est que le rail s'accompagne de gares et souvent de villes garnisons, de l'installation de télégraphes et de toutes infrastructures qui facilitent la mobilisation et la mobilité des troupes.

L'aspect stratégique et militaire du chemin de fer, va apparaître de plus en plus notamment dans la conquête de l'Hinterland et particulièrement la liaison Sénégal – Niger à travers la construction du Thiès – Kayes.

Le chemin de fer apparaît de plus en plus comme voie de pénétration, favorisant le transport rapide des troupes sur les différents théâtres d'opération. Cette finalité mise en œuvre sera explicitée en ce qui concerne les possessions françaises en Afrique de l'Ouest par le Gouverneur de Lavignette qui a dit à propos des lignes de chemin de fer *« ce qui caractérise ces grandes lignes c'est leur origine stratégique et leur dessin impérial ; il s'agissait d'abord de transporter rapidement des troupes et de pouvoir réprimer les tentatives d'insurrection. Il s'agit ensuite de vaincre la montagne en Guinée, la forêt de Côte d'Ivoire et d'atteindre le Soudan, toujours le Soudan cœur de l'Empire français d'Afrique »* S. NJAAY.

III. Le thies-kayes ou la liaison senegal-niger

III.1. Le Contexte général

La volonté d'assurer la liaison entre Dakar et le fleuve fut envisagée. Arriver à Kayes, c'est s'ouvrir les portes du Soudan et arriver au Fleuve Niger comme l'atteste (P. GAFFAREL 1905) qui écrivit concernant les projets du chemin de fer. « C'est un immense progrès qui a été réalisé en peu d'années ». Ce qui a le plus contribué à cette consolidation de notre puissance, c'est le soin apporté par nos gouverneurs à l'extension et à l'amélioration des voies de communication. L'un deux Pinet Laprade forma le projet et ses successeurs s'efforcèrent de l'exécuter, d'unir par une voie ferrée, non seulement, Dakar à Saint-Louis, mais aussi Saint-Louis à Médine et au Niger ».

Si le Dakar – Saint-Louis consacrait la permanence des communications entre les deux villes, le maillage du pays avec les gares et la mobilité des troupes, il y a lieu de souligner que tous les foyers de résistance n'étaient pas encore éliminés dans la colonie. Loin s'en faut.

Pinet Laprade commandant particulier de Gorée, créateur du port de Dakar, avec Faidherbe et après lui va porter l'essentiel de ses efforts militaires dans le centre et le sud du pays.

Lorsque commence en 1876 la marche vers le Soudan avec le Colonel Brière de l'Isle, nouveau gouverneur, le Sénégal n'est pas encore « compact » car de larges parties du territoire étaient peu ou pas du tout soumises à l'autorité coloniale, et ceci restait valable pour les possessions françaises en Afrique Occidentale, quand en 1895, la France créa la Fédération de l'Afrique Occidentale Française regroupant ses possessions. Dakar est choisie comme capitale même si c'est Saint-Louis qui joue ce rôle jusqu'en 1902. En 1904, le décret du 10 octobre, réorganise l'AOF sur le plan territorial et sur le plan de son régime budgétaire. Le gouvernement général qui siège effectivement à Dakar qui s'est détaché de Gorée depuis 1887 comprend les colonies ; du Sénégal, de la Guinée Française, de la Côte d'Ivoire, du Dahomey de Haut Sénégal et du Niger, du territoire civil de la Mauritanie. Chaque colonie est administrée par un gouverneur ayant sous ses ordres des commandants de cercle (division territoriale administrative, inspirée par Faidherbe au Sénégal).

La Fédération est sous l'autorité du Gouverneur Général. Dakar qui voit son port se développer dès 1866 est en pleine croissance. Les services fédéraux qui s'y installent vont accentuer son importance de telle sorte qu'elle va bénéficier d'un statut particulier. En effet, Dakar devient une circonscription territoriale administrée par un gouverneur délégué dépendant directement du Gouverneur général. Depuis 1848 pour Saint-Louis et Gorée et après 1871 pour Dakar et Rufisque, les habitants des « Quatre communes sont des « citoyens » qui font exception à la règle coloniale des sujets soumis au régime dit de l'indigénat, c'est-à-dire « taillable et corvéable à merci ».

III.2 La construction du Thiès-Kayes ou la porte ouverte sur le Soudan

Conquête – Pacification – Mise en valeur vont aller de paire dans l'expansion coloniale française. C'est en 1900 que le Colonel Rougier directeur du chemin de fer Kayes – Koulikoro fut chargé par le Gouverneur Général de dresser les études préalables à l'établissement de la voie ferrée Thiès – Kayes. Entre aléas climatiques, épidémies (fièvre jaune) et problèmes budgétaires, la construction de la voie ferrée ne démarra effectivement qu'en 1907, cela grâce à la loi d'emprunt du 22/01/1907 libérant 13,5 millions de francs sur les 100 millions à l'AOF.

Le Thiès-Kayes devait partir de Thiès en plein Cayor situé près de 80 km de Dakar, jouant un rôle important comme centre de traite des arachides, sur le Dakar – Saint-Louis. Entrepôt, escale, Thiès présente plusieurs atouts comme point de départ.

Les travaux de construction qui débutent en 1907 recouvrent la réalisation de la voie proprement dite, l'édification des gares et le forage des puits. La réalisation se fera en trois sections : 1ère section Thiès – Guinguinéo 140 km ; 2ème section Guinguinéo – Malème-Niani 200 km ; la section Niani-KAYES 200 km ; dès 1908, Thiès voit la construction d'une gare avec deux voies de garage servant au raccordement de la ligne du Dakar – Saint-Louis. Si les travaux commencent simultanément à Thiès et Kayes, la première section est réalisée en 1910. Déjà l'exploitation de la ligne avait débuté dès 1910 sur le tronçon Thiès – Diourbel. Si en novembre 1911, 183 km sont réalisés, la guerre allait ralentir les travaux. Ainsi Tambacounda est atteint en 1915 soient km 395, km 416 (1916) km 528 (1922) et la jonction avec le Kayes–Niger est consacrée le 15 août 1923. Le 1er janvier 1924 le Thiès – Kayes était né. « *La Ligne Kayes Niger (Koulikoro) longue de 555 km commencée en 1882, ne sera terminée qu'en 1901.*

Dès 1923, la marche sur le Niger devient une réalité et ouvre à la colonisation française, tout le Haut-Sénégal et l'immense bassin du Niger aux potentialités agricoles prometteuses.

Dans la colonie pilote du Sénégal, entre 1929 et 1931, les embranchements sur le Dakar – Saint-Louis que sont le Diourbel – Touba (46 km) et le Louga – Linguère (133 km) achèvent le maillage ferroviaire de la colonie pilote.

IV. « L'Ordre du rail »

La construction de chemin de fer va avoir des conséquences importantes d'ordre militaire et stratégique d'abord, d'ordre économique et financier, d'ordre urbanistique et socio-culturel enfin.

IV.1. L'ordre militaire

La prévision de Brière de l'Isle avec le projet de construction du Dakar – Saint-Louis se révéla prophétique « Le rail ne dépend plus de l'ordre, c'est l'ordre qui va dépendre du rail ». En effet, le chemin de fer en Afrique de l'Ouest, mais en Afrique Centrale, (entre le Dakar – Saint-Louis, l'ancêtre, le Dakar – Niger et le Congo-Océan) allait permettre non seulement d'explorer de nouvelles contrées de l'hinterland mais de planter le drapeau français sur d'immenses territoires entre conquête et pacification. La sécurisation ne fut pas aisée malgré l'interconnexion entre voies maritimes, voies fluviales que le chemin de fer avait facilité. Les chemins de fer (Dakar – Saint-Louis – Thiès-Kayes) furent construits dans des périodes où les opérations militaires battaient leur plein. On ne peut qu'être frappé par leur aspect stratégique comme voies de pénétration. En effet le choix des tracés a épousé des régions instables où leur réalisation a joué un rôle décisif dans la suite des conquêtes donnant ainsi raison à J.C. FAURE qui a écrit *« l'Histoire du rail en AOF et en fin de compte l'histoire d'une lutte constante contre l'immensité d'un continent qui abordé sur ses côtes refuse de livrer son arrière pays ».* (S. NJAAY2011).

IV.2. L'ordre économique

C'est l'objectif qui, dès le départ, fut mis en avant, notamment avec le Dakar – Saint-Louis. La construction du chemin de fer devait permettre à la fois la mise en valeur des régions traversées, mais aussi l'épanouissement des colonies au profit de la Métropole. Le tracé des chemins de fer allait déboucher sur les ports fluviaux et surtout maritimes facilitant ainsi le drainage des produits de l'intérieur vers les côtes puis vers la Métropole. Le Dakar – Saint-Louis et ses embranchements par exemple jouera à merveille ce rôle en permettant l'extension du bassin arachidier et l'intensification du commerce de traite basé sur l'exportation des produits arachidiers. C'est ainsi que la part de l'arachide dans le trafic de la voie ferrée évolue de manière croissante en passant en *« 1885 de 19 % des recettes à 22 % (1890) ; 32 % (1895) ; 50 % en (1900) »* S. NJAAY permettant la rentabilité financière de la ligne. On comprend dès lors que le Dakar – Saint-Louis soit appelé le *« rail de l'arachide ».*

IV.3 : L'ordre urbanistique et social

A l'instar du développement de la culture de l'arachide qui fera la prospérité de la colonie, intimement lié au chemin de fer, l'urbanisation de la colonie allait être favorisée elle aussi par le rail. Le rail a favorisé la culture de l'arachide et l'extension du bassin arachidier. L'importance de la production et des tonnages implique la création de gares, de haltes, de lieux transit, où les graines étaient entreposées avant le transport vers le port de Dakar. Les gares et escales vont au fil du temps s'ériger en agglomérations, bourgades dans un premier temps avant de donner naissance à de véritables centres névralgiques dans l'économie de traite : administration, maisons de commerces traitants, paysans vont s'installer dans ces pôles commerciaux le long du Dakar – Saint-Louis dans un premier temps et par la suite le long du Thiès – Kayes et des différents embranchements. Ainsi le rail va déterminer largement la carte urbaine du Sénégal. Beaucoup de villes tout au long du rail seront érigées en chef lieu de « cercle » où réside l'administrateur colonial : Louga, Lingère, Thiès, Kaolack, Kaffrine, Guinguinéo, etc.

Ces différents centres où se concentrent les activités commerciales de par la sécurité et la liberté qu'elles offrent, attirent les populations environnantes notamment autour des gares et escales : paysans, esclaves fugitifs y trouvent des emplois. L'installation des maisons de commerce dites « Bordelaises » et l'arrivée de Libano-Syriens surtout après la première guerre mondiale étoffent la population des villes.

Les différentes agglomérations qui se développeront surtout entre les deux guerres vont en rejoignant les vieilles cités que sont : Saint-Louis (10 000 habitants en 1860) ; Dakar (18 500 habitants en 1904) ; Gorée et Rufisque, donner les grandes lignes de la carte urbaine du Sénégal d'aujourd'hui.

V. CONCLUSION

On ne peut séparer le développement du Sénégal colonial et moderne avec le rail. C'est le rail qui va accélérer la conquête de l'hinterland sénégalais et son intégration dans le commerce international par le biais de l'économie de traite basée sur la culture de l'arachide et les activités qui gravitent autour : commerce, transport, activités portuaires, activités bancaires. On pourrait dès lors avancer que le développement du rail s'est fait au bénéfice de la colonie partant de ses habitants. La réalité est autre.

En effet, trois préoccupations majeures guidèrent les concepteurs et réalisateurs du chemin de fer, administrateurs, commerçants, militaires ils firent siennes ces trois préoccupations suivantes :

- Le chemin de fer doit être un outil privilégié pour installer l'autorité coloniale en accélérant la pacification.
- Le chemin de fer doit jouer un rôle de premier plan dans l'exploitation des colonies en favorisant la mise en valeur des régions desservies et rendant accessibles les productions locales au bénéfice de la Métropole.
- La construction du chemin de fer devait reposer principalement sur un effort local c'est-à-dire supporté par la colonie. C'est ainsi que les emprunts, corvées et travail forcé furent largement utilisés certes à un moindre degré

si on se réfère à la construction du Congo-Océan entre Brazzaville et Pointe Noire et l'hécatombe qui l'accompagna soient « 17 000 personnes tous les 140 km en moyenne sur un tracé de 500 km de 1926 à1927 ». S. NJAAY.

Pourtant c'est ce même chemin de fer qui va favoriser au Sénégal la naissance d'une classe ouvrière qui, par deux fois en 1920 et en 1936, déclencha une grève qui ébranla les fondements de l'autorité coloniale dans la colonie pilote ».

Il faut peut être, au regard des objectifs assignés au rail, saluer la clairvoyance de Lat-Dior qui s'était opposé à ce que le rail soit construit « car il avait compris que le rail signifiait une installation durable des Français. Son refus du rail sera transmis par les griots aux générations suivantes comme le refus de la domination.

N'est-ce pas à juste titre ?

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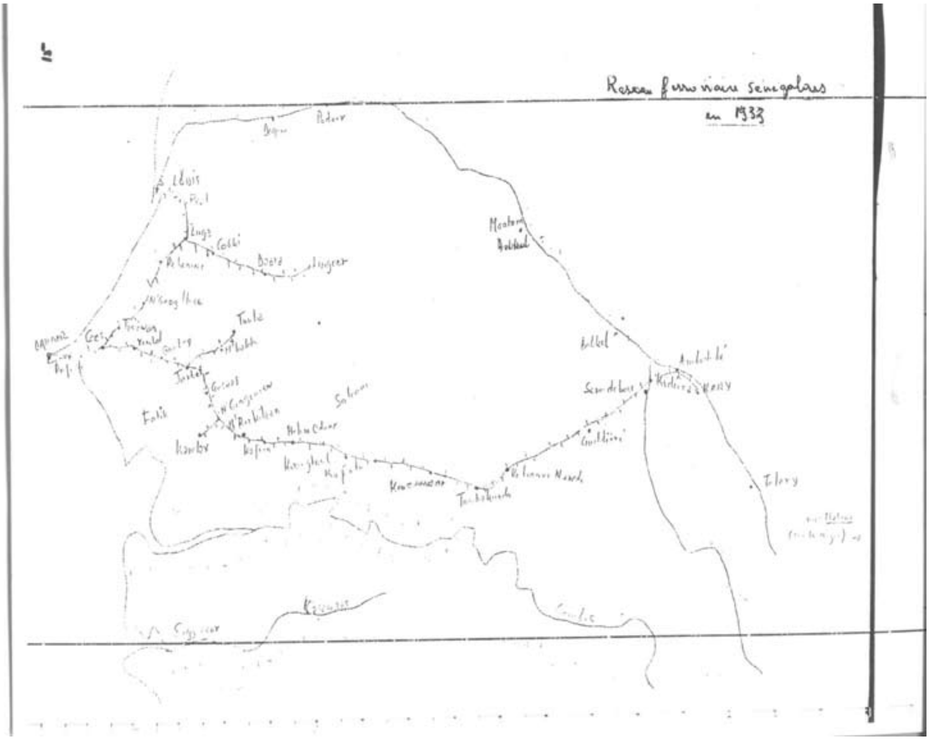
Reseau ferroviaire senegalais
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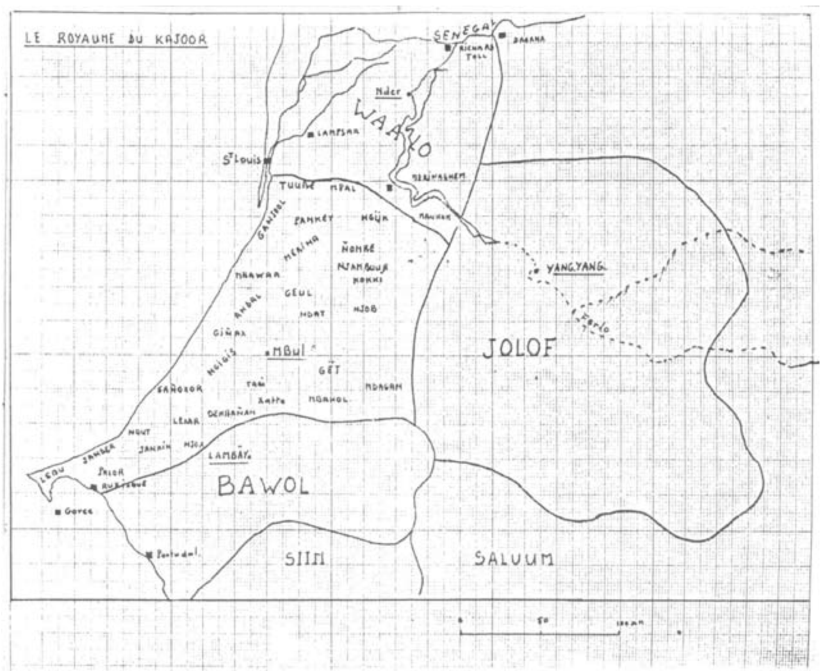
LE ROYAUME DU KAJOOR
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RICHARD TOLL
DAGANA
Nder
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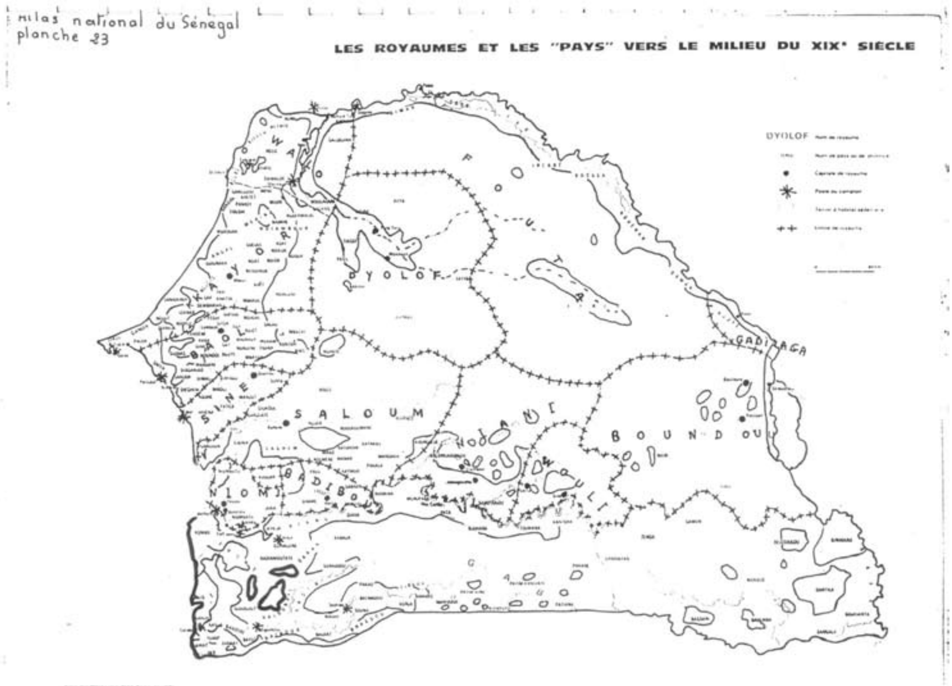
LE ROYAUME DU KAJOOR



Dr. Mor NDAO (Sénégal)

Le rôle de la modernisation du port de Dakar dans la défense de la ville pendant la Deuxième Guerre mondiale.

Introduction

La mission du chef de bataillon Creuly, envoyée au Sénégal en 1845 par l'amiral Hamelin ministre de la Marine aux fins d'inspecter, d'une part, le service du Génie et des Ponts et Chaussées et, d'autre part, d'élaborer la stratégie de défense de Gorée et du Cap Vert se concrétise, d'abord, par l'occupation de Dakar en 1857 et, ensuite, par l'édification d'infrastructures (notamment le port) qui vont être le point de départ de la conquête de la région. Le port fut le moteur de l'essor de la ville car aux origines, Dakar devait tout à son port. Point de relâche de la marine marchande et militaire en route vers les Indes Orientales et l'Amérique, le port de Dakar va intensifier le processus d'urbanisation, entrepris au Sénégal dès le XVIIe siècle par la colonisation française le long de la côte atlantique[1]. Vers la fin du XIXe siècle, se précise le projet d'érection d'un véritable port de guerre qui prend forme en 1898 avec la création officielle d'une base navale à Dakar. Grâce au port, le cadre de la vie urbaine, à l'orée des années trente, se modifie profondément et la capitale de l'A.O.F., qui voit sa population sensiblement augmenter, fait déjà figure d'une véritable ville[2].

Point d'appui de la France, Dakar représente un dispositif majeur dans le projet impérial français en Afrique noire car l'Afrique Occidentale Française (AOF) se conçoit et se définit à Dakar. Ainsi, dès le XIXe siècle, furent édifiés des fortifications dans la ville et alentours, particulièrement au niveau du port pour défendre ce point géostratégique, « finistère » occidental de l'Afrique et qui, au même titre que Saigon en Cochinchine, Diégo Suarez à Madagascar et Fort de France en Martinique, figurait parmi les quatre points d'appui de la France dans le monde.

« Gigantesque création en milieu tropical »[3], « station-service de l'Atlantique »[4] rattachée dès 1885 au chemin de fer qui élargit l'horizon dakarois, le port bénéficie de grands projets d'extension (projets de 1918–1919, projets de 1920, travaux

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1 Voir à ce propos Pasquier R 1960, *«Villes du Sénégal au XIXe s»*, *Revue Française d'Histoire d'Outre-Mer*, N° 168–169, pp 387–426, Paris.

Sinou A, 1993. *Comptoirs et villes coloniales du Sénégal. Saint-louis, Gorée, Dakar.* Paris : Karthala.

2 Whittlesey D., 1941. Dakar and the other Cape Verde Settlements. *Geographical Review*, vol. XXXI, p. 609–638.

3 Seck A, *Dakar, métropole ouest-africaine*. IFAN, Dakar, 1970, p.514

4 Delmas R, « Dakar, station-service de l'Atlantique », *Journal de la Marine Marchande*, Paris, 1953.

d'après-guerre) qui vont être décisifs dans la défense de la ville lors de l'attaque de la coalition anglo-gaulliste en septembre 1940.

En vérité, vers la fin des années 1930, Dakar constituait un enjeu géostratégique de premier ordre dans le dispositif colonial français. En effet, la ville avait ses caractères spéciaux : chef-lieu du gouvernement général, port militaire et marchand, port d'escale d'importance mondiale et premier port de transit de l'AOF, troisième port de commerce français à trafic intense après Marseille et le Havre, dépôt de combustibles, centre de lignes aériennes françaises et internationales à mi-chemin entre l'Amérique et l'Europe, point d'appui de la flotte de guerre, centre de défense terrestre. Dakar fut ainsi un point tant convoité par les différents protagonistes et faisait de la ville un enjeu dès l'éclatement des hostilités et plus particulièrement après l'armistice qui divisa la métropole entre Gaullistes et Vichystes. Alors que pour Vichy, la loyauté des colonies s'avérait nécessaire dans le cadre des négociations éventuelles avec les Allemands, pour la France Libre et De Gaulle, le contrôle d'une partie de l'Empire donnerait une souveraineté effective à un régime virtuel sans assise territoriale. « Intervention de type classique mer contre terre »[5] centrée sur le port renforcée par des éléments aériens, la « Bataille de Dakar »[6] des 23, 24, 25 septembre 1940 opposa les forces pro vichystes à une forte coalition anglo-gaulliste. Comment expliquer « l'échec à Dakar »[7] de la coalition anglaise dont la force de frappe était pourtant beaucoup plus importante (32 bâtiments de guerre y compris le porte-avion l'Ark Royal) que celle des forces françaises pro vichystes basées à Dakar (18 navires)? Hormis les éléments de poliorcétique, du climat invoqué, quel est l'impact de la technologie et du port militaire doté d'une rade bien abritée et d'un arsenal dans la bataille de Dakar?

L'élaboration de la présente étude a été réalisée à partir de sources archivistiques, de travaux bibliographiques relatifs à la question et d'une série d'enquêtes orales. Nous disposons d'une documentation relativement abondante, provenant des archives nationales du Sénégal, du port de Dakar et produite, pour l'essentiel, par l'administration coloniale. Le travail est structuré en deux grandes parties. La première analyse d'abord les grandes étapes du développement du port, le processus de sa modernisation. La seconde réfléchit sur la « bataille de Dakar » (23, 24, 25 septembre 1940), ses enjeux, implications et le rôle du port dans la défense de la ville.

1. La création et le développement du port de Dakar

C'est à partir du XIXe siècle que se précisèrent les ambitions françaises relatives à l'occupation de la presqu'île du Cap Vert. Cette nouvelle attitude

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[5] Maillat, *Dakar sous la flamme de guerre,* slnd.

[6] Mordal J, *La bataille de Dakar*, Paris, 1952.

[7] Watson J.A, *Echec à Dakar, septembre 1940*. Paris, Laffont, 1968.

française est dictée par une conjoncture rythmée par la fin de la traite et l'abolition de l'esclavage, les progrès de la culture arachidière et du commerce, la révolution des transports et la grande poussée impérialiste. Ce nouveau contexte rompait avec l'exiguïté du site insulaire de Gorée.

a) Les données stratégiques et militaires

A partir de la seconde moitié du XIX^{ème} siècle, la géopolitique internationale est dominée par les rivalités entre puissances coloniales. La récupération par la France de ses possessions sur la côte occidentale de l'Afrique est suivie par la volonté affichée de sécurisation de ses établissements et d'extension de sa pénétration vers l'intérieur. Dans les faits, l'installation française à Dakar est dictée par l'évolution de la marine de guerre, de la stratégie navale et de la géopolitique internationale vivement marquée par d'intenses rivalités coloniales qui commandaient l'édification de solides points d'appui. D'autant plus que l'installation de la marine espagnole à Saint Vincent (aux îles du Cap-Vert) représentait une sérieuse menace pour les autorités françaises. Dès lors s'imposait l'occupation de Dakar et l'édification d'une base militaire Dans les faits, il s'agirait d'un « *centre de ravitaillement, de réparation, un lieu de refuge et de repos pour une grande nation maritime, et un centre d'action des croiseur-cuirassés, de torpilleurs, de sous-marins agissant ordinairement en divisions et opérant dans sa zone d'action pour une petite nation »*[8].

Ainsi, consciente qu'une grande nation, loin de se limiter en Europe, devrait contrôler des régions stratégiques du monde, la France opte pour l'érection de points d'appui : Saigon au Cap Saint Jacques en Cochinchine, Diégo Suarez à Madagascar, Fort de France en Martinique et Dakar sur la côte occidentale d'Afrique. Le choix de la presqu'île du Cap-Vert, particulièrement de Dakar peut s'expliquer par sa position géostratégique de *« finistère* » occidental de l'Afrique. En vérité, carrefour international, Dakar facilite la connexion Europe-Afrique australe, Europe-Amérique du sud[9]. Point d'appui privilégié sur l'Atlantique sud, *« principal établissement, centre des opérations militaires et maritimes, en un mot capitale des possessions françaises en Afrique de l'ouest »*[10], Dakar devait, au fil du temps, déclasser les autres villes rivales sénégalaises et africaines de la côte occidentale d'Afrique.

L'option pour l'occupation militaire de la presqu'île du Cap-Vert trouva un écho favorable à l'orée de la seconde moitié du XIXe siècle sous l'impulsion d'un ensemble de facteurs : abolition de l'esclavage, révolution industrielle, rivalités

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[8] Selon le capitaine Hautefeuille cité par Seck, p. 310.

[9] Dieng T , *Le port de Dakar de 1914 à 1945*. Mémoire de maîtrise d'Histoire, FLSH UCAD, 2012, p.19.

[10] Delmas Robert, « les origines de Dakar et de ses relations maritimes avec l'Europe », *Journal de la Marine Marchande*, Dakar1964, p 37–45.

coloniales, grande poussée impérialiste. La mise en place d'un Empire colonial postulait l'édification d'un dispositif militaire avec un point d'appui à Dakar. Le 1er février1856 le commandant supérieur de Gorée, Mauléon, dans son rapport, préfigurait déjà du destin continental, voire mondial de Dakar lorsque, à l'adresse du ministre, il insistait sur les opportunités stratégiques et militaires de la pointe de Dakar. Pour Mauléon, « *Dakar doit devenir un jour, par sa position militaire et maritime, la meilleure sans contredit de toute la côte par la facilité de sa rade sûre et d'une défense assez facile »*[11].

Il est hors de doute que, la première fonction assignée à Dakar et à son port a été une "station-service"[12], un port d'escale, point d'appui, pour le ravitaillement et l'avitaillement en eau, vivres et combustibles. En effet, sa baie facilement accessible et sa position géostratégique permettaient la construction d'un appontement au bénéfice des bâtiments de la Marine Militaire et des navires marchands (relâcher et approvisionnement). Bien situé sur les routes des Indes Orientales et de l'Amérique, le port de Dakar offrait des opportunités certaines aux navires. Après plusieurs valses – hésitations, la compagnie des Messageries Impériales finit par porter son dévolu sur l'anse Dakar. C'est en 1857 que démarrent les travaux du port avec la construction dans l'anse Bernard Dakar d'un parc à charbon aux fins de ravitailler les paquebots reliant, pour le compte de la compagnie, deux fois par semaine, la métropole à l'Amérique. Le 04 novembre 1866 marque la première escale dans le port de Dakar d'un navire de la Compagnie des Messageries Impériales. La fonction d'escale dévolue à Dakar venait d'être réalisée.

Au total, grâce à ses atouts naturels et ses opportunités en ravitaillement et en avitaillement. Dakar finit par recueillir l'héritage commercial de Gorée, déclasser les villes rivales avant de capturer le trafic des îles du Cap-Vert pour devenir l'escale obligée de l'Atlantique vers l'Amérique du Sud et le Cap.

b) L'agrandissement et la modernisation du port

Une comparaison avec les ports voisins à l'image de Saint-Vincent, Las Palmas, Santa Cruz, Conakry, etc.) laisse apparaître des avantages nautiques indéniables pour le port de Dakar (port profond, mieux abrité des houles du large, périmètre portuaire largement suffisant pour accueillir les infrastructures accompagnant le port). Il s'y ajoute que Dakar, en tant que point d'appui, pouvait servir de base de défense, d'avitaillement et de ravitaillement.

Le port fut le pilier du développement et de l'essor de la ville. A l'origine, Dakar devait tout à son port. L'année 1857, date de l'occupation française de Dakar, représente une séquence décisive dans l'évolution ultérieure de la ville. En vérité, elle jette les premiers jalons dans l'équipement d'un futur port avec

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[11] Seck A,op cit, p. 286.

[12] Delmas R, 1953, op cit.

l'érection, par la Compagnie des Messageries Impériales, d'un dépôt de charbon au niveau de l'anse Dakar. Le projet d'une deuxième jetée, ficelé en 1863, parachève la fonction d'escale inter atlantique lorsque, le 4 novembre 1866, un navire poste de la Compagnie des Messageries Impériales, à destination du Brésil, fit escale au port de Dakar. A partir de 1867, démarre une série de travaux destinés à l'agrandissement du port.

A la fin du XIXe siècle, fut émis le projet de création d'un port militaire, véritable port de guerre qui débute en 1898 avec la création officielle d'une base navale à Dakar équipée d'une rade et d'un arsenal.

Le rôle joué durant la guerre devait décider, dès la fin des hostilités, de la réalisation de grands projets axés sur l'agrandissement du port et de sa modernisation. Ainsi, de grands travaux et études furent réalisés de 1918 à 1945. En effet, la première guerre mondiale a montré les insuffisances des moyens d'action du port. Avant même la fin de la Grande Guerre, la métropole en 1917 projetait l'élargissement du programme de 1914 avec l'aménagement de toutes les parties encore inutilisées de l'anse de Dakar et son prolongement. Ce projet attira les réserves et critiques de certains qui estimaient que l'accent doit être mis sur les aménagements destinés à améliorer les conditions d'exploitation des ouvrages existants au lieu d'étendre les dimensions du port. Dès lors, un budget consistant dégagé va permettre la réalisation d'importants travaux entre 1926 et 1933.

Au chapitre des réalisations, mentionnons l'allongement de 75m du môle V, la construction de deux postes d'accostage pour le déchargement des pétroliers ou pour l'avitaillement des navires en mazout. Aux nouveaux quais construits et pourvus de canalisations d'eau à haut débit et d'éclairage électrique, s'ajoutent des voies ferrées, des canalisations de la Société Shell pour les combustibles liquides sur les postes pétroliers et sur le môle VIII. Il s'y ajoute un système de projecteurs puissants capable de ravitailler des navires la nuit dans les conditions idéales, l'élargissement de l'artère située entre l'Arsenal de la marine et la gare du Dakar-Niger, la construction d'un phare à Gorée et une amélioration de l'ensemble des feux de la presqu'île. Ainsi, à la fin des années trente, l'ancienne escale, « station service de l'Atlantique » faisait figure d'un véritable port militaire et commercial.

La réalisation du programme d'ensemble offrait au port de Dakar un outillage moderne et performant capable, avec la montée des périls et les bruits de bottes qui agitent le monde à la fin des années 1930, d'assurer la défense nationale[13].

2. Le port au cœur de la bataille de Dakar

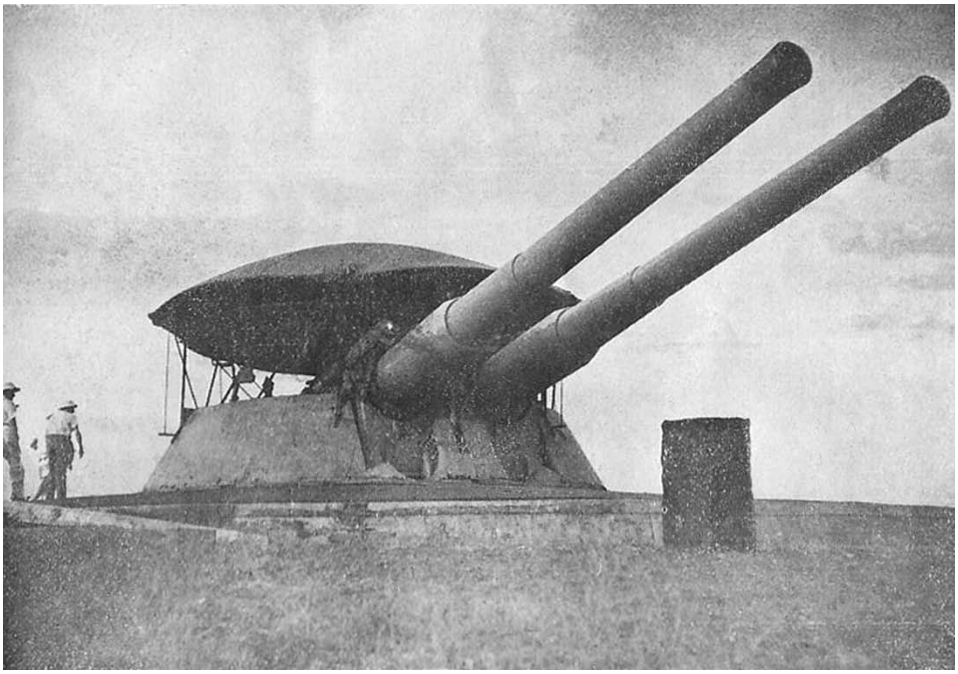
A partir des années 1930, les fortifications (tourelles, batteries de côte, bunkers) le long de la côte et autour du port sont renforcées face à une situation internationale de plus en plus lourde de périls. Edifiées depuis 1906, les murailles

[13] Archives du P.A.D. E2 , 1,1, 10 Rapport Bost, Chef du service du TPPM, 30 avril 1940.

de fortification se dressent dans les points stratégiques de Dakar, suite à de grands travaux de renforcement et d'aménagement initiés à partir de 1935. Ce dispositif fut essentiel pour contrecarrer l'attaque de Dakar qui représente « une intervention de type classique mer contre terre »[14] renforcé par des éléments aériens.

a) L'organisation militaire de la ville à la veille du conflit

Elle est marquée par l'édification de fortifications pour la protection de Dakar et de son port.



Une tourelle édifiée à Dakar

A Gorée, à la pointe Nord, au niveau de Castel, sont érigées une tourelle de 240, une artillerie 90 auxquelles s'ajoutent des alvéoles de 150, de la batterie de 138,5.

Le dispositif est complété par des « soutes, parcs, magasins, abris, emplacements DCA, projecteurs, postes d'observation, de guet et de télémétrie »[15]. A partir de 1939, un poste de reconnaissance de la Marine est installé sur le Castel.

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[14] Maillat, Slnd, op cit.

[15] Idem.

Télépointeur de la batterie Nord du Castel à l'île de Gorée, utilisée contre les bâtiments britanniques. Les canons de cette batterie sont des canons de 240mm, provenant des pré-dreadnoughts de la classe Danton.

Au niveau du Cap Manuel, le dispositif de l'importante édification est constitué d'une tourelle de 240, de soutes et magasins situés en dessous, d'un poste d'observation et de télémétrie, d'un abri de projecteur. Aux Madeleines la batterie, édifiée depuis 1906, comprenait un « parapet bétonné, abritant quatre pièces de 140 sur pivot »[16] alors qu'en bas sont construits magasins et soutes. A partir de 1938, à la suite du réarmement de Dakar, furent installées quatre alvéoles bétonnées supplémentaires (pour les 31 et 41 pièces, un poste de contrôle sous béton composé d'un poste d'observation, d'une tourelle de télémétrie, de salles de conjugateur de tir, d'un groupe électrogène et d'une tranchée bétonnée pour permettre les déplacements. En 1939, fut construit un abri pour projecteurs. Après l'attaque anglaise, la modernisation de la batterie se concrétise par l'emplacement d'une DCA et d'un nouveau poste de télémétrie à dépression.

Au niveau des Mamelles, à côté du Camp Archinard, se dresse l'ancien poste d'observation et poste de contrôle de la batterie de 240. Ce poste d'observation doté de projecteurs, offre un bon champ de vision sur Dakar, Almadies, Yoff et Cambérène. En 1935, furent agrandis le blockhaus et les aménagements souterrains attenants. Entre 1935 et 1938, furent installés trois canons 240 constitués de pièces

[16] Idem.

sur pivots placés en alvéoles bétonnés. D'autres batteries sont érigées le long de la corniche, de la côte à Bel Air (qui abrite l'hydrobase, occupée par des troupes et services), Fann, Yoff, Cambérène, Cap des Biches, Ouakam, Pyrotechnie, Bargny.

Le dispositif général à la veille du conflit fut sensiblement renforcé. La France assigna un certain nombre de rôles au point d'appui de Dakar. Point d'appui de la flotte, il devait assurer les fonctions de ravitailleur, de réparation, d'escorte et de lutte anti sous-marine.

b) Enjeux et forces impliquées dans la bataille

A l'orée des années 1940, Dakar constituait un enjeu géostratégique de premier ordre dans le dispositif colonial français convoité par les différents protagonistes.

La signature de l'armistice (25 Juin) et l'appel de Londres le 18 Juin 1940 du Général de Gaulle allaient diviser les milieux coloniaux entre partisans du Maréchal Pétain, collaborateur de l'occupant allemand et gaullistes adversaires de la capitulation. A Dakar, nombreux étaient les partisans de la Résistance. Si le gouverneur général, Cayla, fut au début pour la continuation de la lutte, le refus de l'Afrique du Nord, avec le général Nogués, de se mettre aux côtés des gaullistes va influencer l'A.O.F qui finira par s'aligner sur le Commandement d'Afrique du Nord. Entre temps, l'attaque navale de Mers el Kébir, durant laquelle le cinquième de la flotte française fut détruit par les Anglais, bascula beaucoup d' hésitants dans le camp pro vichyste.

A partir de ce moment, les événements s'accélérèrent car, pour De Gaulle, la lutte de libération nationale dépassait le cadre métropolitain pour s'étendre jusqu'aux colonies qu'il fallait empêcher, coûte que coûte, d'être récupérées par Vichy et c'est précisément dans ce cadre que Dakar fut impliquée militairement dans la deuxième guerre.

Ainsi, dès le 7 Juillet 1940, un contre-torpilleur pro gaulliste fut refoulé à Dakar tandis que, le lendemain, le «Richelieu» fut attaqué et immobilisé dans le port de Dakar. Or, en ces moments, l'A.E.F, par la voix de Félix Eboué, rejoignait la résistance alors que Cayla, soupçonné d'être pro gaulliste, fut muté à Madagascar et remplacé par Pierre Boisson qui, bien que versatile et hésitant au début, finit par rejoindre Vichy.

Pour De Gaulle, le ralliement de Dakar à sa cause permettrait à la France Libre d'avoir des moyens matériels et humains pour continuer la lutte, mais aussi une assise territoriale et politique pour un Etat virtuel. Or le ralliement de l'AEF poussa les autorités de l'AOF à prendre des mesures préventives pour protéger ses bases contre toute attaque anglo-gaulliste. C'est dans ces conditions que De Gaulle se présenta au large de Dakar le 23 Septembre 1940 avec une coalition FNFL-anglaise face aux forces pro vichystes basées à Dakar.

France (forces alliées à Vichy)

Cuirassés :	Richelieu (ne pouvant appareiller)
Croiseurs :	Georges Leygues Montcalm
contre-torpilleur :	Fantasque Malin l'Audacieux
Torpilleur :	le Hardi
sous-marin :	Persée Ajax Bévéziers
Avisos :	Calais d'Entrecasteaux d'Iberville Commandant Rivière Gazelle la Surprise
Patrouilleur :	Air france I Air france III Air france IV

Forces anglaises

Cuirassés	Barham Resolution
Porte- Avion	Ark Royal
Croiseurs	Devonshire Cumberland Australia Delhi Dragon
Destroyers	Inglefield Faulknor Fortune Foresight Greyhound Fury
Patrouilleurs dragueurs de mines	Milford Bridgewater

Transports de troupes et de matériels	Westernland (transportant le général De Gaulle) Pennland Ettrick Kenya Karanja Sobieski Anadyr Fort-lamy Neveda Casamance Belgravian pétrolier Ocean Coast

Forces Nationales de la France Libre

Avisos :	Savorgnan de Brazza Commandant Duboc Commandant Dominé
Patrouilleurs :	Président Houduce

Au petit matin, des avions britanniques survolèrent Dakar, jetant des tracts de sympathie et souhaitant le ralliement de l'AOF aux côtés des Alliés, de la France Combattante dans quatre heures. Après l'échec des pourparlers, Dakar fut violemment bombardée par la flotte anglo-gaulliste commandée par le vice-amiral John Gunningham. Ce que Jacques Mordal appelle "la bataille de Dakar" venait de commencer. Les hostilités vont durer trois jours, mais Dakar résista farouchement, persuadant De Gaulle de battre en retraite pour regagner Freetown au soir du 25 Septembre 1940. Les pertes matérielles et humaines furent lourdes : le bilan officiel, rapporté par le journal Paris Dakar, dans sa livraison du 26 septembre 1940, s'élevait à 175 morts et 350 blessés, alors que les sources officieuses faisaient cas de centaines de morts.

En réalité, De Gaulle voulut prendre Dakar pour plusieurs raisons. D'une part, il y avait la position géostratégique tant convoitée par les Anglais pour déplacer le théâtre des opérations anglo-allemandes en AOF, tandis que De Gaulle y voyait le moyen de se donner une assise politique et territoriale. D'autre part, il compterait récupérer une partie des réserves d'or de la Banque de France et des banques nationales belge et polonaise – soit 1000 T plus 60 à 70 millions de francs or évacuées au Soudan (Kayes) par train spécial pendant l'offensive du Reich.

c) Le rôle du port dans la « bataille de Dakar »

Une analyse des événements, du contexte et des infrastructures permet de supposer que l'existence d'un port militaire et sa modernisation ont pu contenir la coalition anglaise pourtant plus importante que les forces maritimes basées à Dakar. L'édification depuis la fin du XIXe siècle d'un port militaire doté d'une rade bien abritée et d'un arsenal a pesé lourdement sur l'issue des combats. En effet, l'existence d'un port militaire repose sur deux piliers : une rade et un arsenal. Selon Rouville, un port militaire doit avoir :

- une rade bien abritée capable d'accueillir des navires pouvant se tenir mouillés en sécurité par ancre ou par dispositifs d'amarrage appelés « *coffres d'amarrages* » ;
- un arsenal à même d'offrir aux navires des services comme l'avitaillement et le ravitaillement en matières consommables[17], en munition, réparation, etc.

C'est pourquoi la rade doit « *être assez grande pour que les navires ne soient pas gênés dans leurs évolution et assez bien protégée contre la mer pour que les relations des navires sur rade avec la terre [...] soient assurées par tous les temps sans difficultés excessives* »[18]. A ce dispositif, s'ajoute l'étroitesse des passes donnant accès à la rade capables de dissuader l'ennemi avec des engins de barrage passifs ou actifs assez large qu'on peut difficilement embouteiller par un coup de main extérieur. Par ailleurs, un bon arsenal doit disposer « *d'une part, des moyens de réparation, des ateliers pour le travail de fer, du bois, des ateliers de torpilles, des machines, des formes de radoubs et des magasins contenant des pièces de recharge et d'autre part, tout ce qui est nécessaire à une flotte : minutions, combustibles, vivres (services de subsistances), des bureaux pour l'Etat-major, des casernements et des hôpitaux pour les équipages, des écoles de formation de diverses spécialités (mécaniciens, fusiliers ...)* »[19].

Le choix de l'anse de Dakar pour l'édification du port militaire fut commandé par l'existence des premiers ouvrages (le fortin) de la Marine et d'un grand espace nécessaire capable d'accueillir les équipements. Dispositif essentiel à l'endroit des autres puissances maritimes, le port de guerre permet à la France d'assurer la protection de ses colonies de la côte occidentale d'Afrique d'une éventuelle attaque navale.

En 1898, démarre à Dakar les travaux en vue de l'édification d'une base navale pourvue d'un arsenal permettant le mouillage d'une division de croiseurs cuirassés. Dès l'époque, le département de la Marine entreprit des travaux destinés à faire de Dakar un point d'appui de sa flotte. Les travaux devaient permettre les installations suivantes :

- une vaste rade intérieure avec l'édification d'une jetée de 2080 m dénommée « *Jetée Nord* » ; le prolongement sur 160 m de longueur de *la « Grande Jetée »* construite de 1864 à 1866, et de la « *Jetée Sud* » (500m);

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[17] Dieng T, op cit.p.35.

[18] Rouville A.G, *Cours des travaux maritimes* 1945–1946, p. 214.

[19] Idem, p. 215.

- l'érection à l'intérieur des jetées d'une *« rade militaire »* d'un mouillage de 40 ha dragué à 9 m, capable d'accueillir une division de quatre croiseurs cuirassés ;
- un terre-plein avec casernements et installations nécessaires à la création d'un arsenal ;
- un bassin de radoub d'une longueur de 200 m et d'une profondeur de 8,5 m[20].

Avec la réalisation de l'ouvrage, le port de Dakar « *reste unique entre Gibraltar et le Cap »[21]*, un endroit idéal pour les navires sillonnant l'Atlantique Est. Les travaux enchaînés durant la décennie 1898–1908 furent évalués à 21 200 000F[22]. Avec la réalisation du port, la Marine disposait d'une infrastructure moderne et multifonctionnelle composée de 4075m de quais dont 842 pour la batellerie, d'un wharf de 223 m de longueur accessible par fonds de 9,40 m sur le côté Est, 7,50 m sur le côté Ouest et de 700 m de quais destinés aux remorqueurs puissants et aux grosses batelleries·

A partir des années 1930, la construction de nouveaux quais de canalisations d'eau à haut débit, l'éclairage électrique normal auquel s'ajoute un système de projecteurs puissants capable de ravitailler des navires à charbon et à mazout la nuit, l'élargissement de l'artère située entre l'Arsenal de la marine et la gare du Dakar-Niger, la construction d'un phare à Gorée et une amélioration de l'ensemble des feux de la presqu'île, l'édification de voies ferrées, de canalisations de la Société Shell pour les combustibles liquides sur les postes parachèvent un processus de modernisation enclenché depuis la fin du XIXe siècle.

Conclusion

Point d'appui, Dakar, fleuron des cités coloniales françaises en Afrique noire, Dakar représente un pilier majeur du projet impérial français en Afrique noire. Pour défendre la ville, dès le XIXe siècle, furent érigées des fortifications au niveau du port aux fins de défendre ce point géostratégique, « finistère » occidental de l'Afrique et qui, à l'image de Saigon au Cap Saint Jacques en Cochinchine, Diégo Suarez à Madagascar et Fort de France en Martinique figurait dans le dispositif des quatre points d'appui de la France. A la fin du XIXe siècle, fut émis le projet d'un port militaire, véritable port de guerre qui débute en 1898 avec l'édification d'une base navale à Dakar disposant d'une rade et d'un arsenal. Le rôle militaire du port de Dakar va créer les conditions de son développement avec, pendant un demi-siècle, des extensions successives.

La modernisation du port se manifesta dès les années trente d'abord par l'édification de quais de canalisations d'eau à haut débit, ensuite par l'éclairage

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[20] Delmas R, op cit, p. 49.
[21] His/69/ P.A.D. : Le port de Dakar-ses origines-état actuel-extensions futures.
[22] Dieng T, op ,cit.p.38.

électrique doté d'un système de projecteurs performants à même d'avitailler des navires à charbon et à mazout la nuit et, enfin, l'élargissement de l'artère située entre l'Arsenal de la marine et la gare du Dakar-Niger.

Il s'y ajoute l'érection d'un phare à Gorée ainsi qu'une amélioration des feux de la ville et ses environs, la construction de voies ferrées à l'intérieur, de canalisations de la Société Shell pour les combustibles liquides sur les postes complètent le processus de modernisation entamé dès la fin du XIXe siècle. Dès lors, le port de Dakar pouvait assurer la fonction de point d'appui et de « station-service de l'Atlantique » à lui assigné par la France.

L'analyse et l'évaluation des événements et des infrastructures permettent de se faire une idée sur le rôle et l'impact du port dans l'issue de la bataille de Dakar.

Il est permis de supposer, à bon droit, que la construction du port militaire, son équipement et sa modernisation ont été déterminants dans « l'échec à Dakar »[23] de la coalition anglaise dont la force de frappe était beaucoup plus importante (32 navires dont un porte-avion l'*Ark Roya*l) que celle des forces maritimes françaises pro vichystes basées à Dakar (19 ou plutôt 18 car *Le Richelieu* pas opérationnel). On peut admettre que l'édification depuis la fin du XIXe siècle d'un port militaire doté d'une rade bien abritée et d'un arsenal a été fondamentale dans la bataille de Dakar.

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SOURCES D'ARCHIVES
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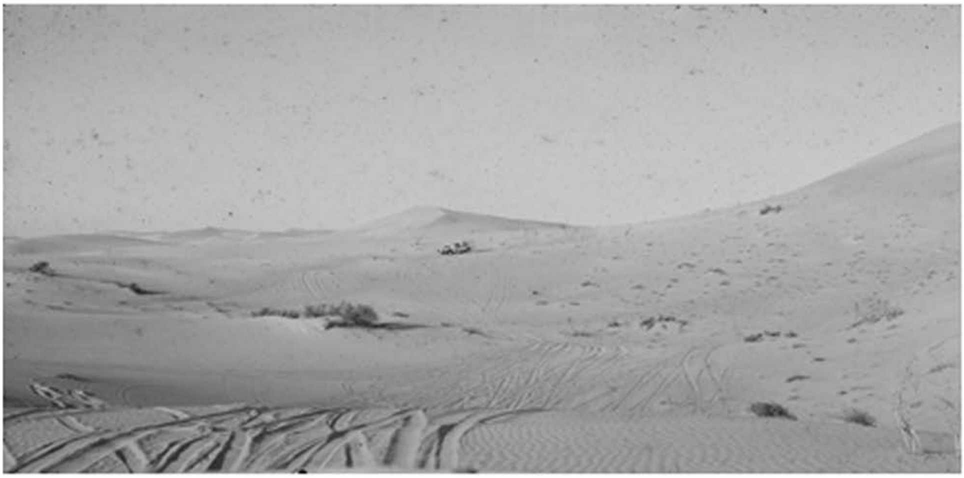
2. Archives du Port Autonome de Dakar (PAD)

Dr. Saif al Bedwawi (UAE)
Desert Disputes in the Emirates



Introduction

The aim of this paper is to discuss disputes and skirmishes that occurred in the Emirates' desert and how the military used its technology in coping with these small battles.

The Empty Quarter desert of UAE is a fast and sandy dune that covers hundreds of miles with no water, trees, or roads. Only the Bedouin nomads with their camels lived in the area. Given that Around 80% of United Arab Emirates is covered by Desert and the rest is the Rocky Mountains on North and Al Ain area and Sabkha or salty desert in the rest.

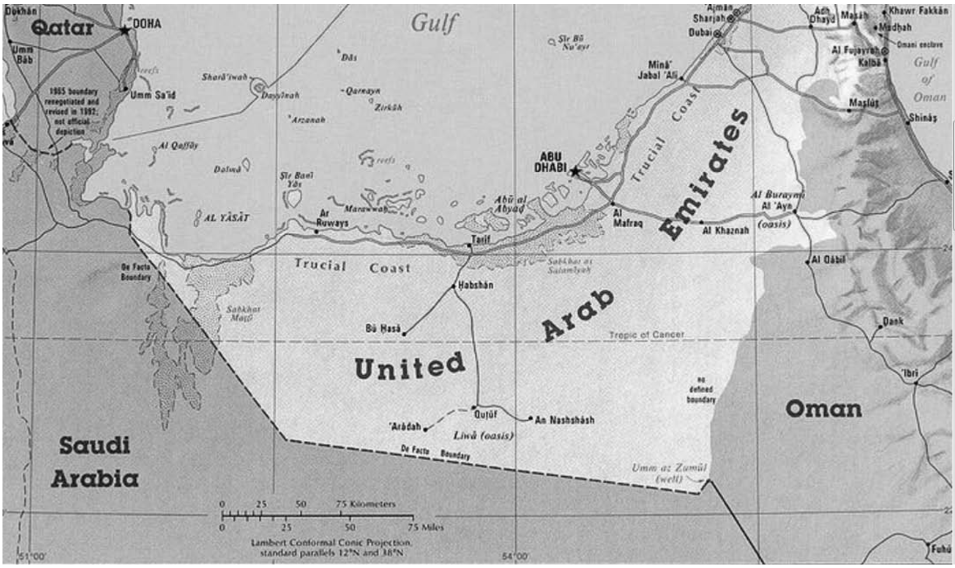
In 1932 Britain established a small airport at Sharjah to protect oil companies that were digging for oil in the desert. A major problem was finding adequate landing posts for aircraft.

In 1952, a small garrison called Trucial Oman Levy was established to carry patrolling duties in the whole of the Emirates. The Empty Quarter area was a challenge for those Bedfords and Lorries. The best car was the Land rover that needed a good trained driver otherwise it would be stuck in the desert forever. On many occasions, patrolling soldiers had to bury their patrol jerkins in order to reduce the weight of their cars.

Furthermore, not every tier was fit for driving in the desert. Accordingly a special team was formed to study the best kind of tires that would work in Liwa.

Another problem was the weakness of signals in the desert. The heat of the desert made patrolling difficult thus cutting them off from their headquarters.

In the end, the best way to defeat the desert was to use the resources that were roaming around already. Arabian camels were put in the service of the army to perform duties such as carrying soldiers into cut-off places where neither cars nor planes could patrol. This made for some interesting stories, and soldiers became creators of songs, poetry, and novel stories that lived into today's Emirati society.



UAE Map

Desert Water Wells

The highest precious commodity in the desert is water due to its scarcity. This made the Bedouin of UAE desert to dig water wells in certain places in the desert.

Some of those water wells become the only source of water in the area. Unfortunately, those wells often depleted in the summer and thus added to the problem.

When a veteran officer was asked how he managed to carry a patrol in the desert? Well, he said first we have to have a Bedouin as a guide, and second we used to carry a lot of jerry cans of water.[1]

[1] Interview with Alan Sanderson. Ex TOS solder in the Emirates. London, 17/7/2012.

Water wells in the desert

Accordingly, water wells were so much important for the soldiers. This made the General Head Quarter to draw a map of all wells in the desert thus Convoy can stop by them in their way toward the Empty Quarter during their patrolling.[2]

[2] For water wells and its important in the desert see, Al Yahya, Eid, (Editor). (2006) Travellers in Arabia: British Explorers in Saudi Arabia. London: Tracy international.

High temperatures in the desert

One of obstacles that limit the use of technology in desert warfare is the high temperature. It effects on the mechanisms used such as tanks, signals, personnel carriers, and trenches. For example during Kuwait Operation of 1962, British forces landed on the ground In the Kuwaiti desert to stop the threat of Iraqi Abdul Karim Qasim. It was luck that the Iraqi troops did not attack British troops because if they did, it might had a catastrophic result on the British side, for the reason that it was July and the heat had terrible impact on the British machinery. Furthermore, some soldiers were so exhausted (because of 120 degrees Fahrenheit in the summer months), that led kept them out of the war. Also in the same Operation, heat had affected signals transmission which partly became useless as it was difficult to send or receive signals.[3]

Training in the heat

Soldiers dress in the desert

Some Armed Forces faces a challenge in the selection of military clothing appropriate for its soldiers working in the desert , especially if the soldiers are fighting in an environment other than those trained by, an example of British forces in the Second Gulf War. The British Ministry of Defense was keen in finding proper boots for the troops destined for the desert movement in the Gulf War. The problem was that those boots were easily filled with sand as a result of movement

[3] For Kuwait Operation see: Howarth, J. (1973). An Appraisal of Kuwait Operation of July 1961. Aberystweth, University of Wales, MSc thesis.

between the sand dunes, also were not suitable in swamp where they filled with water.

The other case is wearing Shamaq in the desert in order to protect faces from the sands' dust and to protect soldier's eyes and nose. It's just what Arabs wear in this part of Arabia.[4]

Shamaq or covering faces in the desert of Arabia

Sandstorms and their impact

The sand storms put limitation on the vision and thus affect the course of the war, not to mention the dust that enters in the mechanisms and affect performance. In the war against Iraq proved to be that dust and sand storms can also limit the helicopters to identify their goals during the course of operations.

The following pictures shows sandstorm that had swept the camp of U.S. forces while they wherein Kuwait in 2011, look at the impact of the storm which blocked the sun and turns the place into darkness.

[4] The Gulf Crisis: The First Sixty Days. *The Guardian* Collection Number One. P., 27.

Sand storms in Kuwait 2011

Vehicles Movement in the Desert

It was those vehicles like Land rover, Dodge, and Bedford that were used in UAE desert in 1960s. Even those vehicles were made to work in the desert, but still had difficulties especially when they were going through the sandy hills. A British traveler said once: "We were driving on the sands as if we were walking on water." Therefore, the Military Patrol had to reduce weight of their vehicles, sometimes by burying fuel and water jerry cans in the desert. It was though disappointing because storms cover that place and thus in their way back they lose their marks.[5]

Bogged in the desert

[5] Shepherd, Anthony. (1961). Arabian Adventure. London: Collins. P., 86–95.

Land rover slipping in the sands

Bedford bogged in the desert

Dodge Power Wagon

Patrolling in Liwa desert of the Emirates

Liwa desert is situated south west of Abu Dhabi on the edge of the great Empty Quarter desert (Rub Al Khali). The distance from Dubai/Sharjah being some 380 km one way and from Abu Dhabi the Capital city some 220 km. Liwa is the name of a vast, almost barren desert region, that extends from the southern part of the Emirate of Abu Dhabi, all the way to the border with Saudi Arabia; and south of Al Ain, all the way to the border of Saudi Arabia and Oman.[6]

6 See: Thesiger, Wilfred. (1965). Arabian Sands. London: Longman.

Liwa: Home land of Arab tribes

Why Patrolling Liwa?

There were many reasons for patrolling Liwa Oasis as follows:

First: In 1950s Oil companies were searching for oil in the desert but were not aware of the roads or the exact boundaries. Therefore, they called upon the military to assist them.

Second: To stop gun running from Saudi Arabia to Oman during Oman internal Jebel Akhdar war in 1957–59.

Third: Some British officials and travellers were interested in experiencing desert life and thus they needed help from the military.

Fourth: Regular military training of the Emirates forces.

Fifth : Home of pure Arab beduin that most of the Sheikhs come from.

Sixth: Home of the best pure Arab camels.

Camels of Liwa

Movement in the Liwa Desert

The difficulties involved in taking vehicles into the Liwa were considerable and could only be overcome between October and April. It might have been possible to take Land-Rovers or Dodge power wagons in during the summer, but the efforts that would have had to be expended in constantly pushing and digging out would have left the party, in the intense heat, quite unable to carry out their tasks.

Movement would have had to have been at night, and that was extremely dangerous as most of the dunes had at least one precipitous slope, which would have spelt disaster to men and vehicles alike. Accordingly Patrolling Liwa Oasis was rather hazardous in 1950s.

To avoid that there were some findings that were recommended by officers who had been to Liwa as follow:

First of all, you cannot carry many soldiers or rations because big vehicles such as Bedfords cannot go more than 40 miles inside Liwa. Therefore, smaller vehicles would be dependent on petrol which it carried, or which they had laid down in dumps ahead.

Second, you have to have a good driver who had first-hand experiences with the area and that was rather rare to find.

Third, each car load should be 3 men, ten jerry cans, rations, ammunition, spare parts, radios, and bedding.[7]

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[7] Shepherd. Ob. Cit., P., 88.

Air strep in the desert with various transportations

Empty Quarter Air Port:

It is important to supply Troops stationed in the desert for long periods by aircraft, and that meant importance of a desert airport. A British plane in 1963 was sent to Bu Hafafa in the Empty Quarter of UAE.

When the plane came close to the well of Bu Hafafa could not find the air strip that was mentioned on the map. Simply a sandstorm had turned it into high sand dunes.

The pilot tried to get to the airport but the plane lost balance and seems to be one of its engines stopped working and then tried to land in an open area, but no luck, where 7 people died of the total number of 8 officers and NCOs.[8]

Camel Patrols:

The military authorities in the Emirates found out that it was much easier to use camels for patrolling the desert.

First: Camels can move for days without water.

Second: It is not expensive.

Third: It is fun and adventure especially for British officers.

The problem though: Can Officers and soldiers ride them comfortably?

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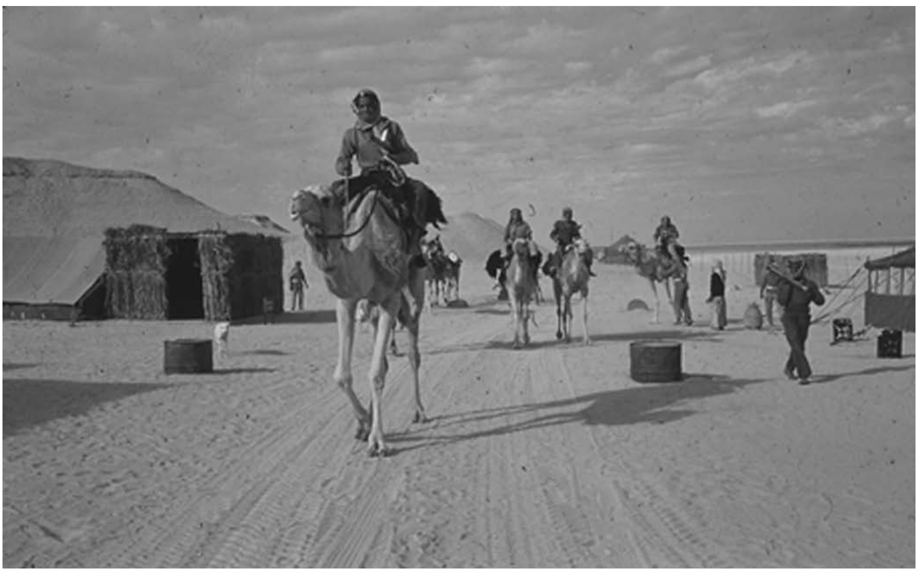
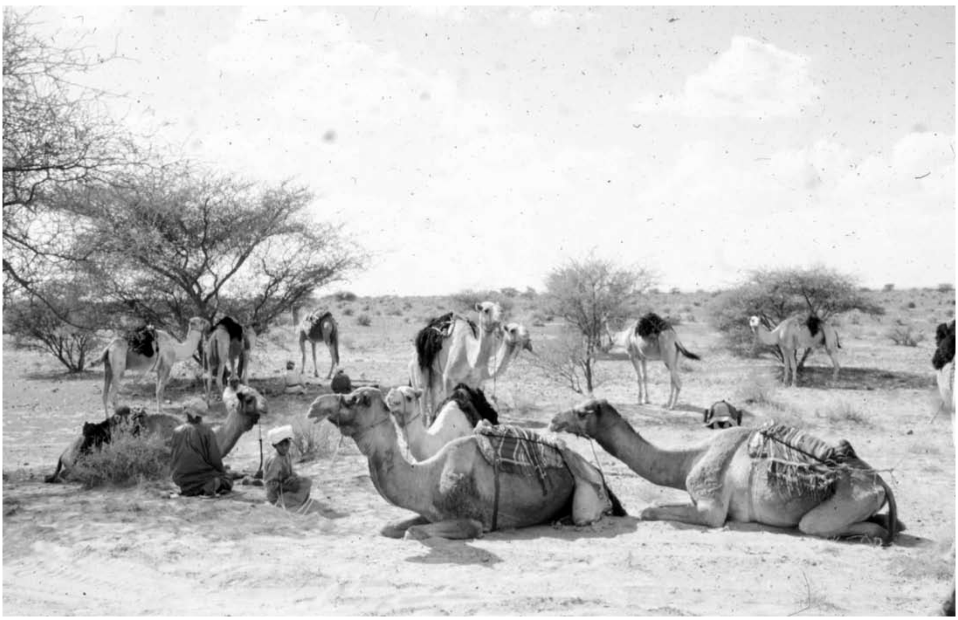
8 Lee, David. (1978) Flight from the Middle East. London: Ministry of Defence, Air Historical Branch, RAF. P. 262.

Firstly, in order a camel a rider must have a training course that supervised by a Bedu.[9]



[9] Mann, Michael. (1994). The Trucial Oman Scouts: The Story of a Bedouin Force. London: Michaell Russell. P. 69.

On the March



A time for a brake

Summary:

This paper was about the limitation that desert put on modern technology. The Liwa Oasis of Abu Dhabi was used as a case study.

The findings were that sending normal vehicles to the desert was rather hazardous and therefore you have to train solders in similar circumstances and if possible to use Beduin (with their camels) who lived in the desert.

Fergal Purcell (Ireland)

The Long Walk: An Aspect of the Evolution of Improvised Explosives Devices from the Irish War of Independence to Twenty First Century Afghanistan, and their Impact on Military Tactics and Technology

Introduction

With the 2003–2011 war in Iraq, new terms entered the vocabulary of the public in western countries such as IED or Improvised Explosive Devices, uparmouring and Hill Billy armour. The concepts to which these terms referred, were not new, but rather have a history going back many years. Such concepts are typical of long wars, or war among peoples. The nature of long wars has caused militaries to change their conventional tactics, techniques, and procedures (TTP) to adopt to the multifaceted tasks now expected. IEDs help irregular forces limit the effectiveness of conventional forces, by reducing their mobility and striking a psychological blow. IEDs have become a significant weapon of irregular forces in the Iraq and Afghanistan wars influencing tactics, and expenditure on new equipment. This has been building up for ninety years.

This paper examines the development of the IED from its early state during the Irish War of Independence to becoming a strategic weapon in the Iraq war; the technology used to counter IEDs, and how IEDs impacted tactics of irregular and conventional forces.

The Rise of the Ied

What are IEDs, who uses them and why?

An IED is defined as:

> *A device placed or fabricated in an improvised manner incorporating destructive, lethal, noxious, pyrotechnic or incendiary chemicals and designed to destroy, incapacitate, harass or distract. It may incorporate military stores but is normally devised from non-military components.*[1]

Usually irregular forces have limited access to military grade material. While light infantry weapons are generally more readily available, the absence of heavier

[1] NATO definition, cited in Wesley Bourke "Exercise Green Zone," *An Cosantoir* 70, no. 17: 15, quoted in Frank Callanan, "Independent Review into matters related to the deaths of Corporal Fintan Heneghan, Private Mannix Armstrong and Private Thomas Walsh on 21st March 1989, while serving with 'C' Coy, 64th Infantry Battalion, United Nations Interim Force in the Lebanon (UNIFIL)," Dublin: Department of Defence, 15 September 2011. 11–12.

weapons such as rockets, mortars, landmines and anti-tank weapons, results in the inability of irregular forces to attack effectively. IEDs provide irregulars forces with weapons to penetrate armoured vehicles, and breach defences of fortified posts.

Mining roads with IEDs capable of disabling or penetrating armoured vehicles can reduce the mobile capability of conventional forces. With this class of weapons, irregular forces have the capability to stage indirect or stand-off attacks on their conventional force opponents. They also can have a significant impact on the morale of conventional troops. Unit commanders and troops become reluctant to patrol outside their defendable positions, thereby ceding control to irregular forces.

Countering the effects of IEDs ties down elements of the military in security operations with which they would not normally have to contend. Security is provided to commercial and other non-military assets reducing the number of troops available to deploy in operations against the irregular forces. For every frontline soldier on a security detail at a facility, Counter-IED (C-IED) activities, or IED Disposal (IEDD) incident, this is one less soldier available to engage the irregular forces, thereby relieving some of the pressure on the irregulars.

Armour piercing IEDs and large IEDs have shown a capability to destroyed armoured vehicles. In the Summer 2006 Lebanon war, Hezbollah tank-killer teams were armed with anti-tank guided missiles (ATGMs), including tandem high explosive anti-tank (HEAT) RPG 29 Vampire and AT-14 Kornet. IEDs were also used, with "super heavy" IEDs[2] destroying Merkava battle tanks. Although armed with ATGMs, Hezbollah still employed IEDs, thus acknowledging their effectiveness on the battlefield.

The significance and capability of IEDs have been misunderstood by some. This has been evidenced where an institution has had little recent history with IED, and had not taken in the experience of other militaries. After a year of combat in Iraq, to state that irregular forces in urban settings "rely primarily on … IEDs because their marksmanship is not good"[3] showed a lack of understanding of how IEDs had been employed by irregular forces in the previous three decades, and were then shaping the Iraqi battlefield. Already a 'tipping point' had occurred in October 2003, when IEDs caused twice as many casualties as weapons fire.[4]

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2 Lieutenant Colonel David Eshal, "Lebanon 2006: Did Merkava Challenge Its Match?" *Armor* (January–February 2007): 12.

3 Lieutenant Colonel Lester W. Grau (Rtd.) "Something Old, Something New: Guerrillas, Terrorists, and Intelligence Analysis," *Military Review* (July–August 2004): 43.

4 Andrew Smith, "Improvised Explosive Devices in Iraq, 2003–09: A Case of Operational Surprise and Institutional Response," *The Letort Papers* (Carlisle, PA: Strategic Studies Institute, US Army War College, April 2011): 10.

An early history of IEDs

During the Irish War of Independence, IEDs were used by the Irish Republican Army (IRA)[5] in a support role in their engagements with Crown forces.[6] IEDs, or landmines, were used to breach the defences of fortified Royal Irish Constabulary (RIC) barracks, or as a prelude to an ambush on motorised patrols.[7]

The IRA had difficulties employing IEDs effectively owing to two major issues. First, acquiring explosives plagued them. Gelignite was the most available explosive acquired from quarries and was used sparingly.

Second, IRA knowledge of explosives was limited. Often explosives failed to detonate, severely limiting the effectiveness of their attacks. Failures were owing to a multitude of reasons, mostly stemming from the IRA's "complete ignorance of high explosives."[8] Some mistakes were elementary – using low tension batteries on high tension detonators.[9] This deficiency was corrected when former British Army Royal Engineer officers with experience from the 1914–18 war join the IRA.[10]

Rail was a major mode of transportation for Crown forces, however the Irish railway strike placed an embargo on transportation of armed Crown forces

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5 In this paper, IRA will refer to the Irish Republican Army during the Irish War of Independence, 1919–1921, while PIRA will refer to the Provisional IRA from the split with the Official IRA in December 1969, to the Good Friday Agreement, 1998.

6 General Staff, 6th Division, "The Irish Rebellion in the 6th Divisional Area: From after the 1916 Rebellion to December, 1921; An account compiled in 1922 by the General Staff, 6th Division," *The Irish Sword* 27, no. 107, (Spring 2010); United Kingdom Cabinet, *Conclusions of a Conference of Ministers held at 10, Downing Street, S.W., on Wednesday, March 31st 1920 at 11.0 a.m.* CAB/23/21; General Officer Commanding-in-Chief, *Report by the General Officer Commanding-in-Chief on the Situation in Ireland for week ending 16th April, 1921*. CAB/24/122. 2. The term "Crown forces" is used here to encompass RIC, ADRIC (Auxiliary Division Royal Irish Constabulary), RIC Reservists, and British military. This term was in use by British Army of the time and the British cabinet.

7 General Staff, 6th Division, "The Irish Rebellion in the 6th Divisional Area: From after the 1916 Rebellion to December, 1921; An account compiled in 1922 by the General Staff, 6th Division," The Irish Sword 27, no. 107 (Spring 2010): 62. Ambush at Ballinhassig, Co Cork, 22nd October 1920. Ambush on two Crossley tenders of 1st Batt. Essex Regiment. A mine was to explode under the leading tender, but failed; Tom Barry, Guerilla Days in Ireland (Cork, Ireland: Anvil Books, 1971), 132.

8 Barry, *Guerilla Days in Ireland*, 63–4, 73. An attack on Kilbrittan RIC post with a mine consisting of thirty pounds (~13kg) of gelignite and gun cotton. The mine failed to explode. Next attack on the post used an ordinary detonator instead of the electric detonator.

9 Patrick Lynch, "British General Killed in Action against Cork and Kerry IRA at Clonbanin," *With the IRA in the Fight for Freedom 1919 to the Truce* (Cork: Mercier Press, 2010), 323–4. Low tension (voltage) batteries were used on a mine with high tension detonator. Therefore the voltage applied was insufficient to active the detonator.

10 Tom Barry, *Guerilla Days in Ireland*, 132–3. Captain McCarthy, a former officer in the Royal Engineers, who made mines for breaching walls, canister bombs and other devices. McCarthy would add two detonators to his mines, in case one failed.

and munitions. Crown forces were therefore forced to use motorised transport on "roads in a deplorable condition."[11] The troops were not "as mobile as if the railway service was effective."[12] This embargo was "a serious set-back to military operations" which had it been total and indefinite may have resulted in Crown forces withdrawal to the ports and coasts.[13] This illustrates how dependent Crown forces were on rail transportation. Had IRA concentrated attacks on the rail system, and a greater supply of explosive available for use against motorised vehicles, they may have seriously isolated their enemy.

When the railway strike ended, Crown forces returned to troop movements by rail, while continuing to rely heavily on motorised transport. 5th Division troops were to disperse themselves among civilian train passengers to deter attack[14] while military patrols foiled many IRA attempts to mine railway lines.[15]

Roads were rendered impassable by a number of different methods, for example IEDs cutting bridges. This reduced the number of possible reinforcement routes the IRA had to defend, and also funnelled British routine traffic on to predictable routes, increasing the probability of British troops driving into IRA ambushes. British tactics in response included increasing the number of vehicles in each patrols, "sending of an armoured car ahead to reconnoitre",[16] equipping vehicles with bridging materials,[17] and carrying civilian hostages on government vehicles to deter ambush.[18]

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[11] William Sheehan, *Hearts and Mines: the British 5th Division, Ireland, 1920–1922* (Wilton, Cork: Collins Press, 2009), 12.

[12] C. F. N. Macready, General, Commanding-in-Chief the Forces in Ireland. General Headquarters, Ireland. Parkgate Street, Dublin. 26th July 1920. "THE PRESENT MILITARY SITUATION IN IRELAND AND THE PROPOSED MILITARY POLICY DURING THE COMING WINTER. MEMORANDUM BY THE SECRETARY OF STATE FOR WAR" 6th August 1920. 2.

[13] General Sir Nevil Macready CIC of Military Forces in Ireland. Sir Nevil Mcready. *Annuals of an active life.* (London, 1924). ii and 472, and Sturgis diary 18 December 1920 PRO/30/59/3, quoted in Charles Townshend, "The Irish Railway strike of 1920: industrial action and civil resistance in the struggle for independence," *Irish Historical Studies* 21, no. 83 (March 1979): 265–282.

[14] Sheehan, *Hearts and Mines,* 224. Appendix XVII, "5th Division Instructions for Armed Parties on Trains in Ireland," (amended 19.3.21).

[15] General Officer Commanding-in-Chief, *Report by the General Commanding-In-Chief on the situation in Ireland for week ending 2nd July 1921.* CAB/24/126. Image Reference:0009. Patrol of 1/P.W. Volunteers disrupt IRA party which had laid 3 land mines. Troop train with 1/Kings Own Yorkshire Light Infantry stopped; General Officer Commanding-in-Chief, *Report by the General Officer Commanding-in-Chief on the situation in Ireland for week ending 9th July, 1921.* CAB/24/126. Image Reference:0035. "Between Killaloe and Ennis, Co. Clare, an attempt to blow up a train conveying an Auxiliary Coy. R.I.C. was frustrated by a Military patrol, which dispersed the rebels."

[16] Notes on Tipperary No. 2 Brigade Flying Column. O'Malley papers P17 A/12, as quoted in Charles Townshend, "The Irish Republican Army and the development of guerrilla warfare, 1916–21," 331.

[17] Sheehan *Hearts and Mines*, 75–76.

[18] Ernie O'Malley, *On Another Man's Wound* (Blackrock, Co Dublin, Ireland: Anvil Books, 2002),

The IRA understood the military value of these road cutting activities. However by the end of the war, the British Army had not grasped how their mobility and effectiveness had been impacted. Cutting roads was viewed more of an annoyance, than having any military objective.[19]

Early Innovation – Bomber and Eod Technical and Tactical Developments

Technical development

The Northern Ireland Troubles[20] saw the Provisional IRA (PIRA) designs of IEDs rapidly evolve from devices initiated by safety fuses[21], to a myriad of initiation methods, with British Forces responding with both technical advances and improvement in TTP employed. The rate of innovation on the part of the bomb designer and Explosive Ordnance Disposal (EOD) was initially high as both rapidly learned their trade, developing new techniques and tools. Northern Ireland became a laboratory for both designing and defeating IEDs. PIRA bomb designers and their Engineering Department were generally self taught, developing innovations without state support. There was much experimentation, with a high number of PIRA killed and injured during these experiments. It is unknown how many of these deaths were from experimentation, carelessness when they should have known better, C-IED activity, or sabotage of devices by British forces.

In efforts to prevent devices from being defused, PIRA bomb designers added anti-handling devices, mercury tilt and microswitches for anti-tilt or movement, light-sensitive fuses, and relays for collapsing circuits.[22] The anti-handling design is limited by the imagination of the bomb maker. Movement of the device could initiate its anti-handling mechanisms. Therefore EOD operators would secure a line to the device, with a hook and then could pull the line. This gave them the ability to remotely move the device to a preferred location. This tactic was hazardous as the line could break requiring another manual approach. On one such task in late

319; Peter Hart, ed., *British Intelligence in Ireland, 1920–21; The Final Reports* (Cork, Ireland: Cork University Press. 2002), 28.

19 Sheehan, *Hearts and Mines*, 75–76, 193.

20 Term given to define the violence associated with Northern Ireland, 1969–1998.

21 Shane Paul O'Doherty, *The Volunteer* (Durham, CT: Strategic Book Group, 2011), 49–52, 54–56. Safety fuses were not reliable when roughly handled. Bending it into angles, could break the inner core of gunpowder, a spot where the fuse was likely to burn out; G.I. Brown. *The Big Bang: A History of Explosives,* (Gloucestershire: Sutton Publishing, 2005), 176–178. Safety fuse is an old technology having been patented by William Bickford in 1831 (patent No. 6159).

22 Anti-handling devices as a concept were not new, having been part of the German air campaign in World War Two starting with the ZUS-40 anti withdrawal device. Fredric Boyce and Douglas Everett, *SOE: the scientific secrets* (Stroud, Gloucertershire, UK: The History Press, 2009), 50. British devices in World War Two also had anti-disturbance mechanism, such as the SOE Limpet mine Mark II.

1971, Lieutenant Colonel George Styles Senior Ammunition Technical Officer (ATO) Northern Ireland, observed a line break and the ATO manually reattach the line to the device. Lt Col Styles wondered why a man could be placed on the moon, yet there was no mechanical device to attach a hook and line on an IED. Styles prototyped the first EOD robot, "Little Willie", using a hospital wheelchair as the robot chassis.[23] This concept was brought to Lt. Col. Miller at the Fighting Vehicles Research and Development Establishment where Lt. Col. Styles laid out his requirements. The first operational EOD robot was deployed in a remarkably short 22 days. As the robot platform was a mechanised wheelbarrow purchased from Miller's local garden centre, the robot was given the name "Wheelbarrow." This was followed by a rapid evolution of Wheelbarrow, from the Mark I in March 1972 to the Mark V only fifteen months later.[24]

The memo park timer, a commercially available timer designed to remind car owners to feed parking meters, was employed by PIRA as part of the initiation mechanism. These timers provided two hours from arming to initiation of the device.[25] Coupled with anti-handling devices ATOs had a short time to defuse the bomb. A device was designed to quickly disrupt the bomb's initiation mechanism with an explosively propelled water jet, codenamed "pigstick." PIRA responded by placing their devices inside metal milk churns or beer kegs. EOD countered with the Flat Sword, an explosively driven blade, fired at the metal container to rip it open and disrupt its mechanism.[26]

PIRA also designed and deployed a number of improvised mortar and projected recoilless improvised grenade systems. These ranged from small multi tube Mark 6, the 158.75kg mortar bomb of the Mark 13, to the Mark 15 Barrack Busters, delivering 75 kilograms of explosive. British forces replied by the development of blast proof buildings, the "Mark 15 Cube".[27] Even British helicopters were not immune to attack by PIRA mortars. In 1994 Mark 15 mortars downing a Lynx helicopter at Crossmaglen, and an RAF Puma at Newtownhamilton.[28]

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23 Lieut. Colonel George Styles GC as told to Bob Perrin, *Bombs have no pity: My War Against Terrorism* (London: William Luscombe, 1975), 147–148.

24 Peter Birchall, *The Longest Walk: The World of Bomb Disposal* (London: Arms and Armour), 1997. 132, 182. Mark VII was introduced in 1975 and remained in service for the next twenty years.

25 A.R. Oppenheimer, *IRA, the Bombs and the Bullets; A History of Deadly Ingenuity* (Dublin: Irish Academic Press, 2010), 215.

26 Birchall, *The Longest Walk* , 136.

27 Chris Ryder, *A Special Kind of Courage: 321 EOD Squadron – Battling the Bombers* (London: Methuen. 2005), 256–7.

28 Tony Geraghty, *The Irish War: The Hidden Conflict between the IRA and British Intelligence* (Baltimore and London: The John Hopkins University Press, 2000), 199, 203. "IRA downs British Helicopter" *The Telegraph* July 13, 1994. Toby Harnden, *Bandit County: The IRA & South Armagh* (London: Hodder and Stoughton, 1999), 398.

In contrast Hezbollah had state assistance, and was able to avail of technology and techniques already proven in Northern Ireland. Prior to the 2003 invasion of Iraq, M-21 Directorate of the Iraqi Intelligence Service was involved in designing and making IEDs.[29] Irregular forces in Iraq and Afghanistan were able to develop expertise and adopt these technologies, with assistance from state actors, internet, CD-ROM, and multimedia sources.[30] Jihadists prepared a 71 page manual with colour photos and detailed diagrams on deploying IEDs, and provided observations on American military vulnerabilities and countermeasures.[31] The speed of adoption increased with the availability of multimedia technologies, and movement of individuals among different groups. A far cry from when Vladimer Jabotinsky had to travel to Ireland to learn from the IRA their experiences fighting the British Army during the War of Independence.[32]

Tactical development

In order to deliver a larger explosive device to a target, the PIRA introduced the Vehicle Borne IED (VBIED) in March 1972[33] with a five fold increase in the average size of IEDs.[34] A number of reasons caused the switch from man-handled bombs to car bombs. First, a car could carry more weight than an individual, allowing larger devices to be brought to the target. Secondly, a car bomb in an urban environment is difficult to detect, as it blends in with other parked cars. British troops viewed empty parked vehicles with deep suspicion resulting in innocent cars being destroyed in controlled explosions or by anti tank fire.

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29 "Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD" Volume I of III. 30 September 2004. 81. M21 The Al Ghafiqi Project existed to make explosive devices for the IIS; Scott Ritter, "Defining the resistance in Iraq – it's not foreign and it's well prepared: UN weapons inspector saw 'blueprints' for Monday's insurgency," *Christian Science Monitor,* 10 November 2003. www.csmonitor.com/2003/1110/p09s02-coop.html (accessed 19 June 2012). UN Arms inspector finds IED related documentation during an inspection of a compound in Abu Ghraib, June 1996.

30 Chris Hunter, Eight Lives Down: The story of a counter-terrorist bomb-disposal operator's tour in Iraq (London: Transworld Publishers, 2007), 36.

31 Noah Shachtman, "How Technology Almost Lost the War: In Iraq, the Critical Networks are Social – Not Electronic," Wired Magazine, no. 15.12 (27 November 2007). www.wired.com/politics/security/magazine/15-12/ff_futurewar?currentPage=all (accessed 15 April 2012); Rick Atkinson, "The single most effective weapon against our deployed forces," The Washington Post, 30 September 2012. www.argumentations.com/Argumentations/StoryDetail_5295.aspx (accessed 15 April 2012).

32 Briscoe, Robert with Alden Hatch, For the Life of Me (Boston and Toronto: Little, Brown and Company, 1958), 264.

33 Seán MacStiofáin, Revolutionary in Ireland (Edinburgh: Gordon Cremonesi, 1975), 252.

34 Author's analysis of the data for number and size of explosive devices in Northern Ireland. "Northern Ireland Annual Abstract of Statistics: RUC Chief Constable's Report", quoted in Bob Rowthorn and Naomi Wayne, Northern Ireland: The Political Economy of Conflict (Boulder, Colorado: Westview Press, 1988), Table A4.1, 177–8.

EOD operators also used 84mm anti-tank weapons with inert rounds to disrupt VBIEDs.[35]

Irregular forces observe the TTPs of conventional forces to learn how to counter their foes. Irregular forces are on their home turf, and conventional forces are often from outside the area of operations, rotated in for a temporary tour. Therefore the reactions of one unit based on their TTPs to an attack will not become institutional knowledge of the replacement unit. Irregular forces can predict the reaction of future units to a similar attack in the same area. At Narrow Water, Royal Marines had used a stonewalled gateway as their Incident Control Point (ICP) after they detected a Command Wire IED (CWIED).[36] Three years later, a PIRA attack on a three vehicle convoy of the Parachute Regiment began with the detonation of a concealed roadside RCIED destroying the third vehicle. An RF signal armed a timer secondary device detonating 30 minutes later. It was placed at the paratrooper's ICP, the same gateway used by the Royal Marines. The resulting explosion caused more casualties than the primary device, and almost downed a helicopter. Afghanistan Taliban applied similar tactics to their attacks. They planted secondary pressure plate Victim Operated IEDs (VOIED) at potential ICP or helicopter medevac locations, to cause further casualties.[37]

Civilian mobile phone networks provided a mechanism to initiate a device from greater distances. A call to a mobile phone IED could complete the circuit initiating the device. Mobile phones have limited applications. Attacks on fast moving mobile patrols are impractical, as the time spent in the kill zone is too short. Owing to several variables including the time required for signalling between the firer's phone and the device's phone, communicating with mobile network elements, which is dependent on the traffic load, a call could take 1 to 5 seconds to be completed.[38] This can be sufficient time for a vehicle to enter and exit a kill zone.[39] A tactic of linking several devices together in a daisy chain, to be detonated

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[35] Edgar O'Balance, Terror in Ireland: The heritage of hate (Novato, California : Presidio Press, 1981), 169; Bowyer J. Bell, The secret army: The IRA. New Brunswick, NJ: Transaction, 1997, 477. 3td Battalion, Parachute Regiment fired eight 84mm rounds in support of the RUC, during their tour in South Armagh, 15 April to 17 August 1976; Paul Wharton, First Light: Bomb disposal during the Ulster Campaign; How sacrifices went unrecognised (Gloucester: The Choir Press, 2009), 49.

[36] Harnden, Bandit County, 197–200; Mark Urban, Big Boys' Rules: The Secret Struggle against the IRA (Croydon, England: Faber and Faber, 1993), 85–6.

[37] Frank Ledwidge, Losing small wars: British military failure in Iraq and Afghanistan (New Haven: Yale University Press, 2011), 186; Toby Harnden, Dead Men Risen: The Welsh Guards and the defining story of Britain's war in Afghanistan (London: Quercus, 2011), 256.

[38] Email exchange between author and Ericsson Research 12 – 20 January 2012.

[39] The kill zone of a 155mm shell is approximately 50 metres when fired from a howitzer. Artillery munitions such as 105mm and 155mm shells have been used as the explosive and shrapnel component of IEDs, where these munitions are available. The radius of the kill zone is reduced when the shell is buried as part of an IED. At 60 kmph, and 3 metres from the IED, a 6.9 metre long Stryker vehicle takes 5.4 seconds to enter and exit the 99.8 metres it traverses of the kill zone.

together, increases the area of the kill zone, a tactic employed earlier by PIRA and the Lebanese Amal militia.[40]

PIRA introduced hand thrown drogue bombs, an armour piercing device with a drogue parachute to ensure the warhead impacted first.[41] To counter these devices, Dawson armour was added to Royal Ulster Constabulary (RUC) armoured vehicles. RUC vehicle patrols started to travel in pairs with a British Army armoured vehicle escort with two top cover sentries.[42] Countering drogue bombs increased the cost of patrols, tying up vehicles and troops.

Coupling explosively formed penetrators (EFPs) with passive infrared triggers allowed the EFP devices to be detonated with increased accuracy. EFPs proved to be more popular than artillery shell IEDs, as they are lighter, smaller[43], and as they are a projectile, they can be placed some distance from the target. Hezbollah used artificial landscape boulders to conceal their devices along roadsides.[44] Iraqi insurgents made rocks or kerb stones from cement or expanding foam to conceal their devices.[45] After contacts, Iraqis collected the discarded Coalition brass to make platter charges, as NATO brass was of a superior quality to that of Eastern Bloc ammunition.[46]

Commanders favour foot patrols because of their effectiveness in building trust with the local population. For force protection, troops were equipped with handheld mine detectors, small drones with cameras and explosive detector dogs. During the Afghan campaign, the dependence on contracted working dogs was so

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40 "Provisionals claim mine explosion," The Irish Times, 12 September 1972. "The mine was the biggest single bomb ever used in Northern Ireland, but explosions containing equal amounts of gelignite have occurred with separate bombs linked together."; Frank Callanan, "Independent Review into matters related to the deaths of Corporal Fintan Heneghan, Private Mannix Armstrong and Private Thomas Walsh on 21st March 1989, while serving with 'C' Coy, 64th Infantry Battalion, United Nations Interim Force in the Lebanon (UNIFIL)," Dublin: Department of Defence., 15 September 2011. 17–18. Two 155mm shells placed 40m apart, linked by cable to a firing point, planted in a stone wall between the village of Bra'Shit and the Water Towers (post 6–9B).

41 Steve Smith, 3–2–1 Bomb Gone: Fighting Terrorist Bombers in Northern Ireland (Stroud, Gloustershire: Sutton Publishing, 2006), 147.

42 Ryder, A special kind of courage, 237.

43 Thomas E Ricks, The Gamble: General David Petraeus and the American military adventure in Iraq, 2006–2008 (New York: Penguin Press, 2009), 172. EFP the size of large coffee cans.

44 Judith P. Harik, Hezbollah : the changing face of terrorism (New York: I. B. Tauris, 2004), 132.

45 Captain Kevin Ivison, Red One: A Bomb Disposal Expert on the Front Line (London: Phoenix, 2011), 141.

46 Acting Brigade Sergeant Major Joseph Joie, interview by author, McKinney, Texas, 6 May 2012, interview. Sgt. Maj. Joie was attached to Multi-National Transition Command – Iraq, when he served in Iraq 2004–5 and was in a convoy with Polish troops when hit by an IED. They speculated that a vehicle with troops doubled up from an earlier strike was the target. The IED struck another vehicle. Parts from a mobile phone were retrieved so it is believed that a mobile phone initiated the device.

great that they were shipped in groups of up to fourteen.[47] Battalion commanders had to sign off on dismounted operations that did not include dogs.[48]

Electronic warfare, from early use of radio to the crowded airwaves of Baghdad

Irregular forces adopted technologies from many civilian sources. With radio controlled model aircraft systems a new method of command detonation became available. The firer could be in a position away from the IED, within radio frequency (RF) signal range, and observe the target. The firer uses the transmitter to send a RF signal to the receiver which completes the firing circuit, detonating the explosives.

The PIRA first use of the radio control mechanism to initiate a Radio Controlled IED (RCIED) occurred in 1972. The initiator was adapted from a model aircraft remote control transmitter-receiver. The response of the British Army was for their EOD units to attempt to jam the frequency using service radios on EOD Humber armoured vehicles.[49] A specially designed electronic counter measure against the radio controlled devices was deployed to EOD units which had the ability to electronically scan and detect RCIED.[50]

The PIRA found model aircraft RF modules to be subject to too many spurious signals, endangering the IED handlers once the device was armed. Design changes were made to have certain pulses initiate the RCIED, and later tones were introduced to avoid jamming. PIRA used white band, taking the British more than a year before developing a successful countermeasure.[51]

When the PIRA found a gap in the electronic protective umbrella, the British Army scrambled to determine how their protective shield had been pierced. Security of device design was critical to the PIRA, while capturing an intact device was a goal of British Army EOD. With an electronic countermeasure successfully deployed, the PIRA RCIED threat would be neutralised until PIRA Engineering Department could develop a mechanism to overcome the electronic protection shield. Often it would take up to a year to do so, therefore security of radio control mechanisms was paramount.

Within a short time after the fall of Baghdad, Iraqi insurgents used radio control mechanisms from toys to initiate RCIEDs. A tactical response was to install the same type of transmitter in vehicles with the transmit button taped down, thereby continually transmitting the RF signal in order to prematurely

47 Associated Press, "Suit filed in deaths of 14 dogs," *Dallas Morning News,* 16 December 2011.

48 Tom Vanden Brook, "Pentagon expects IED hits to rise," *USA Today,* 13 May 2011. www.usatoday.com/news/military/2011-05-12-ieds-rise-in-afghanistan_n.htm (accessed 15 April 2012).

49 Steve Smith, *3–2–1 Bomb Gone,* 123; Tony Geraghty, *The Irish War*, 208.

50 Steve Smith, *3–2–1- Bomb Gone*. 208.

51 Urban, *Big Boy's Rules,* 113.

initiate the RCIEDs.[52] American formal jamming countermeasures stemmed from repurposing older devices to new uses. US Army soldiers were unsure of the effectiveness of the Warlock jammer. Warlock interfered with Special Forces Ultra High Frequency (UHF) radios. Soldiers disconnected Warlock, preferring to have intra-unit radio communications, rather than the dubious protection provided. With hot Iraqi summers, troops disliked equipment in vehicles, which added to the internal temperature without providing a proven service.[53]

Afghan Taliban employed CWIED and pressure plate VOIED against ISAF vehicles as they had RF jamming equipment capable of countering RCIEDs. RCIEDs were used against Afghan National Army and Afghan National Police, as their vehicles usually lacked RF jamming equipment.[54]

Technology advances within the sphere of radio communications have made the task of force protection through the use of RF jammers more difficult. In the early 1970s there were few RF sources in the urban areas of Northern Ireland. By the Iraq war, Coalition military contributed to an already crowded radio spectrum.[55]

Effects on Conventional Forces

<u>Force manoeuvre</u>

When IEDs threaten the occupants of armoured vehicles, road travel may reach a risk level unacceptable for routine mobile patrols. Conventional forces change their tactics as part of force protection. They travel at night, avoid potential ambush sites where possible, or permanently avoid dangerous routes.

British Army units in South Armagh responded to PIRA roadside bomb attacks by extensive use of helicopters, even for removing trash. Movement of military vehicles was banned in certain areas; unit commanders would not risk the lives of their troops just to make a statement on freedom of movement.[56]

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[52] Thomas E. Ricks, *Fiasco: The American Military Adventure in Iraq* (New York: Penguin Books, 2007), 218. Lt. Col. Steve Russell stationed in the Iraqi town of Tikrit, mounted one of these toy controllers in his Humvee, with the levers taped down. As all these toys utilized one frequency, this mechanism could initiate the IEDs with these toy controllers, when Lt. Col. Russell's signal was received, approximately one hundred metres from his Humvee.

[53] Joie, interview. Sgt. Maj. Joie described Warlock as "a piece of crap." It interfered with the UHF radios used for intra-unit communications. The soldiers cut the wires to Warlock, preferring to maintain radio communications with the rest of their unit, so that they could be reinforced if attacked, or go to their comrade's aid when needed. Even with air conditioning, internal vehicle temperatures could reach 140F (60C).

[54] Toby Harnden, *Dead Men Risen: The Welsh Guards and the defining story of Britain's war in Afghanistan* (London: Quercus, 2011), 234.

[55] Rick Anderson, "There was a two-year learning curve . . . and a lot of people died in those two years," *Washington Post,* 1 October 2007. www.washingtonpost.com/wp-dyn/content/article/2007/09/30/AR2007093001675.html?sid=ST2007092900754 (accessed 28 April 2012). "An XVIII Airborne Corps analysis showed that U.S. troops in Iraq were struggling to manage 82,000 radio frequencies, including jammers and communication channels."

[56] Frank Ledwidge, *Losing small wars*, 185–7; Paul Wharton, *First Light*, 41.

IEDs took on a central role with attacks on Israeli Defence Forces (IDF) in south Lebanon. To reduce the number of troop rotations and therefore opportunity for attack, IDF soldiers served lengthy tours without leave. Helicopters were used to ferry troops in and out of outposts.[57] This was a considerable change from the mid-1980s when South Lebanese Army (SLA) militia travelled in soft skinned Mercedes Benz cars.[58] The effectiveness of IEDs was so significant, that Israel lobbied the April Understanding Monitoring Group to have IEDs prohibited.[59]

In Iraq the US military increased airlift of supplies to reduce the number of their ground supply convoys in Iraq.[60] Some British elements refused to use inadequately protected Snatch armoured landrover, thus limiting their mobility and effectiveness.[61]

To avoid roadside emplaced IEDs, troops patrol from the centreline of roads disrupting civilian traffic. Civilians are cautious of being close to patrols, fearing being caught in IED blasts, thus alienating the civilian population. IEDs separated the conventional forces from the civilian population, and reduced the intelligence gathering capabilities of these patrols.[62]

<u>Transport and logistics</u>

In a war among people where combat can occur anywhere such as Iraq, all vehicles were subject to attack when outside fortified bases, therefore lightly protected armoured vehicles which were designed for rear area roles were targeted by irregular forces. These vehicles proved to be vulnerable to IED attacks. Between the limited number of available armoured vehicles, the need for mobile patrols and

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57 Nicholas Blanford, *Warriors of God: Inside Hezbollah's Thirty-Year Struggle Against Israel* (New York: Random House, 2011), 217. Augustus Richard Norton, "Hizballah and the Israeli withdrawal from Southern Lebanon," *Journal of Palestine Studies* 30, no. 1 (Autumn 2000): 30.

58 Author's observation of SLA militia in Southern Lebanon, Summer 1986.

59 Blanford, *Warriors of God,* 216.

60 Stewart M. Powell "Army Turning to Helicopters to cut roadside bomb deaths: Most operations conducted at night" *San Diego Union-Tribune*, June 17, 2007, www.signonsandiego.com/uniontrib/20070617/news_1n17choppers.html (accessed 2012-03-19).

61 Written evidence for the UK Iraq Enquiry from Kevin Hurley, Acting Commander, Metropolitan Police and Major Royal Military Police Territorial Army. www.iraqinquiry.org.uk/media/46159/hurley-statement-final.pdf (accessed 10 March 2012). "I also prohibited police officers from being transported in 'Snatch Landrovers.'"; Statement by Paul Robert Kernaghan, ACPO Lead in International Affairs [2000 – 2008] and Chief Constable of Hampshire Constabulary [1999 – 2008]. www.iraqinquiry.org.uk/media/46162/kernaghan-statement-final.pdf Statements to the UK's The Iraq Inquiry; Ivison, *Red One,* 162; Rayment, *Bomb Hunters,* 13; U.K. Defence Committee, "Thirteenth Report", http://www.publications.parliament.uk/pa/cm200506/cmselect/cmdfence/1241/124102.htm (accessed 8 July 2012). Section 3 Challenges Facing UK Troops, Armoured vehicles, paragraphs 51–59; James Sturcke, "Snatch Land Rovers: the 'mobile coffins' of the British army," *The Guardian,* (1 November 2008). (accessed 8 July 2012).

62 David Kilcullen. "Counterinsurgency Redux,*" Survival* 48, no.4 (Winter 2006-07): 118–9.

the large logistical footprint, coalition forces maintained a significant presence on Iraqi roads, providing irregular forces with a ready supply of targets.

During the Irish War of Independence Crown forces added extra protection in the form of steel plate to their Crossley Tender lorries. Applying the armour was conducted in Britain, Belfast, and the railway works at Inchicore, Dublin, which had uparmoured vehicles during the 1916 Rising.[63] These up-armoured vehicles lacked a top-deck armour affording an opportunity for the IRA to throw or drop bombs into of these vehicles[64] which became "almost a daily occurrence."[65] To protect against these attacks, steel wire mesh was added in an inverted V form, so that bombs would bounce harmlessly away from the vehicle.[66] Hooks were added to IRA bombs to be entangled in the wire mesh. To counter these hooked bombs, the wire mesh was supplemented with a canvas covering. This also provided the vehicle occupants with some protection from the Irish weather,[67] but would have impaired observation. The 5th Division instructed that the tarpaulin to be rolled up during patrols to allow the "look-outs" to use their rifles without delay.[68]

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[63] W. H. Kautt, *Ambushes and Armour: The Irish Rebellion 1919–1921* (Dublin: Irish Academic Press, 2010), 70.

[64] James Durney, "How Aungier Street / Camden Street became known as 'the Dardanelles'," *The Irish Sword* 27, no 108 (Summer 2010): 249–250.

[65] General Officer Commanding-in-Chief, *Report by the General Officer Commanding-In-Chief on the situation in Ireland for the week ending February 5th, 1921.* CAB/24/119. 1. "There has been increased activity on the part of the rebels during the past week as anticipated in my last report. It is most marked in Dublin City where the bombing of Military or Police vehicles is now almost of daily occurrence."

[66] 5th Division Standing Orders for Armed Parties moving by Lorry, and for Lorry Convoy. Paragraph 8. William Sheehan *Hearts and Mines,* 191; As told by participants to Patrick Lynch. "Landmines used against Lorry-borne Auxiliaries at Rathcoole: Cork No. 2 Brigade, 16 June 1921". *With the IRA in the Fight for Freedom 1919 to the Truce* (Cork: Mercier Press, 2010), 428. ADRIC stationed in Millstreet, County Cork, Summer 1921 were equipped with armoured tenders "were covered with steel wire mesh to ward off bombs and grenades" and mounted machine guns; Robert Briscoe, *For the Life of Me*, 63. "We fought back. One way was ambushing the lorries on country roads or blowing them up with mines. Another was tossing Mills bombs into them from the windows under which they passed. This was so effective that tents of wire netting were put over the open lorries, which we often derisively called chicken coops." During the War of Independence, British military grenades, were often referred to as bombs, such as the Mills bomb. Sometimes the grenades cast in IRA foundries were referred to a Mills grenades. Therefore it is difficult to determine if the bombs used on the vehicles initially were Mills bombs, improvised grenades (a form of IED) or other bomb; Kerry No. 2 to Michael Collins, undated, 1920, Collins Papers (MA A/0495/I) quoted in Kautt, *Ambushes and Armour,* 164; Ernie O'Malley, *On Another Man's Wound*, 169. Made improvised grenades from tin cans packed with scrap iron around a stick of gelignite; I.O. [Cecil J. C. Street] *The Administration of Ireland, 1920.* London: Philip Allan, 1921. 201–203.

[67] David Dunne, *Armoured and Heavy Vehicles of the RUC 1922–2001* (Hersham, Surrey: Ian Allan, 2007), 14.

[68] Sheehan, *Hearts and Mines*, 191. "5th Division Standing orders for Armed Parties moving by Lorry, and for Lorry convoy." Col. W. Maxwell-Scott, General Staff, 5th Division, Curragh Camp, 20 June 1921.

In Iraq, uparmour kits were not readily available in adequate numbers. US troops improvised, creating "Hillbilly armour" with whatever materials were locally available. This was not the first time for US troops to install improvised armour on their vehicles. During the Vietnam war the 8th Transportation Group augmented security of convoys with locally sourced scrap steel placed on the sides of 2½ ton trucks along with addition of machine guns, turning these trucks into gun trucks to protect the cargo trucks.[69] Vietnam style gun trucks were sent to Iraq and Afghanistan, where some described them as being "something of a grenade basket", reminiscent of British Army experience in Dublin eighty five years earlier.[70]

Protection of vehicles by improvised armour, kits or production upgrades, had an impact of adding significantly to the weight of the vehicle. This reduced the fuel efficiency requiring more fuel to be supplied.[71] For operations in Iraq, this meant more fuel convoys, which translated into more 'movements for contact'. Fuel supply convoys were especially attractive targets as transportation troops and their military police escorts in supply convoys were not frontline combat troops, and did not react to ambushes as aggressively or effectively as combat troops.[72] Supply vehicles were generally thinly armoured or had improvised armour around the cabs thus presenting a soft target.[73] Destroying an opponent's fuel supply, increases their operational costs, and reduces available fuel. Less fuel for a mechanised force reduces its operational effectiveness, resulting in an easing of pressure on irregular forces. An 8,000 US gallon capacity fuel truck had the capacity to fill 150 Stryker vehicles with a combined range of almost 47,000 miles (75,600 km), making fuel convoys attractive targets for irregular forces. Fuel convoys constituted approximately seventy percent of vehicles on supply routes.[74]

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69 Paul S. Gardiner. "Gun Trucks: Genuine Examples of American Ingenuity," *Army Logistician* (July–August 2003): 34–35.

70 Rick Anderson, "The IED problem is getting out of control. We've got to stop the bleeding," *Washington Post,* 30 September 2007. www.washingtonpost.com/wp-dyn/content/article/2007/09/29/AR2007092900751.html (accessed 28 April 2012). "Some soldiers sang the truck's praises, while others found it top-heavy and 'something of a grenade basket', according to a senior commander in the 10th Mountain Division."

71 Dr. Daniel Gouré and Kenneth A. Steadman, *Medium Armor and the Transformation of the U.S. Military* (Arlington, VA: Lexington Institute, September 01, 2004), 9–10. Medium armoured vehicles fuel consumption is high. The Infantry Carrier Vehicle variant of the Stryker has a range of 312 miles on 53 US gallons (5.89 m.p.g., 502 km on 200 litres, 2.51 km/litre, 0.398 litre/km). This is before the additional 3mm of armour to withstand RPG-7 strikes; U.S. Department of Defense, *Program Acquisition Costs by Weapons Systems,* February 2010. 3–7.

72 Ahmed S. Hashim, *Insurgency and Counter-Insurgency in Iraq* (Ithica, New York: Cornell University Press, 2006), 190.

73 Andrew F. Krepinevich and Dakota L. Wood, *Of IEDs and MRAPs: Force Protection in Complex Irregular Operations*, Centre for Strategic and Budgetary Assessments, 2007, x.

74 Major Vincent C. Nwafor, "The Changing Face of Fuel Management," *Army Logistician* 39, no. 2 (March–April 2007): 24–29. Fuel was trucked from Kuwait to Cedar fuel farms in 8,000 US gallon fuel tankers by Jassim Transport and Stevedoring Company. KBR also used 8,000 US gal-

Morale of conventional forces

For military convoys to travel safely, routes were swept for IEDs, which slowed down convoys.[75] These delays increased the probability of being ambushed, adding to the soldiers' stress. Troops were equipped with metal detectors. Sweeping for buried IEDs became the norm to ensure the way was clear for dismounted patrols. Afghan Taliban forces countered this tactic by introducing low or no metal pressure plate IEDs, using carbon rods from consumer batteries as the conducting material.[76] Such IEDs proved difficult for experienced operators to detect.[77] Low or no metal IEDs meant that experienced metal detector operators could miss detecting an IED, leaving their comrades exposed to attack. This reduced confidence of troops in their route clearance and IED detection capabilities. Unit commanders were concerned about the psychological effect of low metal devices on the troops. With the uncertainty of whether there would be an IED strike, the sudden violence of the strike, and the extent of resulting injuries, troops were becoming "IED-shy".[78] The relentless daily IED attacks and loss of comrades drove some soldiers to suicide.[79]

Genitourinary (GU) injuries suffered by foot patrols from upward blast IEDs has had a negative effect on morale. While such injuries had not been publicised, as it might have had a negative effect on recruitment,[80] the possibility of such injuries were well known among serving troops. Some soldiers dealt better with losing limbs than suffering GU injuries.[81] With the change in direction in counterinsurgency, troops were expected to patrol on foot where possible[82] thereby

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lon fuel tankers; Lt. General William G. Pagonis with Jeffery L. Cruikshank, *Moving Mountains: Lessons in Leadership and Logistics from the Gulf War* (Boston: Harvard Business School Press, 1992), 148. Capacity of most US Army fuel tankers is 5,000 US gallons.

75 Harnden, *Dead Men Risen*, 227.

76 Rayment, *Bomb Hunter*, 59–60.

77 Harnden, *Dean Men Risen,* 227–9, 246–7, 287–8. Examples of low or no metal IED strikes in an area just declared safe by search teams with metal detectors.

78 Andrew Johnson, "Taliban make 'undetectable' bombs out of wood," *The Independent,* 10 January 2010. www.independent.co.uk/news/world/asia/taliban-make-undetectable-bombs-out-of-wood-1863353.html (accessed 15 April 2012).

79 Kelly Kennedy, "The tragic story of 1st Sgt. Jeff McKinney," *Military News* 8 June 2008. http://www.militarytimes.com/news/2008/06/military_suicide_060808w/ (accessed 7 July 2012). On the 11th of July 2007, 1st Sgt. Jeffery McKinney, Alpha Company, 1st Battalion, 26th Infantry Regiment, 2nd Brigade Combat Team, 1st Infantry Division, commits suicide on patrol after losing five men on 21 June 2007, when a deep buried IED destroyed their Bradley fighting vehicle.

80 Clancy Sigal, "The US isn't facing up to the literal emasculation of its soldiers," *The Guardian,* 19 April 2011. www.guardian.co.uk/commentisfree.cifamerica/2011/apr/19/genital-injuries-taliban-ieds (accessed 18 June 2012).

81 Christopher Torchia, "Groin-injury threat worries frontline Marines," *Marine Corps Times* (21 September 2011) www.marinecorpstimes.com/news/2011/09/ap-groin-injury-threat-worries-front-line-marines-092111/ (accessed 18 June 2012).

82 David H. Petraeus, Commander, International Security Assistance Force/United States

increasing the exposure to IEDs. This resulted in an "increased rate [of] double and triple amputees…[which] took their toll on unit morale."[83]

Conventional forces Response – Tactics and Training

Conventional forces's tactics to counter effects of IEDs

Initially in Iraq, snipers were positioned overlooking likely IED emplacement sites. OH-58 Kiowa reconnaissance helicopters patrolled roads at night, looking for IED emplacement teams.[84] US troops also employed a bait tactic to counter the IED networks. A bait convoy would be sent out form their base to draw out IED team. Once IED teams were located and identified drone aircraft would track them, and signal intelligence teams monitor their communications. A larger force would then spring the trap on these IED teams.[85] This latter tactic had the advantage of catching more members of the IED network, not just the emplanters.

When a mobile US patrol detected an IED which they could not neutralise, the location was marked on the Blue Force Tracker to warn other units of the danger. Troops would attempt to neutralise IEDs with an AT-4 round or 0.5 calibre MG, or air dropped JDAM.[86]

US troops were instructed to apply the combat lock in armoured Humvees. Troops disregarded this instruction, as they were concerned that following an IED strike which could twist metal, a stuck door and combat lock mechanism might trap them in a burning vehicle.[87]

Many of the roads in Afghanistan were unpaved dirt roads,[88] with the hard

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Forces – Afghanistan. *COMISAF's Counterinsurgency Guidance,* 27 July 2010. http://images.defensetech.org/wp-content/uploads//2010/07/COMISAF_COIN_Guidance_Jul_2010.pdf (accessed 20 June 2012).

83 Dismounted Complex Blast Injury Task Force, *Dismounted Complex Blast Injury: Report of the Army Dismounted Complex Blast Injury Task Force,* 18 June 2011, 1.

84 Ricks, *Fiasco,* 218. Snipers used to counter IED teams; David Kilcullen, "Counterinsurgency Redux," 119. Snipers proved more effective than classical-style patrolling in Iraq and Afghanistan; Joie, interview. Snipers and OH-58s operated at night, and killed those they found digging to plant IEDs.

85 Evan Thomas, "A New Way of War," *Newsweek Magazine*, 15 August 2007. www.thedailybeast.com/newsweek/2007/08/15/a-new-way-of-war.html (accessed 20 March 2012).

86 Joie, interview. AT-4 US designation for Saab Bofors Dynamics 84 mm anti-tank weapon. Also used by British Army against suspect VBIEDs in Northern Ireland. JDAM – Joint Direct Attack Munition guidance kit for aerial delivered bombs.

87 Joie, interview; David C. Ake, "Why Troops Love, and Sometimes Hate, the MRAP," *National Defense* (September 2011). http://www.nationaldefensemagazine.org/archive/2011/September/Pages/WhyTroopsLove,andSometimesHate,theMRAP.aspx?PF=1 (accessed 25 May 2012). Described the need to get out of a hit vehicle before ammunition begins to cook off from the heat, or vehicle completely catches fire. Doors and ramps not operable owing to the IED strike.

88 Carter Malkasian and Gerald Meyerle, *Provincial Reconstruction Teams: How do we know they work?* (Carlisle, PA: Strategic Studies Institute, U.S. Army War College, March 2009), 3.

top routes limited to the vicinity of the largest cities. Emplacement of IEDs in dirt roads is quick, and the Taliban could "seed IEDs like vegetables."[89] A hard top road created a significant problem for irregular forces, as it was difficult to place and conceal an IED, which reduced the number of roadside IEDs.[90] Such problems faced the PIRA, and their solution was to place IEDs capable of destroying armoured vehicles in culverts.[91] Lebanese, Iraqi and Afghanistan irregular forces followed suit.[92]

To counter culvert devices, culvert denial systems were created. Initially in Afghanistan Hesco barriers were used, but they blocked passage of water which could result in unintentional flooding. Hesco barriers were replaced by home made or commercial systems. It is surprising that some units in 2011 were unaware of the availability of commercial systems, having resorted to making their own culvert denial systems.

<u>Necessity to train specialists, new roles for EOD</u>

In asymmetric warfare, where there is no continuous combat line, introduction of the IED has cast EOD units in non-traditional roles. This is most evidenced by EOD tasks such as route clearance. Any route clearance operation conducted in an area with irregular forces with IED capability is a temporary measure. Irregular forces can return to an unsecured route and plant new IEDs, sometimes doing so during a multi-day route clearance operation itself.

Many EOD units neutralise IEDs by detonation, utilising clearance charges; deliberately detonating the device and then collecting any surviving evidence of the IED design. This is an EOD philosophy based on force protection. When an EOD unit is on task, the cordon troops providing protection to the EOD team is exposed to attack. EOD teams are very cognisant of risks to their comrades and will work to neutralise IEDs in the safest and most expeditious manner possible. US Navy EOD teams have a preference for neutralisation, unlike the British Army philosophy of exploitation.[93]

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89 Harnden, *Dead Men Risen*, 234. Lt. Col. Gareth Bex, Commanding Officer 11 EOD Regiment, Royal Logistics Corps.

90 David Kilcullen, "Taliban and Counter-insurgency in Kunar", ed. Antonio Giustozzi, *Decoding the New Taliban: Insights from the Afghan Field,* (New York: Columbia University Press, 2009), 242.

91 "Troops defuse bomb in hotel," *The Irish Times,* 23 October 1971. British Army defused a 50 pound (22.7kg) of explosive in a milk churn hidden in a culvert near Belcoo, Co. Fermanagh; David McKittrick. "Landmine kills five soldiers in Armagh," *The Irish Times,* 20 May 1981. Ten ton Saracen armoured car "disintegrated when the bomb – estimated at between 600 lb and 1,000 lb [272–453kg] – in a culvert underneath it".

92 Scheherezade Faramarzi, "Civilians constitute real resistance," *The Irish Times,* 23 January 1985.

93 Harnden, *Dead Men Risen,* 543–4; Rayment, *Bomb Hunter*, 160–1; APOBS – Anti-Personnel Obstacle Breaching System, a rocket fired mine clearance device.

The British philosophy has been to defuse IEDs to gain intelligence for Weapons Intelligence Section in order to defeat the bomb making organisation.[94] By defusing an IED without detonating the device, the components can be examined to identify sources of supply, identify the bomb makers, or help in developing countermeasures. In Afghanistan, with the high casualty rate among British ATOs, and the high number of IEDs overwhelming ATOs, a decision was taken to change tactics from exploitation to detonation in situ.[95]

As IEDs are increasingly deployed against conventional forces, the C-IED training spreads from EOD and Engineering units, to all troops. From 1972, every British Army infantry unit about to be deployed in Northern Ireland was required to train search teams to recognise IEDs.[96]

Conclusion

This paper describes a history of the IED, starting with its adoption by the IRA during the Irish war of independence in the early 1920s, to its near domination of irregular warfare today. The circumstances of its origin foreshadowed its use since as the weapon of the weak, whether fighting for independence, or against the forces of an occupying power.

The use of IEDs, especially the more sophisticated ones of recent years, has had a tremendous influence on low-intensity warfare. Conventional forces have been forced to adapt their tactics and, especially, to expend vast resources on protecting logistic and administrative transport movement, even in rear areas.

The PIRA and British EOD quickly innovated technology in the early years of the Troubles. Many lives were lost as each side learned their trade, achieving world leading capabilities by the late 1970s. With minimal state sponsorship, the PIRA bomb makers were often self-taught. Many of the designs and developments of IED weapons were created by the PIRA Engineering Department. Civilian technology was repurposed to initiate devices in many innovative ways. Through the three decades of the conflict, many technologies were tried, and perfected or discarded. British Army EOD teams and back room boffins created new technology, or repurposed other technologies, both military and civilian. Owing to the constant presence of British forces, PIRA employed IEDs in complex ambushes, developing tactics which aimed for a high success rate, rather then a high volume of attacks. Such ambushes limited the mobility of British forces in certain areas of Northern Ireland, where contesting the PIRA was not worth the risks of IED caused casualties.

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94 Ivison, *Red One,* 13.

95 Sean Rayment, "Commanders to change bomb disposal tactics," *The Independent,* (12 February 2011). http://www.telegraph.co.uk/news/uknews/defence/8320560/Commanders-to-change-bomb-disposal-tactics.html (accessed 7 July 2012).

96 Ryder, *A special kind of courage*, 81.

Hezbollah, with Iranian state support, further developed tactics limiting IDF troop movements in Southern Lebanon. By the time of the Iraq and Afghanistan conflicts, with the readily available material, IEDs were deployed on an industrial level. PIRA sophistication was out, while simplicity and volume were the order of the day.

In combating IEDs, conventional forces have spent billions of dollars on Mine Resistant Ambush Protected (MRAP) vehicles, detection systems, and medical tools and care. IEDs made their mark on the battlefield, having a significant psychological impact on troops.

IEDs have been significant weapon for irregular forces with the ability to give conventional forces pause. As irregular forces have developed their devices, it is no surprise that IEDs have been found extensively on the battlefields of recent small wars.

Hong-guk OH (South Korea)
The Development of ROK Forces' Military Technology and the Vietnam War

1. Outline of the Vietnam War
2. The 2nd Vietnam War and Development of Weapon Systems
3. ROK Forces' Involvement and Progression
4. Peace Keeping Operations of ROK Forces
5. Conclusion

1. Outline of the Vietnam War

1) *Relation between War and Military Science Technology*

The development of mankind is directly corresponds to the history of war and the evolution of war shares a path with innovation of military science technology. These developments, along with evolution and innovation are bothers of the same womb – military science technology. Military science technology is derived from a military doctrine including strategy and tactics. The outbreak of war is a consequence of a complicated mechanism of technology, doctrine, strategy, tactics and their influences and interferences.

During the Vietnam War, each side tried to gain the upper hand by using up-to-date science technology, doctrine, strategy, and tactics. These dynamics influenced and changed the face of warfare those days.

As part of the Alliance, ROK forces were engaged in hot fighting and had to adapt to the rapid changes in the face of war. Consequently, the ROK Forces successfully accepted and assimilated the changes which became an important turning point of the modernization of the ROK forces.

I will further explore the details of my argument with specific facts.

2) *An Outline of The Vietnam War*

In the 19th Century, Western Empires advanced to Asia to pursue their colonial interests. The tragedy for Vietnam began in September 1958 with the French invasion into Danang. France extended its colonial territory further to Cambodia and Laos to establish the Colony of French Indochina Union. The Vietnamese continued their efforts to free themselves from French colonial control over their nation.

Their first fight with the French took place in 1945 when they violently responded to tge French plan to re-occupy Vietnam with Japanese defeated in the 2nd World War. Ho Chi Minh's Democratic Republic of Vietnam began their fight with the French at North of the 16th parallel. North Vietnam put an end to the 8-year war as a victory in Dien Bien Phu in 1954; they finally defeated the French forces from Vietnam. Unfortunately, clauses of the Geneva Accords split Vietnam into two halves along the 17th parallel.

General elections held in South Vietnam in 1955 finalized the division of the North and South Vietnams. The South regime's dictatorship struggled to win people's support and met resistance.

The Second Vietnam War was sparked along with the North Vietnamese Amy and National Liberation. The war between the two Vietnams became a part of the Cold War driven by two big antithetical ideologies. The U.S. army intervened in Vietnam as part of the Gulf of Tonkin Resolution. In January 1973, peace talks in Paris directed all American and its ally troops to pull out.

The third Vietnam War ended with the North Vietnamese Amy's final offensive into Saigon, which fell in 1975 after a long era of disorganization in South Vietnam's politics. However, after that, the Socialist Vietnam continued to wage war, with Cambodia in 1978 and with China in 1979. The war that lasted 35 years cost the lives of two million people and left irreparable damage to property and infrastructure.

Nonetheless, Ho Chi Minh completed the re-unification of North and South Vietnams. It also signified the end of a prolonged war for 116 years against foreign invasion from China, Japan, France and United States.

1. The 2nd Vietnam War and Development of Weapon Systems

1) *The Characteristics of the Vietnam War*

Guerilla tactics and counter-insurgency operations were notable characteristics of the Vietnam war. It was very different from the 2nd World War as well as the Korean War. There was no offensive to defensive battles and of course, no linear and formative formations.

That is the reason why scholars name the Vietnam War a non-symmetric war. It was an eccentric phenomenon – it looked like a duel of M-16 vs AK-47 rifles, of Helicopter vs Bicycle, B-52 Bombers vs SAM missiles, and of aircraft carriers vs small junks at water. Looking at the war fighting from a different angle, it was a microcosm of long-war between industrial superiority and human will.

Here, I want to bring your attention to the origin of guerilla warfare and its transfiguration. The term 'Guerilla' comes from Spanish roots. Etymologically, 'guerra' means 'war' and 'illa' means 'little'. Literally, 'Guerilla' is a war or little wars. For instance, when Napoleon invaded Spain in 1808, armed civilians and unconventional militias used unique tactics using thick forest and unfavorable terrain to lead a victory against French Army. During the 1st World War, Lawrence with the United Arabic Forces led military forces against the Turkish in 1917. He crossed the desert of Nepud, launched a surprise attack from behind Akaba. In

Asia, guerrilla warfare was the method used in the Great March by Communist Mao's Kuomintang militia of China in 1934. They marched up to 12,000 km, which equals to one quarter of the circumference of the Earth. North Koreans have been using various types of guerrilla tactics such as an Underground Infiltration Tunnels. Recently, they were caught using the Clandestine Torpedo illegally to attack the ROK vessel Cheonan.

2) *Progression of War and the advent of New Weapon Systems*

When the U.S. Marines landed in DaNang on the 8th of March, 1965, they were equipped only with M-16s and bullet-proof vests manufactured in 1963. The war between the allied forces carrying the latest equipment and North Vietnam forces with primitive weapons unfolded like the following: While the UH-1H chopper could maneuver 200 kms per hour, the Vietcongs moved thousands of miles on bicycles through the jungle. Against B-52's strategic bombing flying from Guam and Okinawa, Japan, the NLF invented I.E.D.s using the casing of the bomb shells.

While U.S. aircraft carrier Rainger took an absolute maritime superiority in the Southern China Sea, the NLF utilized small junk boats to transport their arms and materials around Cambodia traveling thousands of miles on sea.

As the war continued, attack helicopters like AH-1 Cobra and AC-47D were introduced. Also the Ho Chi Minh route later on became a field on which to experiment newly invented weaponry such as the SID(Seismic Intrusion Detector) and a new explosive called the Cheeseburger. Drones, now a prominent method of warfare in the war in Afghanistan, were first tested here in 1970, being called the 'Firebee' at that time. To counter this, the North Vietnamese and the NLF resorted to only primal forms of technology.

Thus, using the casing debris from American explosives, the NLF constructed booby-traps to install in various places. Their most advanced forms of technology were RPG-7 and SAM-2 missiles. Their methods at that time could be understood by looking at the remnants of Guchi tunnels in the North-West part of Vietnam. To the world's surprise, they came out victorious in a battle between bicycles and modern planes.

3. ROK Forces' Involvement and Progression

1) *ROK Forces and Major Operations*

ROK forces responded to the US and South Vietnamese government's request for help to fight in September of 1964 to March 1973. It was in all an involvement that lasted 8 and a half years. The earliest forms of aid went in the form of MASH including doctors and nursing officers and 10 Tae-Kwon-Do instructors.

By February 1965, ROK added another 2,000 personnel to form the Korean Military Support Group including Engineer BNs and Security BNs. The Gulf of Tonking incident worsened the situation triggered the further deployment of combat units in August 1965.

As contingency planning, some 50,000 personnel group composed of the Tiger division, 9th Division, and a ROK Marine Corps Brigade was sent to Vietnam. Navy and Air force supplements were additionally deployed to support ground level operation. Also, the units of ROK forces employed civil affair-PSYOPS to separate guerrillas from civilians considering the characteristics of war. They conducted operations within AO mostly along Road No. 1, heavily focused on their company operational bases.

ROK forces' rule 101 translated to 'Separation – Interception – Destroy,' which differed from the US Army's 'Search and Destroy' tactics. Rather, they followed the more detailed code of Separation, Interception and Destroy. This concept of operation succeeded in minimizing the local people's bilateral damage also in the overall success of operation.

The main areas of success were in the Duc Co and Tra Binh Dong battles. The units of ROK Forces won many battles in Operation "MangHo (Furious Tiger)" and Operation "Ojakkyo (Brigde)". Finally, the units of ROK Forces retreated from the Vietman in accordance to the Paris Peace Treaty in March of 1973.

Let me deviate from the main topic to ask some questions about origin of new inventions?

- Where did canned food come from?
- French invented it to keep food for a longer period in Napoleon's war
- How did we come up with women's high-heels?
- It was invented for ladies to not to step on excretion on the road
- When was the first body armor invented?
- It was invented during an ancient Korean battle to defeat the French in 1866.

2) *Development of ROK Forces*

Through the experience of the main operations from the Korean and Vietnam Wars, the ROK forces made great developments in its military weapon system and technology. It was an unprecedented phenomenon for the last 40 years at that time. The Korean forces began with the M-1 rifles provided by the US military aid in 1967. Thanks to that exposure, since 1979, we have been mass producing K-1, K-2 rifles.

The 3rd generation Tank, K2 Black Panther and Infantry Fighting Vehicle K21 are main equipments of ground level warfare. K9 Thunder, a self-propelled howitzer has 60 kms of maximum shooting range. Also, we have the world's first class self-propelled anti-aircraft weapon systems like the K30 Biho, known as the flying tiger and K263A1 Chun-ma, known as Pegasus.

The UH-1H that used to transfer patient bodies began to be produced within our borders. The C-54D that we received from the USAF later developed to T-50 high-level trainer planes through Korea's domestic technological input. We now produce the "Yi Sun-Shin" a 4,500-ton class KDX-2, along with submarines and supply ships for aircraft carriers.

In the 1990s, Korea joined the United Nations and extended its role to international peace keeping operations. In the 2000s, Korea participated in the "War on Terror." In support of these moves were Korean Institute for Science and Technology(KIST) and Korea Institute for Defense Analysis(KIDA). When the development of military science technology is employed in a way suitable to human life, it can complement a more comfortable life.

4. Peace Keeping Operations of ROK Forces

Since its joining the UN in 1991, Korea has been actively involved in world-wide peace keeping operation missions. In 1993 to Somalia and in 1995 to Angola, Korea deployed engineer troops in aid. In 1994, a MASH group was sent to Western Sahara to help the UN's election monitoring group. In 1999, Korea sent PKF to bring civic order and peace to East Timor. In 2004, the Zaytun division was sent to Iraq for reconstruction efforts. To continue its effort, Korea sent medical aid, engineering support, and PRT troops to help Afghanistan people. In 2007, to Lebanon and in 2010 to Haiti's earthquake disaster, Korea yet again sent more military aid.

Also, the Korean navy is carrying out a mission to defeat pirates in Somalia. Not only this, Korean military observers participate in various peace keeping operations in over 17 areas of 15 countries.

Such efforts were derived from the keen awareness of the importance of peace through the experience Koreans learned from the Vietnam and Korean wars. Now, the Korean military forces have well played their part as a global power completing multiple missions, as well as keeping peace on Korean peninsula.

5. Conclusion

War has been inevitable in the history of humanity. Also as many students say, 'the meaning of peace is just an absence of war'. The history of war mirrors the history of mankind of war.

The key to military victory does not come from massive advanced weapon systems but rather from a troop's motivation to carry out a war to a victory. We just reviewed the development of weapon systems and the progression of the Korean involvement in the Vietnam war. The technological developments we have seen for a military necessity have made positive impact on the comfort and safety for the human race. Today, nuclear energies are harvested safely to increase human welfare.

However, we can argue that technological advancements still do not measure up to the power of human will. The latest weapon systems can lead to loss of too many innocent lives. Therefore, we need to invest our efforts to develop military science to work for peace and the betterment of mankind. Now, I would like to invite all of you to the Pyeong Chang Winter Olympic Games, which will be held in Korea in 2018 as it opens a new horizon in the future.

Lt. Col. Italian Carabinieri Flavio Carbone Ph. D. (Italy) Carabinieri technology evolution during Sixties in the fight against criminality

Foreword

The Italian situation during sixties was very interesting from an historical point of view. According with a new deal in economic situation in Italy there was a strong movement of people from the South to the North with the idea to find a more valuable job in the factories because of the economic growth. In this big transformation of the Italian society with a new lifestyle, the Carabinieri General Headquarters started to evaluate new technologies to support the day-by-day Carabinieri action in the criminality prevention and repression action.

The Carabinieri Corps, founded in the Kingdom of Sardinia on 13 July 1814 during the European Restoration period, after the Unification of Italy reached after three Independence wars between 1859 and 1866 and 1870 Rome campaign, extended its area of responsibility to the whole new Kingdom of Italy from the Alps to the small island of Pantelleria in the middle of the Mediterranean Sea.

After about a century from State Unification, two World War Campaigns, 20 years long dictatorship of Mussolini, the so called "co-belligerence period", with the referendum of 2 June 1946, Italian citizens decided to turn the constitutional state organization from monarchy to republic. So the new State maintained the old structures coming from a long period of life, like as Railways, post service, municipalities and, of course the Italian Carabinieri.

The military reconstruction of Italy

After the Second World War Italy suffered heavy restrictions arising from the implementation of the peace treaty of 10 February 1947 signed by Allied Powers. In particular, the Army, of which Carabinieri was a component until 2000, had suffered severe cuts and downsizing along with other armed forces. In addition to such other limitations were added, among which, the high deficit and economic orientation of a political nature to look to the defence system by delegating other countries[1]. This situation had a change with the membership of the Washington Treaty in April 1949 by which it established the NATO (North Atlantic Treaty Organization), because the will of De Gasperi Cabinet. Italy was in the Alliance as a founding member.

[1] Enrico Pino, L'Esercito e la ripresa in Commissione Italiana di Storia Militare, L'Italia nel nuovo quadro internazionale e la ripresa (1947–1956) (Gaeta, Stabilimento Grafico Militare 2000) 15–21.

Following this there was an increase in defence budgets for the reconstruction of the Army, which had a further boost with the bilateral agreements signed with the USA on 27 January 1950 or the mutual defence assistance (MAP as Military Assistance Program) through which materials excess the limit set by the peace agreement would be provided especially from the USA. Moreover, during this period caused great concern the arms race by countries of the so-called “Warsaw Block” and the nuclear tests conducted by the Soviets[2].

This also pushed the Armed Forces of Western countries towards a continuous modernization of equipment and materials of war with the re-start of national mechanical industry. Carabinieri also benefited of all that especially for its military component.

The Carabinieri in the Italian Republic

The Carabinieri Corps came out of the Second World War proved to the sacrifice offered by the military defending their country. Among all the fallen reveals some significant figures which represent only a small part of those who remained in the occupied cities and villages to protect citizens[3].

Carabinieri’s service was not limited to participation in military operations or functions as a fighting force or as military police, but strictly tied to population, territory and the need to ensure smooth functioning of public and private life as belonging to a police force with military status.

So, for example, only in 1946, there were 2,160 murders in the country (then still without certain provinces of northern Italy which had not yet returned under national sovereignty) and 101 Carabinieri lost their lives “duty services”[4]. In the period from 1946 to 1950, there was taken long and complex recovery operations to harvest weapons, ammunition and explosive materials in such a way that there were taken from the illegality, 86 canons, 415 mortars, about 2,000 machine-guns, 70,000 rifles, 23,000 pistols. Therefore the Carabinieri sustained a non-stop-action trying to help Italians to return to civil life even it was an hard job with a new deal connected with the birth of a democratic state after decades of dictatorship and a world war that invested all the Italian peninsula, leaving a long trail of deaths

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2 It is important to see also Pietro Pastorello, La scelta atlantica in Commissione Italia di Storia Militare, Le Forze Armate dalla scelta repubblicana alla partecipazione atlantica (Gaeta, Stabilimento Grafico Militare 1999) 117–125.

3 I want to stress the splendid figures of the Vicebrigadiere (NCO) Salvo D’Acquisto in Palidoro Tower, Rome province (1943) and the Carabinieri Vittorio Marandola, Alberto La Rocca and Fulvio Sbarretti that in Fiesole, near Florence (1944), gave their life to avoid unnecessary reprisals on the civilian population as remembered in Arnaldo Ferrara (edited by), I Carabinieri nella Resistenza e nella Guerra di Liberazione (Roma Ente Editoriale per l’Arma dei Carabinieri, 1978).

4 Vincenzo Pezzolet, paper “Il clima sociale in Italia quale risulta dai rapporti dei Carabinieri (anni 1946/47)2 presented 18 November 1997 in the congress “Cinema e Storia – 1797–1947: dal primo tricolore alla costituzione repubblicana”.

among those who were on national service and among those who instead suffered the tragedies of war as, elderly, women and children.

The contribution of blood and the undisputed professional skills of Carabinieri were a reference point for the Allied Powers that recognized from the earliest days of the invasion of Sicily (10 July 1943), the undeniable validity of a centuries-old institution strong on its traditions. Clearly these evaluations took a respectful action for Carabinieri organization. In fact, if the terms of the Treaty of Peace fixed the strength of the Italian Army in the 185,000 units, it is true that Carabinieri had stabilized strength at 65,000 men who would go up to 75,000 in 1948. This also as a result of other factors[5].

From the Second World War to early Sixties

In the early fifties the Carabinieri General Command started a new reflection to reinforce the action to combat crime. So, it gave over to a new approach, strictly connected with the use of new technologies with specific reference to forensic sciences. But the right time arrived ten years later because it had to wait for a new wind of innovation technologies expired over Carabinieri. So after an initial time of study, technology in Carabinieri entered in the organization much more than before.

On the operational point of view a very important benchmark was the action to fight and to defeat the bandits in Sicily until 1950 when the Corpo Forze Repressione Banditismo (Banditry Forces Repression Corps) led by Carabinieri Colonel Ugo Luca implemented specific services orientated to a more effective control of parts of Sicily who were subjected to the so-called EVIS action (Volunteer Army for the Independence of Sicily) together with the bandit Salvatore Giuliano put a strain on the Armed Forces and Police. For example the ambush in Bellolampo (PA) took place on 19 May 1949 caused seven carabinieri killed in action. In any case, the phenomenon ended with the death of the bandit on 5 July 1950 in Castelvetrano (TP).

The Fifties and Carabinieri "ruralization"

The successes against crime in Sicily and, at the same time, the contrast to Sardinian bandits in those same years brought to light the capabilities of an organization such as the Carabinieri in the repression of significant phenomena crimes. However, in Sardinia the capture of the most dangerous Sardinian fugitives reduced the crime fight to physiological phenomenon[6]. These successes were part of a growing Carabinieri exclusion action from the main urban centres where, under

[5] Pier Paolo Meccariello, Le Forze di Polizia militari nel Dopoguerra in: Commissione Italiana di Storia Militare, Repubblica e Forze Armate – Linee interpretative e di ricerca (Roma, IPI 2007) 195–233.

[6] Such as fugitives Liandru and Sini.

the specific pressure of the Interior Ministry, the police districts were reinforced. Therefore, it was accepted a tacit "ruralization" that had great consequences that went beyond Carabinieri morale. In fact, in parallel to such actions, even the availability of funds for modernization of weapons, uniforms and technology in general suffered heavy reduction interventions[7]. In any case, Carabinieri continued to strengthen relations with citizens through a stronger connection with the territory. By this time, there were continuous and providential interventions of the "Arma" in favour of populations affected by natural disasters. In 1951, for example, the area of Polesine, Ferrara and the Lower Delta of the Po Valley was hit by floods and mudslides[8]. Similar problems were also in Lombardy, Trentino and Emilia. Moreover, also came over the province of Catania in Sicily, Sardinia and several small towns in the provinces of Reggio Calabria and Catanzaro in Calabria. It was an *annum horribilis* for almost all of Italy. In these events, once again as in the past, the Carabinieri was there on the ground, first with the their territorial stations and then with reinforcements from other specialized units who were flowing as they could, with the Army and Fire Service, supporting citizens especially in the countryside because many suffered extensive damage when they do not even lost their lives. The same situation was lived in 1954 winter, when some snowstorms beat the regions Abruzzo and Molise and some parts of Campania locking people in their homes, often without electricity and heating. Again, the Carabinieri timely intervention helped citizen that, in many cases, have been reached in the most inaccessible areas.

The Sixties and the Carabinieri technological and organizational evolution

It is important to remember that the Italian and European economic framework had profound changes in the sixties thanks to the Marshall Plan and the policy of rearmament followed the outbreak of the Korean War[9]. This had undeniable consequences for Carabinieri so that they lived an extremely positive period both in the technological evolution and in internal reorganization. Specifically, after spending the previous decade in a situation of suffering in comparison with Police Corp, because it had increased greatly in budget allocations and in strength to the detriment of Carabinieri[10]. Now, it should be noted that "during the country's

[7] Meccariello, Le Forze di Polizia, 228. He underlines the better organization as materials, guns and equipments. About the so-called "ruralisation", Giancarlo Barbonetti, L'evoluzione dell'Arma nei primi decenni della Repubblica in: Commissione Italiana di Storia Militare, Le Forze Armate e la Nazione italiana (Roma, 2005) 218.

[8] Mario Arpino, Forze Armate ed emergenze: un ausilio al Paese in: Commissione Italiana di Storia Militare, Repubblica e Forze Armate, 57–65.

[9] Paolo Pombeni, l'eredità degli anni Sessanta, p. 39 in Fiamma Lussana and Giacomo Marramao (edited by), L'Italia repubblicana nella crisi degli anni settanta – Culture, nuovi soggetti, identità (Soveria Mannelli, Rubbettino, 2003).

[10] In the paper I used the term "police" even if at the time the police force belonging to Interior

transformation from agriculture to industry, with substantial migration from South to North, the Corps is the most solid territorial presence organisation, the leading organization on which the security State can rely on"[11].

It is important to point out that the decade of Sixties had a high number of casualties among Carabinieri and other police forces in the fight against crime, organized crime and terrorism. I want to remind, as example, a circular letter by the Carabinieri General Command in December 1962 to impose new, more efficient security measures in some situations (mainly parts of Sardinia and Sicily) where the risk of fire fight was very high[12]. A new and increased availability of funds and political will to recognize the Carabinieri efforts in a daily presence for the citizens and for the country allowed the General Command to analyze and to choose new strategic lines to push for a increased technological evolution in order to combat crime, in those years was in transformation in line with the society transformation. It must be said that the so-called "economic miracle" brought a remarkable opportunity for the Italian society, which allowed "the enlargement of the basis of consumption and [...] the transformation of the quality of life of the great mass of citizens"[13]. Indeed, there were identified priorities with the establishment and strengthening of intervention sectors that needed more job just because of the society transformation.

So the main lines of action were identified in:

1. **motor vehicles for all units**. Until that time, the Corps had received a very few number of motorcycles and an even lower number of cars, severely limiting the use of personnel to walk a dozen kilometres from the Station site, as most of the duties were conducted on foot and on horseback. A limited number of such facilities was instead done with off-road vehicles war surplus. Thus, it was determined to enter into service more than 4000 vehicles to ensure the presence of one vehicle for each Carabinieri station (about 5000 for 8000 municipalities) with the establishment of a network of maintenance and reconditioning of motor vehicles.
2. **fast cars so called "gazelles"**. According to some experiences conducted in the late fifties, the General Command in the following decade, established in major urban centres and then progressively in all the commands of

Ministry was called "Corpo delle Guardie di Pubblica Sicurezza". Barbonetti, L'evoluzione dell'Arma, 213–223 and more specific page 218.

11 Mimmo Franzinelli, Il Piano Solo – I servizi segreti, il centro-sinistra e il «golpe» del 1964 (Milano, Mondadori, 2010) 45.

12 Circular letter n. 291/1 prot. RP dated 10 December 1962 Carabinieri General Command – Operational Bureau signed by Carabinieri General Commander, Giovanni de Lorenzo, in Carabinieri General Command – Historical Office, Historical Archive, Documentoteca, 1820.1(7).

13 Pombeni, l'eredità degli anni Sessanta, 39 in Lussana and Marramao (edited by), L'Italia repubblicana.

officer (up to tenenze Carabinieri) the "Nuclei Radio Mobile"[14] (Radio-linked sections). For these units it was chosen the symbol of the gazelle as testimony of fast response and flexibility of action. It was significant that the technological evolution in the period in respect to equip all the units with the car Alfa Romeo Giulia 1300 with Carabinieri colours, for a long time a continuous source of serious concerns for common and organized crime. Moreover, both because of the displacement of vehicles, both of the operational characteristics of use of such cars, the General Headquarters decided to organize special courses for drivers to enable so-called "fast driving", or to know how to drive a military motor vehicle with sirens launched in city traffic without endangering the lives of citizens, Carabinieri and criminals. In this way, it was possible to equip each officer's commands (about 500) located in various urban centres of eight gazelles, able to ensure prompt action every 24 hour/days throughout the year. It is undeniable that the efforts re-enforced relationship with the citizen. The statistic helps us: in 1968, there were 111,557 interventions by those "nuclei" with 2,802 arrests and 3654 detentions that grow the year after (1969), reaching 160,172 interventions with 3,700 arrests and 4,325 detentions[15].

The large-scale use of motor vehicles allowed a greater and more timely presence on the territory that was enriched by a constant contact with citizens accelerated by the capability to travel within the territory of the various Carabinieri stations in almost all weather conditions, providing more effective support to the population.

3. **Light vessels[16]**. It was established a naval service that allowed to start sea and lakes patrolling, from the second half of sixties. The first sea patrols conducted by Carabinieri had the purpose of supporting the units that were operating on the ground and to ensure control of inland waters and in the sea areas closest to the coast. Keep in mind that during that period the traffic of tobacco with nocturnal and clandestine landings along the coast proliferated. Thus, it was possible to perform multiple functions, from surveillance of maritime traffic, in contrast to the phenomena of illegal import of tobacco and later also of guns, drugs and trafficking in human beings, by controlling the full respect of all the rules of navigation code for Fishing boats and yachting to monitoring of marine areas subject to certain safeguards. Do not forget that a very important cultural heritage

[14] Barbonetti, L'evoluzione dell'Arma, 219.

[15] Comando Generale dell'Arma dei Carabinieri, Attività operativa svolta dall'Arma dei Carabinieri nel 1970 quoted also in Giorgio Boatti, L'Arma – I Carabinieri da De Lorenzo a Mino 1962–1977 (Milano Feltrinelli, 1978), 125.

[16] Giancarlo Barbonetti, L'evoluzione dell'Arma, 219.

lies on the seabed of the Mediterranean, and of that heritage, a substantial portion is located within Italian waters. It must be said that, in this case, the downsizing of financial costs of these types of boats joined to a technological improvement constituted an undeniable factor of success of this specialty.

4. **Carabinieri divers units**[17]. As early as 1953 there were two small groups of Carabinieri divers. Since the Sixties (1964), through the use of new and more advanced technical materials and in analogy to what is charged for the light vessels, the General Command effectively reinforced this specialisation sector that became more closely linked to the special naval units in order to have a more rapid intervention in case of needs. Even here, the staff was selected to undergo training very hard and then stationed in the principal Italian maritime centres in order to support the action of units on the terrain guaranteeing specific and very professional actions as the recovery of stolen objects, of corpses and of useful sources of evidence for investigations that otherwise they would not have been possible to continue[18]. The success was remarkable and, for the period analyzed, I want to remember some of these: the actions taken during floods in Florence (1966) and Genoa (1970) with the recovery of precious objects, art materials and aid to the people; archaeological significant discoveries near Naples and Villa San Giovanni during the 1969; intervention based on a the request from Swiss authorities to locate a small submarine (tiger shark) in Maggiore Lake, after the failure of many previous attempts, that on 18 January 1965 he was suddenly engulfed. Two skilled Carabinieri divers succeeded in the undertaking on July 19 after two weeks of feverish search in the muddy waters of the lake[19]. The ability of specialists in the following decades was extended with the adoption of particular underwater wire-guided devices to lead a continue research for a time longer than allowed by the human body and in greater depth.
5. **Helicopters**[20]. The General Headquarters decided to start a program to set up a small fleet of helicopters to integrate and to strengthen ground and water control. In fact, good evidence offered by some experimental services led in cooperation with Air Force, persuaded the Carabinieri General Command to adopt multipurpose aircraft with the aim to support some course of action in quite all over the Carabinieri range of action, id

[17] Carabinieri Subacquei, Comando Generale dell’Arma dei Carabinieri (Roma 1972), 2.
[18] Ibid., 5.
[19] Ibid., 15.
[20] Carabinieri dell’Aria (Ente Editoriale per l’Arma dei Carabinieri, Roma, 1983), 86 and 94 and see Barbonetti, L’evoluzione dell’Arma, 219 also.

est public security, investigative and public order[21]. Thus, the first Agusta Bell helicopters AB47J "Ranger" were bought and piloted by Carabinieri with special military pilot's training. The units were based initially in Sardinia, in western Sicily and Trentino Alto Adige. Even these aircrafts, technologically advanced, became an indispensable support for actions taken on the ground to manage better control and suppression of crime. Furthermore these helicopters, the first of a series of aircraft used by Carabinieri, were built under U.S. license in Italy and it can be probably one of the clearest examples of development technology useful both for the Armed Forces and for domestic industries[22].

6. **Telecommunications[23]**. Everything described till now was firmly integrated through a new system telecommunications network able to connect telephones with the existing radiotelegraphic lines ensuring immediate and also confidential communications between Carabinieri leadership and local Carabinieri stations spread over the Country. This action also permitted the establishment of radio links were the crucial rings were operations centres (at the provincial level and company level) able to guarantee an immediate response to the citizen and to coordinate intervention patrols that also linked various units involved in the operation (foot patrols, motor vehicles, motorcycles, boats and aircraft). This had a significant impact so that an author underlined this challenge: "Another avant-garde initiative is the telephone network development independent from the military and commercial structures, but able to interconnect with both"[24].
7. **Carabinieri General Command Operations Room**. It was a great innovation. It was possible create a reference point at the top of the Carabinieri institution to whom all the relevant news flowed. It is obvious that all was possible thanks to the progressive improvement of telecommunications networks and through the use of vehicles that were gradually connected by radio. In fact, the operational room was the excellence in that period: "the crown jewel is the futuristic control room with adjoining computer centre,

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21 For instance the main activities were divided in more simply such as public security (control of line buses, and stamps and money transport, control of the most inaccessible areas providing support to Carabinieri units on the ground), investigative (search for dangerous criminals and fugitives from justice because responsible of serious criminal acts) and public order (flight over sensitive areas of the territory during mass demonstrations). Thus, the first Agusta Bell helicopters AB47J "Ranger" were bought and piloted by Carabinieri with special military pilot's training. The units were based initially in Sardinia, in western Sicily and Trentino Alto Adige.

22 For more informations, Michele Nones, L'impulso delle Forze Armate allo sviluppo industriale nazionale, in Commissione Italiana di Storia Militare, Repubblica e Forze Armate, 297–329, and specifically 305.

23 Barbonetti, L'evoluzione dell'Arma, 219.

24 Franzinelli, Il Piano Solo, 48.

under construction at the General Command: it costs half a billion lire [in 1965, nowadays about 5.137.455,00 euros] and monitors the country through cameras mounted on aircraft"[25].

8. **Carabinieri skiers and climbers[26]**. Especially since the sixties of last century, it became increasingly significant the presence in the Alps areas of Carabinieri with special skills that, at the end of a training course held at the Carabinieri Alpine Training Centre, were in condition to guarantee ski rescue and surveillance to intervene in case there had been criminal behaviour, also to perform investigative functions in inaccessible places in order to be able to promptly report to the Judicial Authority elements useful for the development of investigative activities. The action of these military specialists was also directed specifically to the conduct of particular investigations that were to be conducted on the ski slopes or on rough roads and required, of course, specific physical conditions, and special training[27].
9. **Carabinieri scientific investigations service[28]**. Since 15 December 1955 was created a cabinet of the central documentation and technical-scientific investigations at the Carabinieri Officers College. This cabinet elaborated a high-quality level that formed the humus for the development of new job in technical and scientific investigation so that on 1 December 1965 , was elevated to Scientific Investigations Carabinieri Center greatly enhancing the ability of technical analysis in support of investigations traditional actions led by Carabinieri units.
10. **Carabinieri Mobile Battalions as advanced technological component**. After the Second World War the Italian Army decided not to perform public order service as ordinary tasks. This marked a clear difference with pre-fascist Italy where the Police were unable to deploy trained and large contingents to manage public order. The fascism itself, with the "March on Rome" and the rise to power did everything to reduce the Army presence and also of the Carabinieri, using the "Milizia Volontaria per la Sicurezza Nazionale" (i.e. the transformation of the old fascist squads not in a military organisation but a paramilitary parallel army[29]. This

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[25] Ibid.

[26] Carabinieri della montagna.

[27] Ibid, 19.

[28] http://www.carabinieri.it/Internet/Arma/Oggi/RACIS/ visited 8 August 2012.

[29] About "Milizia Volontaria per la Sicurezza Nazionale" (National Security Voluntary Militia) activities, it is very interesting Gian Luigi Gatti, Verso un esercito volontario del Regime: la Milizia, paper presented at Military History Congress organized by Italian Military History Commission "Le Forze Armate e la Nazione italiana 1915–1943", Roma 22–24 October 2003 later published as Commissione Italiana di Storia Militare, Le Forze Armate e la Nazione italiana (1915–1943), (Roma 2004), but published by Agenzia Industria Difesa – Stabilimento Grafico Militare Gaeta

experience was overcome with the establishment of Carabinieri Battalions and simultaneously also with the establishment of Police "Celere" units[30]. Indeed, this choice was also due to the will of the Army and its leaders to escape from such tasks that were not perceived as part of their own military service. These tasks, therefore, were acquitted "by deploying a first line of mobile riot police units, Carabinieri and other police units"[31].

With the end of the Second World War the government decided to review the public order system so that, once ended the hostilities, the Carabinieri mobile battalions was re-created[32]. In fact, these were reconstituted in August 1945 in the number of twelve[33]. This organization was subsequently revised placing the mobile battalions under the direct command of the Carabinieri Legion Commands ruled by colonels responsible for all Carabinieri activities (i.e. public order and security) at regional level. From this situation came the turning period of the sixties and it should be one of the most far-sighted Carabinieri General Commanders leaders to develop the general reorganization of the decade: General Giovanni de Lorenzo. He knew how to insert carefully this action inside the more complex Army restructuration during the reorganisation to adapt to a flexible nuclear strategy developed within NATO. So, in this framework the Carabinieri military action capability was implemented together with the improvement of the public order management activities. Indeed, on 1 April 1963 the 11th Mechanized Carabinieri Brigade was officially constituted replying to the needs of the Army to guarantee an adequate territory defence and to the Interior Ministry needs to provide a sufficient manoeuvre reserve

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in 2005. It is very useful also Giorgio Rochat, Giulio Massobrio, Breve storia dell'Esercito italiano dal 1861 al 1943 (Torino, Einaudi, 1978), 213. With a more large view perspective about Carabinieri unit involved in public order activities, Rosario Castello, "Breve riflessione di carattere storico sui battaglioni mobili Carabinieri", in: Rassegna dell'Arma dei Carabinieri, A. LII, n. 2 (April/June) 2004, 89–99. The author speaks about the organisational evolution connected with Carabinieri battalions deployment from 1920 to 2004. For mobile organization in Carabinieri Corps see Flavio Carbone, paper "I battaglioni mobili dei Carabinieri nel primo dopoguerra: la militarizzazione dell'Arma dei Carabinieri Reali nella conduzione dell'ordine pubblico" presented to the International Congress "La Polizia Militare. Military Policing" held by Politics Sciences Faculty, Messina University, 11–12 December 2009.

30 The "celere" units were equipped to a fast intervention in case of riots; they were organized in 1947; see Barbonetti, L'evoluzione dell'Arma, 217.

31 Enea Cerquetti, Le Forze Armate italiane dal 1945 Al 1975 (Milano, Feltrinelli 1975), 26.

32 Castello, "Breve riflessione di carattere storico". On Carabinieri mobile battalions I found very useful the article so if it is not otherwise specified I am referring to it.

33 Decreto Legislativo Luogotenenziale 31 agosto 1945, n. 603. The battalions were placed under the direction of four units led by Colonels, with the following organisation: 1st Group, headquarter in Milan (battalions of Turin, Milan, Genoa and Padua); 2nd Group, based in Florence (battalions of Bologna and Florence), 3rd Group, in Rome (battalions Lazio, Roma and Cagliari); 4th Group in Naples (battalions of Naples, Bari and Palermo).

to guarantee public order, thus Carabinieri Battalions were put under an unified command. Neither we must forget that the decade under analysis began with a special significance episode for public order in Italy, or the events of Genoa 1960. The government then headed by Ferdinand Tambroni could ruled the country with the support of the Italian far-right party (Italian Social Movement); the party decided to organize its national convention that year in Genoa, the city awarded with the Gold Medal for Military Bravery for the contribution given to Italian resistance in the fight against the enemies. The choice of the far-right party gave the opportunity to hold public demonstrations by partisan groups and leftist parties that the prime minister thought he could handle presenting "as a "strong man" defender of democracy against subversion and then drove to an irrational use of Police"[34].

This experience had a very important impact both modifying public order police forces tactics, techniques and procedures, both in the use of technologically advanced equipment that the old jeep at the time. For Carabinieri, the foundation of the Mechanized Brigade Command did not have operational command responsibility connected, but nevertheless played important roles for units cohesion, both for military training, and for public order training. On the other side, it was possible to develop a technology-based intervention, with new vehicles to better manage military and police tasks and new weapons such as, for military task, the 81 mm mortars. So then Carabinieri Commander-in-chief wrote to the Army Chief of Staff in January 1963: "It is my intention to give the Carabinieri mobile units [...] an organisation able to perform modern needs training and employment on the basis of the following criteria: creating efficient tools, in all situations, to perform the actual war operational tasks together with those of public order in peace time". The brigade, in brief, consisted of about 5000 men organized into 13 Carabinieri battalions whose strength characteristics were not in contradiction with the needs of Public order service but gave them remarkable ability to intervene in the actions with the use of decisive force[35].

The Sixties constituted a benchmark for police forces to manage political

[34] Pombeni, l'eredità degli anni Sessanta, 39 in: Lussana and Marramao (edited by), L'Italia repubblicana.

[35] To sum up, the Carabinieri mobile battalions were deployed when Carabinieri and Police local forces were unable to perform the tasks guaranteeing an use strongest and more efficient by analogy to what happened in case to deploy army and other Armed Forces units during riots. The choice was led, above all, for obvious reasons of economy, a more correct employment of special units, also, not to erase a valuable tool to manage riots, using the battalions as a strong force to intervene and solve those problems.

large events in public order, when these events took inspiration from other considerations: "the causal links that have sparked the mobilization of young people can be traced in the growing mismatch between the mutation caused by industrial development and social immobility of the political system, that is, unable more or less pronounced for this to govern the processes of modernization, translating aspirations for individual and group promotions in an effective enlargement of democratic citizenship"[36]. So a big echo had the death of the 19 y.o. policeman Antonio Annarumma. He was deployed during a public order service in Milan for a demonstration of the extreme left sitting in his vehicle when he was hit with an iron bar and died the same day, 19 November 1969[37]. The murder of the policeman was also an opportunity to have a look over an Italy socially divided between North and South, or divided between the young generation of the main urban centres of the Centre-North with an active participation in political demonstrations and southern Italy ones who were in the Police Forces in order to find a chance to redeem himself from the economic difficulties of their regions[38]. The death of the policeman, finally, also is considered the first of the so-called "Years of lead" or of the period starting with students riots at Valle Giulia (Rome) on 1 March 1968 and ending with the Bologna Railway Station massacre on 2 August 1980.

Technological change or new cultural model?

Under this new philosophical approach more money were invested in very specific and high impact technologies with the aim to reinforce Carabinieri action. So, for example, were bought cars like Alfa Romeo to introduce new units called "Nuclei Radio Mobile" in order to strengthen its prevention and traffic control action. The name "Nucleo Radio Mobile" emphasizes a close connection by radio, so the Carabinieri General Command drew up a specific project for linking up the car during patrolling activities with their Commanding officers and NCOs, with a new concept of communication with the "operations main room" located at the Carabinieri General Headquarters (i.e. the Commander General table of command). Thus was created a line of communication between the centre of the

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[36] Alberto De Bernardi, Il movimento giovanile degli anni Sessante e il sistema politico, 179 in: Fiamma Lussana e Giacomo Marramao (edited by), L'Italia repubblicana nella crisi degli anni settanta – Culture, nuovi soggetti, identità (Soveria Mannelli, Rubbettino 2003).

[37] For a summary description of the events, I am referring to internet site on 16 August 2012 http://memoria.san.beniculturali.it/web/memoria/approfondimenti/approfondimenti.

[38] De Bernardi, Il movimento giovanile, 181 in: Lussana and Marramao (edited by), L'Italia repubblicana. Do not forget that such phenomena were closely related to what one historian has called the political "dissident desire" that is such a need "for a generation of young culturally socialized by school and by mass communications, researching appropriate to their status ambitions, became politicized antagonist that directly touched the quality of democracy".

organization and mobile patrols and small Carabinieri stations scattered throughout the country. The use of new technologies also meant a new way of thinking tasks and organization of the military as the Carabinieri.

These technological and cultural transformations in the long term effects were quite significant. It was noted that the wave of a more democratic process started by Italian universities had spread: "not only the factory and the school were profoundly transformed by the democratization" from below "set in motion by the movements of struggle and Protest: hospitals, courts, mental hospitals, public administration, mass communications, the army itself was overwhelmed by a push of mass political participation which contributed greatly to reorient the overall appearance and addresses of modernization"[39].

The dramatic judgment wrote by an important observer of the Italian society of the time has no appeal: "My critics, sorrow or disdain, while all this was happening, had jerks "duties", as I said, to continue to impose: they were "duties" relating the struggle for progress, improvement, liberalization, tolerance, collectivism, etc.. etc.. Did not realize that the degeneration came about through a falsification of their values. And now they have the behaviour to show satisfaction to find that the Italian society has undoubtedly improved, that has become more democratic, more tolerant, more modern and so on. They do not see the avalanche of crimes that engulfs Italy: they relegate this phenomenon in chronicle record and remove all value. They do not realize that there is no solution of continuity between those who are technically criminals and those who are not: and that the model of insolence, inhumanity, cruelty is the same for the whole mass of young people. They do not realize that in Italy there is even a curfew, the night is deserted and left as in the past blackest centuries: but they do not experience, they stay at home (perhaps to gratify his own conscience of modernity with television help)"[40]. Meanwhile, next to the known mafias phenomenon, emerged as the most serious political terrorism which had great influence both in Italian politics, both in the adoption of strategies to counteract this new attack to the State in which the Carabinieri action had great results, and in a significant blood tribute.

Conclusions

According to some historians "Italy tried to realize the modernization and professionalization of its Police forces maintaining the model of a militarized police, even just seeing the militarization as an integral part of the modernization

[39] De Bernardi, Il movimento giovanile, 183 in: Lussana and Marramao (edited by), L'Italia repubblicana.

[40] Pier Paolo Pasolini, "Abiura dalla Trilogia della vita", in: Il Corriere della Sera June and November 1975 now in Id., Lettere Luterane (Torino, Einaudi 1976), 73–74, noted in some parts also in Giovanni Aliberti, Dalla parsimonia al consumo – Cento anni di vita quotidiana in Italia (1870–1970) (Firenze, Le Monnier 2003), 169–170.

process"[41]. I think it should be verified. There are some significant findings: the Sixties, at least for Carabinieri, represented a very important decade for the introduction of new technologies in a much more way; the massive introduction of these also led to a revision and to a reorganization of entire Carabinieri structure to adapt to social transformation and technological developments of the period. This action was so successful that put the institution in terms of dealing with determination and effectiveness the most serious challenges of the next decade, with particular reference to the fight to political terrorism and organized crime.

[41] Donatella Della Porta – Herbert Reiter, Polizia e protesta (Bologna, Il Mulino 2003), 67.

Prof. Tadeusz Panecki (Pologne)
La contribution polonaise au déchiffrage de la machine allemande Enigma.

Tout le monde connait bien les efforts des cryptanalistes français et surtout britanniques de centre Bletchley Parc en ce qui concerne de déchiffrage de la machine allemande Enigma. C'est évident que sans ses efforts et excellente résultats, la deuxième guerre mondiale n'aurait été pas termine le 8 mai 1945et les pertes auraient été plus grande.

Dans ma communication je veux monter et expliquer la contribution polonaise dans la guerre secrète avant la seconde guerre mondiale, c'est-à-dire pendant le période de l'année trente du XX siècle.

Alors, d'abord je voudrais souligner que l'effort polonais sur déchiffrage des résultat de renseignement de l'ennemi se date de début de l'année vingt de siècle passé. C'est pendant la guerre polono-bolcheviste (1919–1921) les premiers efforts dans ce matière était faite par radiorenseignement polonaise. Les spécialistes de la liaison militaire travaillés dans le quartier générale du Marechal Józef Piłsudski ont déchiffré les codes de chifrogrames bolcheviste. En effet Piłsudski et ses officiers connait bien le contenu de chifrograme de W. Lenine adressé au général M. Tuchaczewski qui a attaqué Varsovie en aout 1920 avant que Tuchaczewski avait reçu des télégrammes. Il est évident que le travail de cryptanalists polonais avait grand influence des résultats de la guerre 1920 et de la victoire polonaise.

Les expériences dans la matière de radiorenseignement étaient bien conservé en Armée Polonaise dans les années suivantes. Au sein du 2^{me} Bureau de notre armée a été créé en 1930 la section de chiffres dirigé par Lt. Col. Gwido LANGER. Au debut, les jeunes officiers ont travaillé contre deux ennemis – contre les Allemande et contre les Soviets.

Les Polonais commencent á travailler sur Enigma dès 1928, avec l'appui de leur service de renseignements. En 1929, ils interceptent une machine Enigma envoyée de Berlin vers Varsovie. Elle devait normalement être transportée par la valise diplomatique, mais une erreur lors de l'envoi permet aux services polonais d'en examiner le contenu, Même s'il ne s'agit que d'une version commerciale a priori assez anodine, cela permet de confirmer que les Allemands utilisent massivement Enigma pour chiffrer leur messages. Lorsque toute l'armée allemande se met á l'utiliser des annees plus tard, les Polonais portent leur soupçon sur de variantes d'Enigma. Débute alors une cryptanalyse intensive dans le but de trouver le câblage utilisé dans la version militaire, et ultérieurement d'extraire les clés pour des messages données.

En 1933 – nous savons bien cette date très importante dans l'historie – la section des chiffres s'était élargi des trois jeunes mathématiciens : Marian REJEWSKI, Jerzy Różycki et Henryk Zygalski qui après les études á l'Université de POZNAŃ ont été recruté au service du 2^{me} Bureau de l'Armée Polonaise. Ils ont été des élèves du prof. Zdzisław KRYGOWSKI.

Ces trois jeunes cryptanalists ont commencé le travail sur les chiffres de l'Armée allemande mais surtout sur Enigma.

Je voudrais rappeler que Enigma c'est une machine électronique portable d'origine allemande, faisant appel á des rotors monté sur cylindres pour le chiffrant et le déchiffrement de l'information. Enigma a été construit et produit en 1919 en Allemagne par Artur SCHERBIUS. Scherbius avec Richard RITTER fondent une sociète á Berlin qui produit et vent la première version commercial (Enigma-A) en 1923. Trois autres versions commerciales vont suivre et Enigma-D devient le model les plus répandu après son adoption par la Marine allemande en 1926. L'appareil est ensuite repris par l'armée de terre allemande en 1929. Á partir de ce moment, son usage et étendu á toutes les forces armées allemandes et une grande partie de la hiérarchie nazie. La Marine allemande surnomme Enigma « La Machine M ».

Il faut mentionné que les travaux parallèle sur Enigma étaient mené aux Etats-Unis (Edward HEBERN) et á la Suede (Arvid DAMM).

Pendant la Seconde Guerre Mondiale, différentes versions d'Enigma sont utilisées pour les transmissions allemandes (mais aussi celles d'autres puissances de l'Axe) á partir du niveau division et au-dessus. Certain bulletins météos sont cryptés avec Enigma. Les Italiens utilisent une de version commerciales de la machine, inchangée, pour leurs communications militaires. Cette imprudence bénéficie aux Britanniques. Cela contribue á la victoire britannique face á la flotte italien au cap Matapan.

En de nombreuses occasions, les Allemandes renforcent la sécurité de l'Enigma. Au pris de mille difficultés, les Anglais reconstituent les réglages et parviennent petit á petit á décrypter un nombre croissant de messages, malgré de longues périodes de trous noirs.

En 1933 de chiffre Enigma avait été pénétré par de mathématiciens polonais – déjà mentionnée – aidées de moyens électromécaniques (surnommé « bombes de Rejewski »). Il est difficile d'expliquer en détaille le système de cette opération mathématicien, mais finalement Enigma n'était plus le secret.

En effet de Deuxième Bureau français achète á Hans Thilo SCHMIDT, fonctionnaire du ministère de la guerre á Berlin, le manuel opérateur (Enigma en papier) et une quantité de documents aussitôt transmis aux Polonais.

Sur la base de ces travaux les ingénieurs polonais ont construit une copie d'Enigma. Le Polonais seront aussi capables de déchiffrer une bonne partie des transmissions de l'armée allemande de 1933, durant la Guerre civile espagnole et ceci jusqu'à l'aube de la Seconde Guerre Mondiale.

Juste avant la Deuxième Guerre Mondiale la section de chiffres polonaise a transmis les résultats sur l'Enigma aux Français et Anglais. De 1938, le service anglais du chiffre aide par le apports français et polonais entre en lice.

En effet, le cryptologues britanniques (reprenant les travaux commencées par leur homologues polonais, transmis á l'ambassade de Grande Bretagne deux jours avant l'invasion par l'Allemagne dont la Pologne avait était aussi informée) furent, á plusieurs reprises et sur de longues durées, capables de déchiffrer les messages protégés par ces machines avec des bombes électromécaniques. Les informations obtenues grâce á cette source leur donnèrent un net avantage dans la poursuite de la guerre. Il a été estimé que le conflit en Europe s'est considérablement écourté grâce á la cryptanalyse de code allemande, dans lequel le déchiffrement de messages émis á l'aide d'Enigma a joué une part importante. Bien que la machine ait des faiblesses, les erreurs faites par les codeurs utilisant Enigma, aussi que les piètres décisions politiques de autorités, ont aussi joué un rôle important en diminuant la complexité du déchiffrement des messages.

Après la défaite de la Pologne en septembre 1939, défaite provoqué par des agresseur le III Reich et l'Union Soviétique, les officiers de 2^{me} Bureau de l'Armée Polonaise ont été évacué par Roumanie vers la France. Ici sur la terre française le général Władysław SIKORSKI a créé le gouvernement polonais un exile. La Pologne écrasée par des agresseurs a continué la guerre a coté des ses alliés: La France et la Grand Bretagne. L'armée polonais s'est constitué en France.

En 1939 aussi les cryptologues polonais évacuent d'urgence leur bureau á Varsovie et détruisent le matériel confidentiel durant leur escapade. En passant par la Yougoslavie et l'Italie (neutre en 1939), ils atteignent la France. Près de Paris, au PC BRUNO, les Polonais se mettent au service de la France et recommencent á travailler sur Enigma sous la direction de col. Gustave BERTRAND. Peu avant l'invasion de la France en mai 1940, le mathématicien britannique Alan TURING demeure quelques jours au PC BRUNO ou il sera briefé par ses confrères polonais.

Après l'armistice, les cryptologues se déplacent dans le sud de la France et en Algérie avec les risques que cela pouvait représenter. Il continuent les travaux dans la centre CADIX prés de Alger. Certains officiers supérieurs p. ex. Lt. Col. Gwido LANGER sont capturés et malgré de terrible interrogations, le secret au sujet de la cryptanalyse d'Enigma demeure intact. Quant á Marian Rejewski et Henryk Zygalski, c'est une épopée qui les attend. Tout d'abord á travers l'Espagne où ils seront temporairement emprisonnées, le Portugal et finalement Gibraltar, d'où ils pourrons gagner le Royaume-Uni. Leur collègue Jerzy Różycki aura beaucoup moins de chance puisqu'il meurt noyé lors d'un naufrage en 1942 au sud de la France, après un voyage en Algérie.

En Grande Bretagne, Rejewski et Zygalski sont relégués dans une unité de traitement de chiffre á Boxmoor. On ne sait toujours pas pourquoi ils ont été écartés du grande centre de décryptage anglais de Bletchley Parc. Il est probable que les Britanniques ont décidé de reprendre les travaux á leur compte sans en donner l'accès directe á leur allié polonais. Les mathématiciens polonais sont alors relégués aux travaux plus routiniers. Comme disait Alan Stripp : « Les faire travailler sur le système Doppelkassttten, c'est comme demander á des chevaux de course de tirer des wagons ». C'est Alan Turing qui reprend et poursuit leurs travaux. Après la Seconde Guerre Mondiale Zygalski resta en Grand Bretagne ou il travailla comme professeur de mathématique dans une école provinciale jusqu'à sa mort en 1978.

La cryptanalise d'Enigma était devenue entre-temps une affaire britannique et américaine. Les méthodes polonaises ne fonctionnaient plus sur les versions militaires d'Enigma et la variante d'Enigma pour la marine allemande avait toujours été supérieure en termes de sécurité.

Le 21 novembre 1946, démobilisé, Rejewski retourne en Pologne ou il a laissé sa femme et ses deux enfants. Jusqu'à sa retraite en 1967, il occupe divers emplois sans liens avec sa qualifications et sans jamais parler de son passé de cryptologue. Même les services secrètes staliniens, qui l'ont interrogé plusieurs fois en tant qu'officier de l'Armée Polonaise en Occident, n'ont jamais soupçonné le vrai rôle joué par Rejewski avant et pendant la Seconde Guerre Mondiale. Ce n'est qu'en 1969 qu'il écrit son histoire pour l'Institut Historique Militaire á Varsovie. Il est mort en 1980 á VARSOVIE.

Les informations concernant l'Enigma était gardé come les donné secrète jusqu'à 1970. Après cette date nous pouvons observer les premier publications sur ce thème.

En terminant je voudrais souligner que en voyant le rôle définitivement sur la découverture de la machine Enigma par les Britanniques et les Français il ne faut pas oublier un épisode ou les trois mathématiciens polonais ont joué le rôle important.

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Prof. Dr. Jordan Baev (Bulgaria)
Bulgarian Scientific & Technical Intelligence Services during the Cold War years

The historiography of intelligence and security has benefited significantly from the comparatively greater accessibility of the East European secret services records in the post-Cold War era. In a way, those files revealed not only the specific tasks and activities of the intelligence services in the smaller Soviet bloc countries, but also the global aims of the superpowers, though the KGB and GRU operational archives in Moscow are still almost entirely unavailable so far. A review of the formerly top secret Central-Eastern European documents seems to confirm the view that the Warsaw Pact intelligence services were established as a "mirror" image of the KGB First Main Directorate (PGU) and Soviet Military Intelligence (GRU) services[1]. The multilateral Intelligence coordination and information exchange within the Warsaw Pact started in 1955 and was made regular by bilateral agreements and periodical joint meetings in the next decade.

The history of cooperation within the Soviet bloc in the area of Scientific and Technical (S&T) intelligence is still rarely discussed in the contemporary historiography; however, it represents a "strange phenomenon" in the international history of intelligence services. While the Western countries developed their scientific intelligence branches independently, and indeed had sharp and often competitive secret rivalries among themselves, the Soviet bloc intelligence services coordinated their actions within the coalition's framework of "distribution of goals". The most important strategic tasks in specific regions and areas were assigned by the KGB and GRU leadership, at least, in the initial years of East European S&T intelligence activity. The strongest arguments for an intensive development of the S&T Intelligence collaboration were the necessity of overcoming or avoiding the Coordinating Committee for Multilateral Export Controls (COCOM) barriers in the new era of technological acceleration of the Western economic system and a raging arms race between the two military blocs[2].

Discussions of the Warsaw Pact's cooperation in the field of S&T intelligence have understandably focused on the more developed Soviet allies such as Eastern Germany, Czechoslovakia, or Poland. In addition, there were relatively large

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1 Jeffrey Richelson, *Sword and Shield. The Soviet Intelligence and Security Apparatus*, (Cambridge, MA: Ballinger Company, 1986), p. 204.

2 Those arguments were strongly emphasized during the interviews conducted by the author in April 2005 with Gen.-Major Todor Boyadzhiev, former head of S&T intelligence office in the USA, deputy chief of Bulgarian Foreign Intelligence (1981–1990), and secretary general of the Ministry of the Interior (1990–1992).

diasporas of Central Europeans inside the US, Canada, and Western Europe, which facilitated the attempts to obtain secret military, economic, and scientific information. The Bulgarian intelligence service has been discussed as no more than an executor of the KGB's "dirty work" or of "wet" covert joint actions in the West. Even the newly published Russian monographs on Soviet postwar intelligence services note only a few basic examples of S&T cooperation with East German, Polish, Czech, and Hungarian "comrades", totally ignoring the KGB's "most loyal" Balkan ally[3]. One of the reasons for this neglect was obviously the lack of reliable documentary information.

In December 2006, a new law on the disclosure of state security and military intelligence officers and agents was accepted by the Bulgarian parliament. According to the law, the entire documentation on the intelligence and security services for the period September 1944–July 1991 had to be turned over to the newly established Archive of the Committee for Disclosing the Documents and Announcing Affiliation of Bulgarian Citizens to the State Security (DS) and the Intelligence Services of the Bulgarian National Armed Forces (*ACDDAABCSSISBNA*). In 2008–2012, in accordance with the current regulations, a great amount of formerly top-secret Bulgarian intelligence records were made available for the first time to the public. They could contribute, in particular, to answering the question how it was possible for a small underdeveloped agricultural country in the Balkans to gain leading positions within the Eastern European economic system in areas of high-tech industry such as electronics, chemistry, pharmaceutics, and heavy machine construction. The author of the actual paper was among the first historians to gain access to those files, which resulted in a documentary volume and a monograph on KGB-DS collaboration, and another documentary study about that collaboration exactly in the field of S&T Intelligence activity during the last two Cold War decades[4].

Since its establishment after the Bolshevik revolution, the Soviet foreign intelligence service developed its scientific branch. During the World War II, a new 15th Division at the foreign intelligence department was responsible for developing scientific intelligence. Its greatest success was in the area of atomic

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3 Сергей Чертопруд, *Научно-техническая разведка от Ленина до Горбачева* [S&T Intelligence from Lenin to Gorbachev], (Москва: Олма пресс, 2002); Леонид Млечин, *Служба внешней разведки* [Foreign Intelligence service], (Москва: ЭКСМО, 2004); Дмитрий Прохоров, *Разведка от Сталина до Путина* [Foreign Intelligence from Stalin to Putin], (Санкт Петербург: Нева, 2005); Александр Север, История КГБ [KGB History], (Москва: Алгоритм, 2008).

4 Йордан Баев, *КГБ в България. Сътрудничеството между съветските и българските тайни служби 1944–1991* [KGB in Bulgaria. Cooperation between Soviet and Bulgarian secret services], (София: Военно издателство, 2009); *ДС и КГБ – връзки и зависимости 1950–1991* [KGB and Bulgarian State Security Service: Connections and Dependencies. Documentary Volume], (София: МТ Студио, 2009); Jordan Baev, *Spying on the West. Soviet-Bulgarian Scientific Intelligence Cooperation* – www.php.isn.ethz.ch .

espionage on the top-secret US Manhattan Project[5]. Three months after the establishment of the KGB in March 1954, a separate S&T department was formed within the First Chief Directorate (PGU), which was renamed the 10th Department in 1959. In 1974, a couple of years after the appointment of Yuri Andropov as the KGB chairman, that department was expanded to become Directorate "T" – PGU KGB. The 10th Department of the PGU and Directorate "T" had seven intelligence orientations: nuclear, aerospace, electronics, medicine, chemistry, new technologies, and information and analyses. In parallel, the Soviet Military Intelligence service (GRU) had six special directorates oriented to acquire S&T information: Sixth (Radio-Technical Intelligence), Ninth (Military technologies), Tenth (Military economy), Eleventh (Military doctrines and nuclear weapons) and Cosmic Intelligence directorates, and in addition the Institute for military information (Open sources analysis)[6].

After the establishment of Directorate "T" in 1974, the Soviet leadership approved Andropov's proposal to double the staff abroad. Thus, in 1975 the Soviet S&T intelligence services activated 77 of its agents and 42 informers who focused their activity on the US alone, and specifically on 32 principal objects (General Electrics, Boeing, Lockheed, McDonnell-Douglas, Westinghouse, etc). According to a KGB report to the Central Committee of the Communist Party of the Soviet Union (CC CPSU), during the period 1972–1977, S&T intelligence obtained about 120 000 pieces of new information with 20 000 schemes and diagrams, which were mainly delivered to the state Defense Industry Committee. In 1979 alone, the Soviet Scientific Intelligence Directorate realized 557 "measures involving operational agents" abroad. In 1980 the KGB delivered more than 14 000 pieces of information and 2000 models of different technical equipment to various governmental departments and agencies, and to state firms and research institutes. In 1981 it provided 13 500 items and 3000 models, and in 1982 10 000 pieces of information and 4000 models[7]. The geographic distribution of the intelligence obtained from the leading Western countries was as follows: 61.5 per cent from US sources, 10 per cent from West German sources, 8 per cent from French sources, 7.5 per cent from British sources, and 3 per cent from Japanese sources.

The Bulgarian scientific intelligence service was formed later than those of the Central European allies. In May 1950 four months before the establishment of DS

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5 See: Вячеслав Трубников /Ed./, *Очерки истории внешней разведки России*, т. 4, (Москва: Международные отношения, 1999); John Haynes; Klehr Harvey, and Alexander Vassiliev, *Spies. The Rise and Fall of the KGB in America*, (New Haven: Yale University Press, 2009).

6 Александр Колпакиди, Дмитрий Прохоров, *Империя ГРУ. Очерки истории российской военной разведки* [Essays on Russian Military Intelligence History], (Москва: Олма Пресс, 1999).

7 The KGB Annual reports to CC CPSU were selected from the CPSU records in 1992 and stored at Fond 89 of the Russian State Archive for Contemporary History (*RGANI*) in Moscow. Microfilm copies can be viewed at the Manuscript Division of Library of Congress in Washington, D.C., and the Hoover Archives in Stanford, CA.

First Directorate (Foreign Intelligence), a Bulgarian delegation visited Moscow for talks with the Soviet intelligence chiefs. The Soviets suggested that the Bulgarian intelligence service should consist of four operational divisions, the first of which was to deal with political, economic, and scientific espionage[8]. During the first multilateral Soviet bloc intelligence conference in Moscow in March 1955, the Bulgarian delegation had bilateral talks with KGB Chairman and next GRU Chief Gen. Ivan Serov and the chiefs of Soviet intelligence and counterintelligence services. One of the issues discussed was Soviet support for starting scientific intelligence activities in Bulgaria. The KGB leadership informed the Bulgarian "comrades" that one of the main foreign intelligence goals should be the recruitment of "highly skilled agents" to obtain information regarding Western nuclear weapons, anti-aircraft radars, jet aircraft, and new inventions in the field of chemistry and geology. The Soviets also provided information about the reorganization of the British scientific intelligence division, which was geared towards obtaining new information on the Soviet Union's nuclear weapons, aircraft industry, and anti-aircraft systems[9].

The first Bulgarian S&T intelligence division was formed in December 1959 within the 13th Department of the foreign intelligence service, which dealt with economic issues. It consisted of only three intelligence officers. Subsequently, the S&T intelligence service was transformed in 1964 as a separate 7th Foreign Intelligence department. In pursuance of the CC BCP Secretariat Resolution I-980 of 3 August 1966, 30 new intelligence officers with graduate degrees or even PhDs in technical subjects and the humanities were employed, and 20 of them were sent for one year to the KGB PGU Special School near Moscow (known as "School No. 101"). A few months later, in March 1967, the head of Bulgarian State Security, Gen. Angel Solakov, reported at a confidential plenary session of the CC BCP: "In fact, our Scientific and Technical Intelligence started to function in 1966." Gen. Solakov specified the basic areas of interest in the field of S&T intelligence – electronics, chemistry, and mechanical engineering[10]. In May 1968 Bulgarian State Security leadership arrived in Moscow for consultations with the new KGB Chairman Yuri Andropov. He acknowledged confidentially that the KGB was far behind the CIA in the field of information technologies and computers – approximately seven to ten years. Andropov raised the issue of acquiring exact and current intelligence information on the new generation of US computers[11].

According to the agreements approved during Yuri Andropov's first visit to Sofia in November 1969, the exchange of scientific intelligence between the two countries was significantly increased over the following two to three years. In March

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8 *ACDDAABCSSISBNA – M*, Fond 1, Opis 1, File 1683, p. 2.

9 Ibid., Opis 5, File 44, p. 14–15, 21.

10 Central State Archive (*TsDA*), Sofia, Fond 1-B, Opis 34, File 52, p. 92–93.

11 *ACDDAABCSSISBNA* – M, Fond 1, Opis 10, File 35.

1971 a KGB reference indicated that the Bulgarian S&T intelligence department had delivered 161 pieces of information in the previous year, of which 5.6 per cent were assessed as "extremely valuable", 22 per cent as "valuable", and 39 per cent as having "information interest". On 8 April 1972 a basic long-term agreement and a perspective plan for "intelligence interaction" between the KGB and the DS were agreed in Moscow. Regarding cooperation in the area of S&T intelligence, the plan outlined joint efforts for acquiring secret information by extending the operational teams in the USA, West Germany, Italy, France, Switzerland, and Japan. "In view of the difficult operational environment" for the KGB in Great Britain, the agreement stipulated that "more skilled" Bulgarian intelligence officers would be sent to that country at the request of the Soviet Union. The principal areas of interest were weapons of mass destruction, the aerospace industry, nuclear energy plants, electronics, and "other scientific and technical achievements"[12]. Following the agreement, the exchange of S&T intelligence increased visibly in the next two years.

The Bulgarian Military Intelligence Directorate at the General Staff (known as *RUMNO*) focused its activity in the 1960s and 1970s on three principal tasks: to analyze and report to the political and state leadership the visible changes and eventual crises of the military and political situation in the near neighborhood (the Balkans and the Middle East), to examine carefully the military exercises and troops' dislocation of the "main adversary" (NATO countries), and to reveal the newest technologies and weapon systems, introduced into the NATO armies. The S&T military intelligence was carried out both by the Strategic Intelligence, Operational-Tactical Intelligence, and Radio-Technical Intelligence directorates. A new role was assigned also to the "Information" directorate with its geographic and analytical departments. Inside it was also "Military Technique and Science" department, which was renamed later to "Armament and military equipment". Among the other tasks of the Military Intelligence service, prescribed in a secret directive of 19 June 1971 on the third place was defined: "To reveal the military economic and scientific potential of the countries under reconnaissance and to supply information about the work on creation of the newest ways of warfare and newest kinds and patterns of armament and technical devices"[13].

With the development of the military radio-electronic intelligence (R&RTR) department in the beginning of the 1960s much more attention was paid to the task for identification of NATO radar and troposphere communication and early warning systems in Southern Europe. A military intelligence report of 1965 described in

[12] *ACDDAABCSSISBNA* – R, Fond 9, Opis 2, File 816, p. 13–15; *ACDDAABCSSISBNA* – M, Fond 1, Opis 13, file 10.

[13] *ACDDAABCSSISBNA* – VR, No. 0184. Published in: *Военното разузнаване през комунизма. Документален сборник* [Military Intelligence during the Communist Era. Documentary Volume], (Sofia: Military Publishing House, 2012), p. 195.

details some technical data about the special US (GRS-26 and GRS-27) and UK (S-244) apparatus, while other reports from 1968 and 1971 provided more information on NATO communication systems' development in the period 1966–1971 with the implementation of new multi-channel systems AC HI, MILARD, AUTODIN, etc.[14] A special report from 25 July 1973 discussed, in particular, the technical parameters of NATO Air Defense Early Warning automatic system NADGE[15].

In the 1970s were improved as well the coordination and information exchange between the foreign and military intelligence services and the cooperation with the respective scientific civilian organizations, which delivered more clarified requests for obtaining the necessary technical documentation. For instance, on 6 June 1973 Bulgarian military intelligence service sent not only to the Minister of Defense, Gen. Dzhurov and Chief of General Staff, Gen. Semerdzhiev, but also to the Committee for Scientific and Technical Progress and the Institute of Special Optics and Radio-Electronics the received information about the use of laser technologies for military goals (in particular, the possibilities of detonation of hydrogen nuclear bombs by laser tools)[16]. The chief of military intelligence, Gen. Zikulov discussed in a letter to the chief of foreign intelligence, Gen. Kotsev on 9 December 1974 the parameters of the agreed information exchange, which included a paragraph for "NATO Armament and military equipment". A special request for acquiring new technical data about *B-1* strategic bomber and Cruise missiles was motivated inside that paragraph[17].

Since 1964 the Warsaw Pact Military Intelligence services started to organize annual meetings, where their leaderships exchanged newly obtained information and coordinated their next mutual goals and prospective collaboration[18]. When in 1969 the new Warsaw Pact military structures were developed, some of the Intelligence aims in the S&T field were discussed also at the WP Technical Committee sessions. Besides the annual meetings of the East European Intelligence services there were organized as well several functional commissions, one of them being Scientific & Technical Intelligence commission, established according to a decision of the East European Military Intelligence services meeting in Varna in 1972. The protocols of the next WP Military Intelligence meeting in Budapest in December 1973 outlined the task to pay "special attention" to "a thorough analysis of the military-economic

[14] *ACDDAABCSSISBNA* – VR, Fond 23, Opis 01288, File 1090, p. 1–10, 33–37.

[15] Ibid., File 1096, p. 103–108.

[16] *ACDDAABCSSISBNA* – VR, Microfilm 00592, File I-850, Delo 64, p. 256–276.

[17] *ACDDAABCSSISBNA* – VR, Fond 23, Opis 01288, File I-544, Delo 62, p. 114–118.

[18] According to Col.-Gen. Vasil Zikulov, former chief of Bulgarian Military Intelligence service and a deputy chief of the General Staff (1967–1991), at those multilateral sessions they never shared sensitive information on their particular agent network and operational sources. Such top secret information could be exchanged in very exceptional cases only during special bilateral meetings between Military Intelligence chiefs. – Interviews of the author with Col.-Gen. Zikulov, Sofia, March–April 2005.

potential and scientific and technical achievements" and to "acquire samples and documentation of newest armament and military equipment" in the countries under reconnaissance[19]. During the WP Military Intelligence session in Prague in October 1977 several national representatives raised the question for extension of the scope of issues discussed at the S&T Military Intelligence Commission. However, the Chairman of the commission, Lt.-Gen. L. T. Kostin predicted that the WP Staff' Technical Committee could try to subordinate the S&T Military Intelligence Commission, which would not be allowed. Gen. Kostin suggested as well that the commission must function only as a consultative, but not as a coordinative body since the coordination of the Military Intelligence tasks was assigned to the annual meetings of the Military Intelligence chefs[20].

According to the long-term agreement for the period 1975–1980, collaboration between the KGB and Bulgarian Foreign Intelligence services in procuring military S&T intelligence included acquiring new information on US *Trident* nuclear submarines, *Minuteman* cruise missiles, the *B-1* strategic bomber, and other items[21]. As a result, in the period 1976–1978, the PGU-KGB's Directorate "T" sent 643 S&T intelligence references to Sofia, 313 of which were military-related. In 1976 and 1977, the Bulgarian Scientific Intelligence Department sent 463 classified references to Moscow, eight of which were assessed as "extremely valuable", 82 as "valuable'', and another 174 as "interesting information"[22].

In particular, the newly accessible documentation of the PGU-DS 7th Department reveals quite intensive activity on the part of its very important agent, codenamed "Delon". In the early 1960s, he was appointed to the United Nations office in Geneva and initially maintained contacts with other Bulgarian foreign intelligence departments using the codename "Hamlet". Over the years, his career as a UN employee progressed well, and in 1972 he was transferred to the 7th Department. "Delon" continued to work for the Bulgarian intelligence service until his retirement in 1988. During the period 1973–1974 alone, "Delon" sent to Sofia 1209 pieces of S&T intelligence, 655 of which were passed on to the KGB. In 1976–1977 668 more documents from "Delon" were delivered to the KGB, 164 of which dealt with electronics. The Soviet experts assessed 3 per cent of that information as "extremely valuable", 28 per cent as "valuable", and 54 per cent as being of "information interest". Another report of 1979 revealed that in the meantime, the KGB had reassessed some more of "Delon's" documents as "extremely valuable" or "valuable"[23].

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19 *ACDDAABCSSISBNA* – VR, Microfilm 01008-60, Delo 7, t. II, p. 67.

20 *ACDDAABCSSISBNA* – VR, Fond 23, Opis 0928, File. 737, p. 29–30.

21 *ACDDAABCSSISBNA* – R, Fond 9, Opis 3, File 435, p. 44–47.

22 *Ibid*., File 169, p. 200–204.

23 *Ibid.,* File 171.

In the 1970s, the main priorities of the Bulgarian S&T intelligence service besides the "military field" were Western achievements in the so-called "new technologies" – microelectronics, biochemistry, pharmaceutics, etc. According to a summarized report from 1980, Bulgarian S&T intelligence-gathering had included a decade-long program called "Electronics-S" (1970–1980), under which 487 comprehensive documents totaling 38 582 pages and 102 models and patterns of integrated circuits, data storage devices, and micro computers were obtained. The information contributed significantly to the development of electronic production at the first Bulgarian computing machinery company *IZOT* (established in 1968) and at the *DZU* factory for data storage devices (established in Stara Zagora in 1973), which became a leading source of new "Winchester" type hard and floppy memory discs for the Soviet bloc. During the implementation period of Program "Electronics-S" in the mid-1970s, there were 12 factories and research centers in operation in different parts of Bulgaria. The first 56 MB hard discs were obtained in 1975 from the US company *Memorex*, the next generation of 200 MB hard discs were bought in 1977 in Japan, and the 317 MB "Winchester" hard discs, produced by a leading US firm, were obtained in 1978, also via Japan.

In the field of the defense industrial complex another large machinery group for "special electronic devices" (DSO *Electron*) was established in 1976. It included more than fifteen factories and laboratories, which leadership almost in total comprised by military senior officers (mainly engineers, physicists, chemists and other high-tech experts). Under the Ministry of Defense was established as well another machinery group *Metalchim* for strictly military production and new weapon systems. Both Foreign and Military Intelligence services received requests to obtain a large variety of technical information for the needs of the defense industrial complex.

From the beginning, the strategic guidance of the S&T intelligence services was supervised by an influential member of the Politburo of the CC BCP, who reported directly to Todor Zhivkov. From the mid 1960s to the early 1970s, the scientific intelligence activity was supervised by Prof. Ivan Popov, minister of Machinery Building and a Politburo member. In 1977, he was replaced by Ognyan Doynov, a CC BCP secretary and also a Politburo member. The most important and top-secret decisions regarding scientific intelligence were made personally by three Politburo members – Todor Zhivkov, Ognyan Doynov, and the interior minister, Dimitar Stoyanov. It was also during those years that a secret governmental resolution of 8 April 1975 established the first S&T intelligence joint venture firm registered abroad: *INCO* (INdustrial COoperation). Its primary goals were to facilitate the purchase of modern electronics and machinery equipment, which was subject to sales restrictions by the COCOM, from Austria, West Germany, and Great Britain. In 1973, the Bulgarian S&T intelligence service started the development of a "subsystem for scientific, technical, and economic information with limited distribution". This subsystem was managed by a special Centre for Applied Information (TsPI), which worked under cover at the state Central Institute for Scientific and Technical Information (TsINTI).

On 30 October 1979, the Politburo of the CC BCP approved a secret decision to expand the 7thDepartment into the Directorate on Scientific and Technical Intelligence (DSTI) at the DS First Main Directorate (PGU). According to the Politburo decision, the DSTI's activity was under Zhivkov's personal control[24]. At the time of this transformation, the DSTI staff consisted of 98 officers. The Directorate had operational officers in 13 countries. For instance, 20 officers worked abroad on Program "Electronics-S". A top-secret resolution by the Politburo of the CC BCP of 25 June 1980 stipulated that the scientific intelligence personnel was to be increased by 95 new officers, 65 of which were designated for work abroad. The new Directorate was structured into five departments. Two were geographic (linear) departments: the first department covered the USA and Canada, and the second department was responsible for Europe, Japan, and India. The third department coordinated the intelligence activity inside the country. The fourth department ("Information and Analyses") included the Centre for Applied Information, and the fifth department dealt with "embargo operations". The fifth department also controlled the work of the foreign trade firms *INCO* and *Insist*. Under the secret governmental order R-41 of 19 April 1983, *INCO* was ordered to establish branches in Vienna, Frankfurt, and Tokyo. At the end of the 1980s Bulgarian S&T Intelligence registered the new firm *Setron* in Liechtenstein, which had a branch called *DPA* in Israel with the principal goal of circumventing COCOM export limitations. Finally, via a cover firm in Vienna, DSTI bought the British company *Data Magnetics* Ltd.

In the late 1970s and early 1980s, more intensive bilateral and multilateral intelligence cooperation took place. The Soviet bloc's first multilateral meeting on S&T intelligence was held in Budapest in 1979, and the second one in Sofia in October 1983. The Sofia meeting was attended not only by all Warsaw Pact members except Romania, but also by intelligence delegations from Cuba and Vietnam. Regarding bilateral exchange, in the period 1978–9, the Bulgarian State Security service received 256 pieces of S&T information from East German foreign intelligence service (HVA), most of them rated "valuable". In 1980, DSTI sent 121 pieces of S&T information to its Hungarian counterpart. During the bilateral meetings in Havana in January 1981 and in Sofia in July 1981, the Cuban intelligence chiefs informed the Bulgarians that they had gained access to US technical documentation via their agents inside the Cuban emigré community, and from the territory of a "third country" (Mexico)[25].

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[24] *TsDA*, Fond 1-B, Opis 66, File 2022, p. 3.

[25] *ACDDAABCSSISBNA* – M, Fond 1, Opis 12, File 263, p. 169; File 352, p. 2; File 437, p. 42.

During the so called “Euromissile” crisis at the end of 1970s – early 1980s the main task set to the Intelligence services was the full-scale monitoring for the indications of a sudden NATO nuclear missile attack against the USSR, an operation code-named *VRYAN*. Even in January 1977 the Bulgarian Minister of the Interior, Dimitar Stoyanov, signed an order I-7 regarding “revealing the indications of a possible enemy preparation for a sudden missile-nuclear attack”. In 1981 a special program on this issue was adopted, while at the WP Foreign Intelligence services meeting in Moscow in May 1982 *VRYAN* was defined as a “principal task”[26]. The Military Intelligence services also focused their attention on the tasks of disclosing the sites with disposition of new nuclear missiles in Western Europe and monitoring the “indicators for a sudden nuclear missile attack”. During the WP Military Intelligence services meeting in East Berlin in 1980 and again at another multilateral Military Intelligence meeting in Prague in 1981 it was agreed to exert their efforts on reconnaissance of *Pershing II,* MX cruise missiles, and AWACS systems[27].

However, in the early 1980s, the Eastern European scientific intelligence services suffered several failures with serious consequences. The most destructive of these was the so-called “Farewell” affair between 1979 and 1981, when former Directorate “T” officer Lt. Col. Vladimir Vetrov handed over to the French secret services the names of more than 250 KGB S&T personnel and about 50 other foreign agents and informers. In July 1981, French President François Mitterrand passed on this extremely sensitive intelligence information on Soviet S&T penetration to his US colleague Ronald Reagan during a NATO summit in Ottawa. Urgent US countermeasures were taken, including the signing of President Reagan’s Executive Order No. 12 333 of 4 December 1981, two categorical requests to expand COCOM’s “List of Goods Controlled for Strategic Reasons and Subject to Embargo”, and finally the National Security Decision Directives NSDD 66 of 13 November 1982 and NSDD 75 of 17 January 1983. The two presidential directives, in particular, called for “an agreement to add critical technologies and equipment to the COCOM list” (NSDD 66) and advanced “controls on advanced technology and equipment beyond the expanded COCOM list” (NSDD 75)[28].

In June 1981, the FBI arrested one of the most successful Polish S&T intelligence officers, the president of the Polish American Machinery Company (POLAMCO), Marian Zacharski, described by the Western media as the “Silicon Valley Spy”. Major Zacharski succeeded to obtain from US radar system firm

[26] See: Jordan Baev, “Von der Entspannung zur Kriegspsychose. Die bulgarischen Sicherheitsdienste und der Letzte Hohepunkt des Kalten Krieges 1975–1985”, In: Torsten Diedrich und Walter Suss /Eds./, *Militar und Staatssicherheit Im Sicherheitskonzept der Warschauer-Pakt-Staaten,* (Berlin: Ch. Links Verlag, 2010), p. 347–349.

[27] *ACDDAABCSSISBNA* – VR, Microfilm 01395-864, p. 6.

[28] http://www.dod.gov/pubs/foi/reading_room/737.pdf.

top secret information on *Patriot*, *Phoenix*, and *Hawk* missiles, *F-15* fighter, *B-1* "stealth" bomber, etc. In December of the same year, he was convicted and sentenced to life imprisonment. On 23 September 1983, during a secret meeting with a potential informer on US nuclear weapon systems in a small restaurant in New York, Bulgarian S&T intelligence officer Penyu Kostadinov was arrested by FBI agents. Lt. Col. Kostadinov had been working undercover in the USA posing as a deputy commerce counselor at the Bulgarian mission in New York. A month later, a physicist from Dresden was arrested in Boston. Alfred Zehe had been tasked by the East German HVA foreign intelligence service with examining new documentation on US submarine sonar technology.

In the following months, the Warsaw Pact intelligence services exchanged views on how to resolve those new issues. The Zacharski and Kostadinov cases were discussed during a visit of the Bulgarian intelligence chief, Gen. Vasil Kotsev, in Warsaw in September 1984 and at forthcoming talks in November with the head of the Soviet foreign intelligence service, Gen. Vladimir Kruychkov[29]. However, after back-channel negotiations with the US authorities via the East German lawyer Wolfgang Vogel over the next few months, on 11 June 1985, the biggest prisoner exchange in recent intelligence history was accomplished at the famous Glienecke Bridge in Berlin[30]. Marian Zacharski, Penyu Kostadinov, Alfred Zehe, and a KGB courier, Alice Michelson, were exchanged for 19 East German and six Polish "low-level" CIA agents. An interesting epilogue of the case was the unusually open Radio Address to the Nation delivered by Ronald Reagan "on Counterintelligence Activity", just two weeks after the swap in June 1985:

> *"As the West pulled ahead, the Soviets embarked on a major effort to catch up by stealing or buying what they need from classified information on American satellites, reports on future weapon systems, including our combat aircraft bombers, to our most advanced technologies from high-tech areas like Silicon Valley in California […] We should begin by recognizing that spying is a fact of life and that all of us need to be better informed about the unchanging realities of the Soviet system […] Next, we need to reduce the size of the hostile intelligence threat we're up against in this country. Some 30 to 40 percent of the more than 2,500 Soviet-bloc officials in this country are known or suspected intelligence officers."*[31]

Among the most important joint Soviet-Bulgarian S&T intelligence projects in the 1980s were the bilateral agreements for the construction of factories making

[29] *ACDDAABCSSISBNA* – R, Fond 9, Opis 4, File 663, p. 30.
[30] "An East-West swap", *Time*, 24 June 1985.
[31] *The Public Papers of President Ronald W. Reagan*. Ronald Reagan Presidential Library. http://www.reagan.utexas.edu/archives/speeches/1985/62985a.htm .

high-tech automated flexible manufacturing systems (FMS) and disk memory storage devices on Soviet territory using the capabilities of the Bulgarian Scientific Intelligence Service and its cover foreign firms. The first Soviet requests on the matter were raised in 1981 by the Soviet Ministry of Radio Industry, and more followed after a visit by the future general secretary of the CPSU CC, Mikhail Gorbachev, to the leading Bulgarian data storage device company *DZU* in Stara Zagora in September 1984, just half a year before his election as leader of the USSR. The first project was codenamed "Don", an extension to the broader Soviet secret program "Amur". It envisaged the building of a factory for disc storage devices in the city of Penza, about 600km from Moscow. The equipment for that factory had been procured through a foreign branch of the Bulgarian S&T intelligence company *INCO* in Frankfurt. The next project, codenamed *Neva*, started in 1987, aiming to secure the equipment for a larger Soviet factory in the city of Kostroma on the Volga River. The contractors from the Bulgarian side were the S&T intelligence companies *Insist* and *Setron* in collaboration with *DZU* in Stara Zagora (in 1987, *DZU* was transformed into economic group coordinating the activity of more than 30 smaller branches in the country). Bulgaria and Hungary dropped out of the project in 1990, and when the factory was finally built in 1994, all of the constructions and equipment were totally outdated.

In a Foreign Intelligence report on collaboration with KGB PGU Directorate "T" department for 1985–1987 it was reported that DSTI had sent to Moscow 1326 pieces of S&T information and 61 samples, and the Soviets announced that 94 per cent of the received information was "used" for different goals. 489 pieces of intelligence information were addressed for Soviet Ministry of Defense, while other 51 were re-directed for the needs of Soviet defense industry. About 80 per cent of all 1233 KGB S&T intelligence information received in Sofia was in the field of electronics and IT technologies, and less than 10 ten referred to strictly military issues. During a bilateral meeting in Sofia in May 1987 the chief of KGB Directorate "T" Gen. Leonid Zaytsev requested from its Bulgarian partners to use their "operational resources" for obtaining more information on the construction of joint US-West German new Rockwell-MBB fighter *EX 31-A*, ATB "Stealth" Bomber *B-2*, *JF-90* Euro-fighter, and the hypothetical *F-19* "Stealth" fighter (which in fact never existed, but was mentioned in a Tom Clancy novel in 1986). Among the S&T intelligence priorities, underlined by Directorate "T" delegation, were fifth generation computers, "artificial mind" projects, European *EUREKA* long term research program, and USA *SDI* concept[32].

The third – and last – multilateral meeting of the Soviet bloc S&T intelligence services was scheduled for May 1989; however, it was postponed to the end of June. This time, the meeting was attended not only by the Warsaw Pact countries,

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32 *ACDDAABCSSISBNA* – R, Fond 9, Opis 4, File 576, p. 190–212.

Cuba, and Vietnam, but also by a representative from Mongolia. During the talks with the chiefs of the other delegations the Bulgarians agreed on next joint tasks, among them to acquire documentation and samples of various components of new weaponry like *LEOPARD* and *MERKAWA* tanks. The last ever bilateral meeting between the KGB-PGU Directorate "T" and DS-PGU DSTI representatives was held in Sofia from 23 to 26 October 1989. According to a report by DSTI Deputy Chief Col. Lyubcho Mihailov of 30 October, the two delegations discussed possible new opportunities for further joint interaction in the NATO countries and Israel. At the end of the working meeting in Sofia, a quite ambitious "table of mutual obligations" was agreed; however, it never came into effect[33].

In the mid-1980s the structure and activity of Military S&T Intelligence departments were visibly improved, particularly in the field of analytical expertise and information delivery. According to five summarized reports of 16 December 1986, 13 January, 3 April, 16 September and 9 November 1987[34], the Military Intelligence Service provided to various government agencies 13 different Information Bulletins annually. The information was transferred regularly not only to MoD departments and Armed Forces command structures, but also to the Central Institute of Scientific and Technical Information (TsINTI) as a primary government agency. At the next level the appropriate technical data had been distributed among 420 various organizations – 45 scientific centers, 15 universities, 120 commercial organizations, and 240 firms and factories. Most of those thematic Information Bulletins were prepared by Department 1-B of "Information" Directorate. The most important surveys, like the Bi-Monthly Bulletin "Novelties for Armament and Military Equipment in the capitalist states", were sent directly even to Todor Zhivkov in his capacity of a Head of State and Chairman of the State Defense Committee (DKO). The Military Intelligence service improved also the management of the advanced requests' mechanism. Thus, about 80 per cent of the acquired 472 S&T pieces of intelligence in 1986 were executed by requests from 31 military and civilian agencies. In 1987 were received 479 S&T pieces of intelligence (121 000 pages in total) by requests of 32 different institutions (23 military and 9 civilian agencies and firms).

The last multilateral meeting of WP Military Intelligence Scientific & Technical Commission was held in November 1988 in Prague. It discussed particularly the tasks of acquiring more reliable information on US precision guided weapons systems, newest digital methods for information transfers, and the establishment of NATO ACCIS system (Automated Command, Control and Information System)[35]. Similar to Soviet bloc Foreign Intelligence services joint IT

33 *Ibid.*, File 619, p. 147–170; 255–259.

34 *ACDDAABCSSISBNA* – VR, Microfilm 1550, File I-1551, Delo 201-A.

35 *ACDDAABCSSISBNA* – VR, No. 3019, p. 1–11. Previous meetings of the S&T Military Intelligence Commission were held in Sofia (1979), Warsaw (1980), East Berlin (1981), Prague (1982), Moscow (1983), and Budapest (1985).

database project *SOUD*, which started to function in 1980, Warsaw Pact Military Intelligence services also agreed on introduction of joint intelligence database program called *OBZOR* [Survey]. The first results of the multilateral automatic intelligence database system were discussed in September 1989 in Budapest. In the next – and last – experts meeting on *OBZOR* joint program in Prague in March 1990 the full mounting of the database system was scheduled for October same year, which never happened because of the Warsaw Pact military structures termination and consequent dissolution of the Pact itself.

The secret Bulgarian Military Intelligence monthly bulletins suggested also interesting data regarding the framework of special S&T intelligence interest on new Western weapon systems, such as US Army integrated intelligence *Assault Breaker* system, *PLSS* Intelligence Augmentation system, US antitank missile complex *FOG-M* program, heavy antitank missile complex *AAWS-H*, Italian antisubmarine missile complex *MILAS ASW*, Japanese tank *Type 90*, US nuclear guided ballistic missile *SRAM-2 AGM 131A*, *F-117A* tactical fighter, Italian tank *C-1 Ariete*, etc.[36] Obviously, those documentary reviews were based not only on HUMINT and SIGINT operations, but also on revealed open sources and the information exchange with the other Warsaw Pact countries. The broader range of tasks, assigned to some Bulgarian Military Intelligence officers under cover in Western Europe could be shown by the case of agent *Diogenes* who worked in the late 1970s and in the 1980s for a British programming firm with large commercial contacts in the USA and Japan. According to some instructions, received by *Diogenes* from Sofia, he was requested to acquire information on new technologies of data storage, quantum optics and magnet microelectronics, supersensitive organic and non-organic substances, nuclear spectrometry detectors, etc.[37]

During the second visit of US Deputy Secretary of State John Whitehead to Sofia in February 1988, he officially raised the question of terminating the Bulgarian S&T intelligence activities on US territory. Exactly three months after the so-called "palace coup" in Bulgaria on 10 November 1989, Bulgaria was visited for the first time by a US secretary of state. In his confidential talks with the new state leaders on 10 February 1990, James Baker directly requested the

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36 Ibid., No. 10-490. Bulgarian Military Intelligence "Information" Directorate prepared as well periodical reviews on particular S&T issues, such as: *Оптико-електронната техника в армиите на капиталистическите страни* [Optical-electronic technologies in the armed forces of the capitalist countries], Sofia 1986; *Новости във въоръжението и бойната техника във ВМС на капиталистическите страни* [Novelties of the armament and military equipment in the Navies of the capitalist countries], Sofia 1987; *Новости във въоръжението и бойната техника във ВВС на капиталистическите страни* [Novelties of the armament and military equipment in the Air Forces of the capitalist countries], Sofia 1987; *Изследвания в САЩ по създаване на двигатели за летателни апарати и управляеми ракети с хиперзвукова скорост* [Research in the USA on creation of engines for supersonic aircrafts and guided missiles], Sofia 1988, etc.

37 *ACDDAABCSSISBNA* – VR, RD 1386E.

liquidation of the Bulgarian scientific intelligence services as a precondition for the development of US-Bulgarian relations. A few days later, Prime Minister Andrey Lukanov insisted that the foreign intelligence chiefs organize the termination of DSTI. When the Bulgarian National Intelligence Service (*NRS*) was reorganized in March 1990 and subordinated to the president of Bulgaria, the new structure did not include any unit or personnel to deal with S&T intelligence matters. The Bulgarian Military Intelligence Directorate was restructured and subordinated to the Minister of Defense in the next few years under the name *Military Information* service, while at the end of the 1990s the General Staff' Military Scientific and Technical Institute was closed with a governmental decision. Those acts marked the end of the story of the Bulgarian scientific and technical foreign and military intelligence units, which were established and functioned in the Cold War years.

Captain de Corvette Blaise Mbue Ngappe (Cameroun) L'evolution de la communication dans la bataille contre les coupeurs de routes au Cameroun

Introduction

Aux confins des frontières entre le Cameroun, la République Centrafricaine et le Tchad, s'est constitué un véritable phénomène de la violence rurale, qui prend des visages multiples : embuscades sur routes ou pistes ; prises d'otages avec demande de rançons ; bouclage des domiciles, villages et bergeries ; vols des bétails à grande échelle ; viols des femmes ; amputation des membres ; trafic d'armes et assassinats, etc. Cette insécurité s'étend naturellement sur la frontière entre le Cameroun et le Nigeria, faisant du Nord-Cameroun jusqu'à une période récente, une zone géographiquement prise en tenaille par une menace asymétrique et essentiellement mutante. Cette violence est le fait des « zaraguina » ou coupeurs de routes, terme générique utilisé pour désigner les malfrats agissant en bande avec usage d'armes blanches ou à feu, incluant des armes de guerre[1]. Ils arpentent et écument les frontières ainsi que les zones rurales, mettant en ouvre la culture répandue de la rapine dans la région. Leurs activités mettent sérieusement en danger la sécurité de l'ensemble de la sous-région Afrique Centrale, obligeant les Etats à réactiver la coopération bilatérale en matière de sécurité. La coordination des efforts des gouvernements concernés témoigne non seulement de la prise de conscience du fléau que représente le banditisme transfrontalier, mais également de la volonté politique d'y trouver une solution durable. Les figures et formes d'expression au sens communicationnel sont capitales pour avoir un avantage sur l'adversaire dans cette bataille non conventionnelle. Leur connaissance est déterminante pour comprendre l'évolution de cette catégorie de menace qui s'apparente, par ses modes d'actions indirectes et par la réponse qui lui est réservée, à une guérilla. Cette étude qui n'a pas tenu compte de l'impact du téléphone portable récemment vulgarisé dans la région, ni de la contribution des masses médias, présente les modes de communications utilisés au Cameroun par les belligérants comme procédant d'un art militaire qui s'adapte en fonction de la mutation de la menace qui, elle-même, est fonction de l'évolution de la bataille engagée par les Forces de maintien de l'ordre.

I. Description du phénomène

Le banditisme rural a de tout temps existé dans les savanes et les steppes africaines en général, et au nord du Cameroun recensé dans l'espace géographique

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[1] Rapport n° 110047/RAP/RMIA3/1er BIR/EM/103 du 18 janvier 2011.

du bassin tchadien en particulier. Jusqu'à la fin du XIXe siècle, période au cours de laquelle la colonisation européenne a pris possession de la région, sonnant ainsi le glas des grands empires tels le Ouaddaï, le Baguirmi, le Wandala ou le Bornou, les razzias constituaient un mode d'accumulation quasi légal. Pour les grandes hégémonies politiques, les razzias organisées par les armées en saison sèche permettaient de renflouer les caisses de l'Etat pendant les moments des crises de trésorerie. Pour les peuples, ces pillages aidaient à pallier aux déficits des ménages, à compenser les mauvaises récoltes et à reconstituer les troupeaux décimés par les épizooties ou la rareté des pâturages.[2] A la fois déviance de subsistance et violence conservatrice de mode de vie, la razzia était une forme d'économie parallèle normale. Celui qui la perpétrait n'était sanctionné que s'il menait l'opération contre un membre de sa communauté ou quand il avait manqué de rapporter au chef de la communauté, la part du butin qui lui revenait de droit de part la coutume qui en fait l'usufruitier de toute source d'accumulation.[3] L'enracinement de la razzia a généré une économie de rapine à laquelle participent les détenteurs de l'autorité, les communautés ethniques, les familles et les individus à titre personnel. Elle est apparue valorisante et intégrée comme une culture régionale, permettant aux jeunes gens de s'affirmer en démontrant leur bravoure, leur virilité et même leur aptitude à mériter une épouse[4].

Avec l'avènement de la colonisation et la création des Etats, les razzias d'Etats perpétrées par les armées régulières des Empires constituées, prirent fin. Toutefois, la pratique persista et passa à la clandestinité. En effet, passant outre les interdictions coloniales, des groupes partageant quelques affinités continuèrent à s'organiser pour des vols occasionnels, tendant épisodiquement des embuscades en saison sèche et cultivant leurs champs en saison des pluies. Nombre d'entre eux furent appréhendés par les goumiers et autres gardes régionaux mis en place par l'administration coloniale[5]. Si certains auteurs des meurtres sont systématiquement condamnés à la peine capitale et exécutés sur la place publique, si d'autres détenus sont morts en prison, il reste que la proportion des évadés ainsi que d'anciens détenus est la plus importante et la prison, un lieu de rencontre et de stage pour le développement de nouvelles stratégies de vols. Pour la plupart de ces repris de justice devenus fugitifs, la brousse fut à la fois pourvoyeuse de refuge et de ressources pour le mode de vie de prédateurs auquel ils allaient se destiner pendant de longues années. Ainsi naquit le banditisme rural professionnel, transethnique qui a survécu à la proclamation des indépendances africaines.

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[2] S. Issa, " Les mutations polémologiques du banditisme transfrontalier en Afrique Centrale", *Enjeux*, n° 33, (décembre 2007).

[3] Ibid. ; entretien avec l'auteur à Maroua, le 09 mars 2012.

[4] D. Grévoz, *Les Méharistes français à la conquête du Soudan 1900– 1930*, (Paris, L'Harmattan, 1994), 88.

[5] Ibid, 91.

L'obtention de l'indépendance du Cameroun dans un climat de guerre civile, avec une rébellion qui ne sera vaincue qu'au début des années 1970, n'a pas permis au jeune Etat de se saisir pleinement du phénomène en vue de son éradication. La dénonciation dans les discours officiels de cette forme de raquette commence au début des années 1980[6], s'accompagnant avec l'organisation de la lutte contre le fléau. Mais les violences politiques post -indépendance dans les pays voisins du Cameroun, particulièrement en République Centrafricaine et au Tchad, vont générer la circulation massive des armes de tous les calibres. L'issue de ces conflits et coups d'Etat successifs, caractérisée par l'échec des politiques de réinsertion des anciens combattants, l'errance des groupes armés, les déserteurs et soldats en quête d'amélioration de leurs soldes par des voies criminelles, vont compliquer la nature du phénomène des coupeurs de routes ainsi que les moyens militaires engagés pour cette lutte.

II. Les moyens militaires engagés dans la bataille contre l'insécurité.

Le Cameroun a très tôt pris conscience de l'urgence qu'il y avait à sécuriser la nation. En tant que jeune Etat ayant connu de nombreuses amputations territoriales[7], qui accède à la souveraineté en pleine guerre froide au prix du sang et avec les moyens modestes, il apparait évident aux autorités que pour faire face à la rébellion et sécuriser son territoire, il faut créer très rapidement une armée nationale et faire de la défense une affaire de tous[8]. Les moyens mis dans la bataille contre les coupeurs de routes s'inscriront donc dans le cadre de la mise en place progressive d'une armée garante de l'indépendance et apte à la lutte contre l'insécurité à l'intérieur. C'est ainsi que l'ordonnance n° 59/57 du 11 novembre 1959 portant création des forces armées camerounaises et l'organisation générale de la défense est prise un mois avant même l'indépendance. L'on va dès lors procéder tour à tour à l'accroissement des effectifs, à la définition des missions, au ciblage des zones, au quadrillage du pays et à la formation de l'esprit patriotique. En effet, pour disposer des effectifs pouvant faire face aux rebelles, un certain nombre de mesures ont été prises. Si l'arrêté n° 3697 du 12 novembre 1959 n'autorisait que le recrutement de 300 soldats pour le premier contingent, l'on va rapidement passer

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6 http://camerounlink.net/vip/?Session ID ; Discours du Président Amadou Ahidjo, le 13 février 1980 à Bafoussam, lors du 3ème congrès ordinaire de l'union nationale camerounaise.

7 J. V. Ntuda Ebodé, ‟La nouvelle posture géopolitique du Cameroun et la lutte contre la piraterie dans le Golfe de Guinée", *Piraterie et terrorisme : de nouveaux défis sécuritaires en Afrique Centrale* (Presses Universitaires d'Afrique, Yaoundé, 2008) 50; A-H. Onana Mfegue, *Le Cameroun et ses frontières : une dynamique géopolitique complexe* (Paris, L'Harmattan, 2004) 10. En 1914, la superficie du Kamerun sous Protectorat allemand était de 750 000km2. Après la proclamation de l'indépendance et la réunification, le Cameroun s'étend sur une superficie évaluée à 475 442 km^2.

8 Ntuda Ebodé, Ibid, 51.

à une montée en puissance des effectifs de l'armée de terre, secteur principalement concerné par la lutte contre la rébellion armée.

Ainsi, de janvier 1960 à mars 1961, près de sept formations seront créées au sein de l'armée de terre. Il en sera ainsi du premier bataillon composé des premières recrues de novembre 1959 ; du deuxième bataillon d'infanterie, composé de 320 nouvelles recrues et de 70 militaires en provenance de l'armée coloniale française, lequel sera aussitôt lancé dans la lutte contre la rébellion en pays bamiléké dès juillet 1960 ; du troisième bataillon d'infanterie composé de 132 militaires venant de l'armée nigériane en mars 1961[9] ; de la mise sur pied d'un escadron blindé, d'une compagnie de génie et de la compagnie d'Etat- Major qui va avoir pour mission de coordonner l'évolution des forces armées camerounaises. Les commandements opérationnels de la Sanaga Maritime et de l'ouest du pays pour lutter contre la rébellion, ainsi que la mise sur pied du centre d'instruction de Ngaoundéré où s'opère la formation initiale de tous les militaires, complètent le tableau de la montée en puissance de l'armée du jeune Etat. La mission principale des Forces de défense dans ce contexte est déterminée par le décret n° 61/22 du 16 mars 1961, portant création et organisation du service de renseignement militaire et de la sécurité des forces armées du Cameroun. Elle est de rechercher, neutraliser et éliminer les individus ou organisations portant atteinte ou susceptibles de porter atteinte à la sécurité des forces armées, aux populations et à leurs biens ; d'élaborer les mesures de protection du secret, du moral, du potentiel matériel utiles à garantir la sécurité des forces armées et d'en contrôler l'exécution.

Lorsque la rébellion est vaincue en 1970 et que commence la lutte contre les coupeurs de routes après une période de consolidation de la paix et de l'amorce du développement qui a duré dix ans, le phénomène est considéré comme un problème courant de maintien de l'ordre. La mission confiée a l'armée dès sa formation s'applique alors dans la continuité. La réorganisation administrative du Cameroun en dix provinces à partir de 1983, qui s'accompagne avec le déploiement des unités de gendarmerie sur l'ensemble du territoire, ainsi que l'implantation des Bataillons d'infanterie motorisée, contribuent à renforcer les mesures de sécurité dans les provinces de l'Adamaoua, de l'Extrême- Nord et du Nord, particulièrement concernées par le phénomène des coupeurs de routes. Mais dans cette bataille contre un ennemi de la population qui vit avec la population et se confond à elle, mieux que le déploiement d'un arsenal militaire imposant, c'est la maitrise du renseignement et la communication qui constituent un enjeu majeur tant pour les malfrats que pour les forces régulières.

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[9] R. C. Meka, *La Force Noire : des origines à l'intégration de l'élément camerounais* (Brochure publiée à l'occasion de la célébration du cinquantenaire de l'Armée camerounaise, Bamenda, décembre 2009).

III. Evolution du matériel de la communication.

Le matériel de la communication ici est l'ensemble des moyens classiques destinés aux opérations militaires, concernant le matériel radio et téléphonique dont l'évolution est restée constante. De 1960 à 1976, le matériel radio High Frequency (HF), avec des émetteurs distincts des récepteurs, très rayonnant et de grande portée, est utilisé au niveau central. Dans la même période au niveau des formations, le matériel consistait en des postes émetteurs/récepteurs HF pour la transmission des instructions et recommandations du commandement dans la hiérarchie. Ils étaient complétés par des postes Very High Frequency (VHF) qui sont de courte portée, pour les unités sur le terrain opérationnel. C'est le cas de l'AN PRC 10, du TRPP 8 d'origine américaine et de l'émetteur/récepteur SRC d'origine française. Quant au matériel téléphonique, il est pour l'essentiel composé des centraux téléphoniques de campagne (BD 71 et BD 72 ; TT1 et TT2)[10].

De 1976 à 1983, la période est marquée par le renforcement du matériel radio et téléphonique, ainsi que les groupes de maintenance. Le matériel radio est alors composé de bandes latérales uniques, de RACAL 906 et 922, ainsi que des postes TRC Thompson. En 1981, les transmissions se dotent des matériels de marque allemande à l'exemple du SHELTER, monté sur véhicule UNIMOG, équipé du matériel HF et VHF de la société TELEFUNKEN. L'on a ensuite procédé à l'acquisition des matériels d'origine française et de marque SHELTER, montés sur les VLRA, de type TRC 340 ou 380, ainsi que l'équipement des formations par des postes TRC 300, 344 et 383.[11] Pendant ce temps, le matériel téléphonique a été amélioré par la mise en place des centraux électromécaniques d'une capacité pouvant atteindre une centaine d'abonnés. Le maintien en bon état de fonctionnement de ce matériel est assuré par les techniciens radio, électromécaniciens et les techniciens fils, formés au Cameroun et dans les pays amis.

Après 1983, le renforcement de l'équipement des transmissions a conduit à la mise en service des produits qui permettent une intégration plus avancée dans l'univers des télécommunications. Dans l'ensemble, ces moyens communicationnels conjugués ont permis à l'armée de mieux coordonner les actions sur le terrain pour vaincre graduellement l'insécurité et amorcer le développement du pays. Mais ils sont restés insuffisants et inadaptés pendant de longues années dans la bataille contre les coupeurs de routes, compte tenu de la nature de ce nouvel ennemi et de son mode opératoire toujours révisé.

IV. Les moyens de communication des coupeurs de routes

A la suite de multiples guerres civiles, rébellions et changement de régimes qui ont jalonné l'histoire politique des pays du bassin du Lac Tchad au voisinage

[10] J. NDOUM MVONDO, "Historique des transmissions dans les Forces Armées camerounaises de 1959 à 2010," (Document de travail non publié, Compagnie d'instruction des transmissions, Yaoundé).

[11] Ibid.

du Cameroun, et du fait de la crise économique, la grande criminalité rurale a vu l'entrée en scène de plusieurs acteurs. Elle s'est enrichie d'une main d'œuvre abondante du fait de la prolifération des sans emplois, d'une main d'œuvre experte puisée parmi les combattants anciens ou en activité et d'une logistique conséquente grâce à la prolifération des armes de guerre ainsi que des moyens de communication sophistiqués[12], passés aux mains des populations dans un contexte de militarisation de l'ethnie.

Dans ces vastes espaces frontaliers non couverts par les réseaux de communication militaires et perçus comme des protubérances de l'Etat en déficit d'autorité sur leur périphérie, soit parce qu'ils manquent d'infrastructures conséquentes, soit à cause des différents interétatiques, lesquels font de ces espaces poreux des zones de non droit, l'activité militaire est réduite. Cette insuffisance est méticuleusement exploitée par le banditisme militaire, organisé à travers la sophistication des moyens d'action des bandits civils, sous le contrôle des personnes les plus insoupçonnables.[13] Ils utilisent alors essentielleme des moyens de communication satellitaires de type Thuraya, pour la coordination des actions à l'interface des régions intérieures et des frontières d'Etats.[14] Cet avantage est complété par le fait que l'activité de la rapine culturellement pratiquée par ces populations, couvre une ère linguistique distincte, où le fulfulde et l'arabe sont les langues les plus parlées.

Ainsi, lorsque les gangs s'organisaient en bande pour couper les routes, les complicités dans la chaine de la communication étaient nombreuses. Ces informateurs- communicateurs tout au long de la procédure, se recrutaient facilement dans la population et même parmi les membres de la famille des victimes.[15] Des jeunes gens au regard apparemment anodin qui filent les commerçants, parviennent à détecter les personnes qui doivent être dépouillées dans un itinéraire donné, communiquent leur emplacement dans le véhicule aux membres de l'embuscade ; les chauffeurs véreux qui doivent utiliser les signaux particuliers dans un convoi pour indiquer aux malfrats le véhicule occupé par des personnes particulièrement recherchées ; des complices parmi les agents de banques qui ont pris la peine de communiquer les montants décaissés par certains hommes d'affaires,[16] etc. Sans être exhaustif, voilà un exemple de réseau de communication tel qu'il s'établit pour une opération des coupeurs de routes. Si une partie de cette communication

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[12] J-F. Bayart, S. Ellis and B. Hibou, *The Criminalization of the State in Africa* (Oxford/Bloomington/ Indianapolis, James Currey/Indiana University Press, 1999), 1–31.

[13] S. Issa, ''Les jeunes patrons du crime organisé et de la contestation politique aux confins du Cameroun, de la Centrafrique et du Tchad'' (International conference "Youth and the Global South: Religion, Politics and the Making of Youth in Africa, Asia and the Middle East" Dakar, Senegal, 13 – 15 October 2006).

[14] Ibid. ; Entretien avec l'auteur à Maroua, le 09 mars 2012.

[15] B. Abakaka, Commandant la compagnie de gendarmerie de Guider (interview du 07mars 2010 à Guider). ; Rapport de synthèse n° 106/4-EM/CIE/GDR du 08 juin 2009.

[16] B. Abakaka , Ibid.

est établie au contact, dans un environnement où tout le monde est obligé de collaborer avec la malhonnêteté au risque de se faire tuer, les grands acteurs situés à des kilomètres de distances et occupant des fonctions sociales les mettant à l'abri de tout soupçon pour de telles pratiques, cordonnent ces opérations criminelles et rentables par l'usage des téléphones satellitaires.[17] Un tel degré de collaboration et de coordination de la communication dans un système verrouillé, débarrassé de toute tentative de dénonciation auprès des administrations, a mis à mal les forces de maintien de l'ordre qui étaient réduites à venir après coup, pour constater les dégâts. Plusieurs années durant, l'armée a ainsi couru après ce phénomène régional, étendu sur de grands espaces, au-delà des limites des frontières d'Etats, avant de trouver des solutions par un art d'adaptation qui lui est propre.

V. Amélioration du dispositif militaire et des moyens de communication.

Le début des années nonante s'ouvre avec de nouvelles acquisitions en matériel de communication et la réorganisation du dispositif militaire sur le terrain. Dès 1993, plusieurs postes émetteurs/récepteurs de marque Yaesu, Motorola, Ramsès ainsi que le MP 25, sont acquis en vue d'élargir les possibilités de communication et de coordination des actions entreprises par les unités déployées sur le terrain. Dans les formations décentralisées, les matériels HF de marque Thompson sont utilisés et la fréquence des liaisons assurée. C'est le cas des TRC 383-B, 340 et 300-3 pour les liaisons sol-sol ; Socrate 40-40 B portatif pour les liaisons sol-air et Socrate 46-52 monté sur véhicule pour les liaisons sol-sol et sol-air.[18] La mise sur pied du projet Hélios au début des années 2000 vient couronner ces efforts d'amélioration des moyens de communication militaire. Il s'agit d'un système à composante infrastructurelle et opérationnelle, qui vient pallier aux insuffisances des équipements en moyens de communication précédemment acquis. Une vingtaine de centres et stations sont ainsi répartis dans les régions militaires couvrant tout le territoire, pour la transmission rapide des données.

Cette amélioration s'accompagne du redéploiement du dispositif militaire sur le terrain. A côté des bataillons d'infanteries motorisés, des compagnies, des brigades de gendarmerie et des unités de polices, l'Etat déploie des unités spéciales plus mobiles et mieux équipées pour faire face à la menace.[19] C'est ainsi que le Groupement polyvalent d'intervention de la gendarmerie nationale qui ratissait

[17] Ibid.

[18] B. Nzalli, Chef de troisième bureau à la Région militaire interarmées n°3 (Interview du 06 mars 2012 à Garoua).

[19] B. Mbué Ngappé, ''Les conflits au Tchad et leurs impacts sur la population civile au Cameroun'' *Actes XXXIV Congrès International d'histoire militaire,* (Trieste, 31 août– 05 septembre 2008, Tome II), 652–661. Dans le cadre de cette bataille, le Groupement Polyvalent d'Intervention de la Gendarmerie (GPIG) et les Bataillons d'Interventions Rapides (BIR) sont des unités spéciales au Cameroun. L'Office Central de Répression du Banditisme (OCRB) en Centrafrique et l'unité de Recherche, Assistance, Intervention et Dissuasion (RAID) au Tchad qui reproduit le RAID français, sont leurs équivalents dans ces pays, dressés contre le même ennemi.

les trois provinces septentrionales, va voir son action renforcée par la création des Bataillons légers d'intervention, qui deviendront ensuite des Bataillons d'interventions rapides avec des moyens de communication satellitaires permettant aux militaires spécialement préparés pour ce type de menace, de pouvoir opérer et communiquer dans les zones anciennement considérées comme étant abandonnées à la criminalité transfrontalière. Le redéploiement permanent de ces unités spéciales dans les marchés, sur les routes et aux abords des frontières a porté des fruits et ramener progressivement le calme dans les zones de grande criminalité.

Cependant, le tableau ci-dessous qui est un exemple du bilan des opérations du 1° BIR sur une période de dix ans de combat sans relâche, nous permet de faire un constat. Il montre suffisamment que si les routes et pistes sont devenues plus calmes avec l'éradication de la menace sous la forme des embuscades, celle-ci reste permanente chaque année, malgré les résultats obtenus sur le terrain. Ceci s'explique par le fait que les acteurs de cette forme de criminalité ont abandonné les voies routières et les pistes de marchés pour se transformer en voleurs de bétails, preneurs d'otages avec assassinats et demande de rançons. Car cette nouvelle activité transfrontalière parait plus lucrative et moins risquée, mais n'échappe pas à la détermination engagée pour la bataille contre le phénomène.

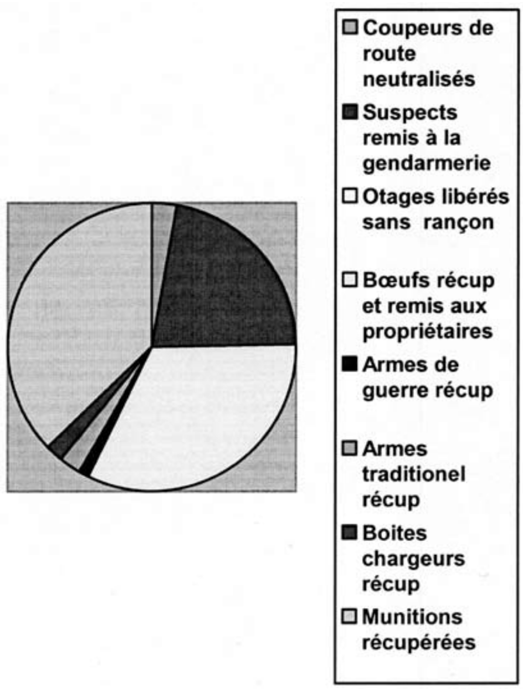
Lorsque l'armée a réussi à infecter le système de renseignement dans la préparation et l'exécution des embuscades, la population des coupeurs de routes a considérablement diminué et leurs activités en état de disparition sur le territoire camerounais. Toutefois, la forte répression de ces bandits par l'armée camerounaise a entrainé leur exode vers la Centrafrique et le Tchad, où se sont reconstituées des bandes plus redoutables et se sont établis des partenariats entre acteurs du crime. Les incursions sporadiques observées au Cameroun sous la forme des raids sur les villages avec repli de l'autre côté de la frontière, partent ainsi de ces bandes lourdement armées, qui ne manquent pas de complicités dans les zones ou familles choisis pour leurs opérations. En effet, certains chefs de gangs ont établi leurs réseaux de communications au Cameroun avant de quitter le pays sous la pression des forces spéciales et reviennent sur commande, pour des opérations militaires assimilables aux coups de mains. Leurs correspondants se recrutent à plusieurs niveaux. Il s'agit autre autres : des citoyens adeptes de la culture du rapt, qui veulent régler leurs comptes aux voisins par simple jalousie ou par le souvenir d'une dispute que l'on croyait oubliée ; des bergers véreux ou mal entretenus, qui organisent des prises d'otages avec rançon dans le but de se venger de leurs patrons et obtenir le gain voulu ; certains chefs de villages et hommes d'affaires qui tentent de reconstituer leurs gangs de l'autre côté de la frontière,[20] etc. Quel que soit le cas de figure, la maitrise du réseau de la communication reste l'effet majeur à réaliser pour la préparation, la coordination de toutes ces opérations et la réplique à elles réservée par les forces spéciales.

[20] B. Abakaka , Ibid.

TABLEAU ET GRAPHIQUE PRESENTANT LE BILAN DES OPS DU 1° BIR DE 2002 A 2011

OPERATIONS / ANNEES	Coupeurs de route neutralisés	Suspects remis à la gendarmerie	Otages libérés sans rançon	Bœufs récup et remis aux propriétaires	Armes de guerre récup	Armes traditionnelles récup	Boites chargeurs récup	Munitions récupérées
2002	08	62		92	03	07	06	105
2003	10	40		104	04	02	08	361
2004	11	42	23	155		04	17	271
2005	02	46	14	137	02	26	01	18
2006	08	59	31	500	04	13	13	557
2007	20	109	123	605	13	32	37	827
2008	27	121	118	455	21	15	42	866
2009	04	42	28	207	04	26	04	44
2010	30	122	62	267	16	18	57	1258
2011	33	81	07	333	27	06	63	1327
TOTAL	**153**	**724**	**346**	**2855**	**101**	**149**	**248**	**5634**

Source : Rapport n° 110047 du 18 janvier 2011 : Statistiques des opérations du 1° BIR année 2010.



Conclusion.

Du maintien de l'ordre renforcé, la répression du banditisme rural est devenue une préoccupation de défense nationale à cause du professionnalisme des bandits et de leur transmigration d'un Etat à l'autre. La logique du tout-répressif mise en œuvre, a abouti à un « assainissement » du climat sécuritaire. Les actions simultanées des unités spéciales de répression du grand banditisme ont donné une impression de sécurité retrouvée aussi bien en ville qu'en campagne. Mais l'une des constantes de l'histoire du banditisme de grand chemin en Afrique subsaharienne, c'est sa capacité à se reproduire, à muter au gré des changements de la politique répressive de l'Etat, et au gré de l'apparition de nouvelles conjonctures criminogènes, lesquelles disséminent de nouveaux vecteurs de l'agression et de nouveaux acteurs de la criminalité transfrontalière. Certes, la maitrise des réseaux, des techniques et des moyens de communications des coupeurs de routes par les forces régulières, a considérablement contribué à diminuer le phénomène au Cameroun. Mais elle n'a pas suffit pour l'éradiquer. Ainsi peut-on dire du banditisme transfrontalier qu'il est un phénomène cyclique. C'est dans ce sens que l'on a assisté, à partir de 2003, à l'apparition de la prise d'otages dans les zones frontalières comme nouvelle modalité du phénomène du banditisme de grand chemin. Les initiatives tripartites entre la Centrafrique, le Cameroun et le Tchad sous l'égide des Nations Unies ont initialement permis de faire un constat majeur : l'insécurité qui prévaut dans les zones transfrontalières de ces pays est sans surprise, activement entretenu par d'ex-combattants, des militaires démobilisés et des bandits de grand chemin en quête d'une vie facile. Avec cette mutation, une communication essentiellement basée sur l'échange des informations à temps entre les pays concernés et une franche coordination des moyens de lutte au cas où les volontés politiques s'accordent, peuvent permettre de porter un coup sévère à cette nouvelle menace qui s'impose dans les frontières interétatiques en Afrique centrale.

Dr. Azriel Lorber (Israel)

On the Acceptance of Technological Innovations for the Battlefield

Introduction

Although most modern military thinkers consider advanced technology (in the hands of either side) an important component of the overall quality of the force, it was not always so. In fact, there are numerous examples of military and political leaders that failed to appreciate new weapon systems and their potential effect on the battlefield. Admittedly, there is a caveat to this statement: Military men understood technological innovations, as long as these were incremental improvements in existing and familiar hardware – a lighter sword or a longer range rifle. But in numerous instances, the leaders did not understand or appreciate new ways of doing things; no matter how much better these innovations promised (or threatened) to be. The list of such items is endless, including, among others, the firing cap, torpedoes, machine guns, military aircraft, radar systems, military rockets, jet aircraft, artificial satellites, unmanned aircraft, active defense for APCs and the development of anti-missile defenses. The introduction of all these, and many others was derided, or actively resisted, and this happened in many countries and under all political systems. To be sure, all these were eventually developed and introduced (or countered, as the case may be) but in many cases it was a long up-hill struggle. Such delays contributed to increased casualty figures, wastage of resources and even total defeats. While the above examples (and many more similar ones) are all known we propose to look at them in a new way and possibly find a common denominator to these failures.

We define such rejections and delays as **Technological Failures**.

The Technological Failure and its causes

Basically, the technological failure stems from the lack of understanding of technological advances and their potential to change the battlefield. This lack manifests itself in two ways:

A. Not appreciating the importance (and inherent threat) of novel technology or devices available to the enemy.

B. Lack of appreciation of the importance and potential benefits of new technology or devices available to us (and thus not adopting them).

There are five major sources for technological failures;

1. Not understanding new technologies (and devices) which contribute to new weapons and their potential to change the battlefield and the nature of war.

2. Conservatism and general mistrust of new ideas.
3. The NIH (Not Invented Here) syndrome, leading to disdain for the enemy and his capabilities.
4. The assumption that the enemy thinks the same way we do.
5. Political Intervention.

It should be borne in mind that any technological failure may be caused by more than one of the reasons listed above. To illustrate, we will present some examples.

Some Case Studies

<u>The English debate on the V-2</u>

The first clear evidence to indicate that something was going on in Peenemünde came during May 1942. By March 1943 there accumulated more information about German development of "secret weapons", possibly long range ones, and the British high command considered the threat real enough to create a special working group (chaired by one Duncan Sandys) to investigate the matter. The trouble was that nobody really knew what form the threat might take. This was compounded by compartmentalization; other professional bodies, including the "shell" company which performed research in rocketry, were not consulted.

In June 1943 some "Torpedo Like" objects were discovered in Peenemünde (see fig. 1) and the initial assumption was that these were long range rockets.[1] Nobody yet thought in terms of guided missiles.

This discovery precipitated a major crisis as to the nature of these "objects" and whether they were indeed rockets. There was no dispute about their size: about 11meters long with a diameter of nearly 2meters. The established wisdom said that if these were solid fueled rockets (a technology which everybody was familiar with) they would weigh about 40 tons and their (rocket) motors would not be able to lift them.[2]

Professor Lindemann (Lord Cherwell), Churchill's scientific advisor, objected vehemently to any suggestions that the "objects" were rockets of any kind. He based his opinion on the thrust to weight considerations (for solid fuel) which on their own were correct. What's more, he found an ally. This was Dr. A. D. Crow, who was in charge of all rocket developments at the Ministry of Supply. Neither Lindemann, nor Crow were aware of liquid fuelled rocket research done in the US by Robert Goddard. But Crow did not know of another development initiated earlier, closer to home.

Lubbock, an engineer at the Shell Company did develop (on a 1941 request from the Ministry of Supply) a liquid fuelled rocket to assist aircraft take-offs

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1 Constance Babbington-Smith, *Air Spy* (Ballantine Books 1957) 150.

2 This was based on the weight of the fuel and the wall thickness (made of steel) necessary to contain the internal pressure of the combustion.

(RATO). In May 1943 Dr. Crow was invited to see a (successful) test of this rocket but did not report it to the Sandys working group of which he was a member. (They discovered about the test only in September.)[3]

Towards the end of June, still without definite knowledge on the nature of the German development, (and with some confusion caused by what later turned out to be the V-1 missiles) Churchill decided to bomb Peenemünde. This was done on the strength of R.V. Jones' arguments on the potential danger and in contrast to Lindemann's position.[4]

This bombing mission took place on the night of 17–18 of August, 1943. It did not cause the expected damage but it forced the Germans to disperse much of the research and most of the production activity to safer sites. The delays caused by this move precluded the V-2's employment against the invasion beaches. The first operational V-2's were in fact fired only on the 8th of September, 1944.

The German Misunderstanding of the full role of radar

Radar and its role in the Battle of Britain were already widely discussed in the literature. Here we would like only to underline some points which may seem trivial (and certainly seemed trivial at the time) but which were at the root cause of the German failure. Again, the emphasis is on the necessity of thoroughly understanding extant technology when planning military campaigns.

When Britain started constructing the huge towers of the Chain Home radar system the Germans soon became aware of them. They suspected their role, but to verify they sent two Zeppelins, loaded with radio receivers to hear what they could hear. The Germans already had radars and they assumed that if these were truly radars the Brits (like the Germans) would be using the best available technology – RF frequencies on the order of 400–560 MHz. The Germans listened for many days but discovered nothing. (Only after the war it was found that the British scientists chose to use standard commercial components which operated at lower frequencies, but were cheaper and readily available. The lower performance bothered them less at that stage because it was sufficient for their purpose.)

A well run technical intelligence branch should have discovered this but the problems ran much deeper. In Germany, the Luftwaffe was a newcomer on the radar scene. The German navy had shipborne radars for several years when Goering, who accompanied Hitler on a visit to the German navy, found out about the very existence of radar. When he approached the navy's command for information and

3 David Irving , *The Mare's Nest*, (Corgi Books 1966) 62.

4 Reginald V. Jones *The Wizard War* (Coward, McCann & Geoghegan, Inc. 1978) 343–345. This was a fine show of leadership by Churchill. Lindemann was after all his scientific advisor. But Churchill also remembered a previous dispute between Lindemann and Jones. This involved the question of guidance by radar beams, which Lindemann derided and Jones warned against. Turned out Jones was right. Ibid, p. 101.

possibly technical assistance he was curtly told that this was a navy weapon and if the Luftwaffe wants radars they can go and invent it on their own.[5] The Luftwaffe eventually got their radars, from the same company that worked for the navy, but the problems of German radar were aggravated by poor understanding of the potential of radar to change long established paradigms about warfighting.

On "Adler Tag" (August 12th, 1940) the first day of "the Battle of Britain" the Germans did attack four of the Chain Home radar stations. (See Fig. 2). One was severely damaged but the British used some deception and to the Germans listeners it appeared that nothing had happened. At a conference on that evening, Goering complained that the bombing does not seem to knock the radar stations out. Major Joseph (Beppo) Schmid, head of the Luftwaffe intelligence, agreed that these attacks were a waste of time and the radar stations were unimportant. Colonel Paul Deichman, Chief of Staff of Fliegerkorps II (which conducted the campaign) concurred but had a more imaginative reason: "Leave the British their radar. It will enable them to find our fighter formations, which will thereupon destroy them."[6]

While colonel Deichman was overconfident, major Schmid was simply incompetent.

Schmid was no pilot; spoke no language except German, had no technical training and his lowly rank testified to the low regard that the Luftwaffe's high command had for this job. (His counterpart on the British side was a pilot, holding the rank of Air-Commodore, the equivalent of a Brigadier General).[7]

In a report on British air defense, written on July 16th, 1940, about a month before the Battle of Britain, Schmid did not mention radar at all. In a later report, authored on the 8th of August he wrote about radar but completely misunderstood its function. He concluded that British fighters will be tied down to their ground controllers and restricted in mobility, so that German attack formations attacking a target will encounter only local opposition.[8]

This mistaken conclusion may have been at the root of the decision reached at the above described meeting, to cease attacking the radar stations. On that evening Germany lost the Battle of Britain and, arguably, the war.

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5 Louis Brown *A Radar History of World War II* (Institute of Physics Publishing, 1999) 78. Two and a half years later the German air force had its revenge on the German navy. When the air force captured the first centimetric radars (from downed British bombers) they neglected, for six months, to inform the navy of this new Allied technology. During that period U-boats were sunk because they did not have suitable receivers to warn them of the approach of so equipped coastal command's sub-hunters. After the war it was written that – "…it can perhaps be explained only by a criminal lack of liaison between the German air and naval technical staffs. ." Philip Morse and George Kimbal *Methods of Operations Research* (OEG Report No. 54. Office of the CNO, Navy Department 1946) 96.

6 Peter Townsend *Duel of Eagles* (Simon and Schuster 1970) 333.

7 Derek Wood with Derek Dempster *The Narrow Margin* (Paperback Library 1969 90) 106.

8 Stephen Budiansky *Air Power* (Penguin Books 2005) 235–236.

It should be pointed out however that the Germans were not alone in misunderstanding the far reaching ramifications of the use of radar. A noted researcher states that even after the British revealed the existence of its Air Defense System (and presumably its details) American Military Attaches were more interested in the weapons "and paid much less attention to the organizational arrangements that lay at the heart of the effectiveness of the British air defense system."[9]

The American disbelief of the performance figures for the Mitsubishi A6M (Zero) fighter

In the thirties of the previous century, Japan was already known as the Neighborhood's Bully and her expansionist policies were clear to all.[10] However, the West considered the Japanese technologically incompetent, their engineers capable only of copying western products and their near-sighted pilots incapable of flying modern aircraft.[11]

The argument about them being copycats was poor from the start: there was always the danger that they might copy the best (which in fact they did in many areas) but the claims about technological inferiority was even more puzzling. Apparently it was forgotten that only thirty years previously, those same Japanese (admittedly with some British tutelage) soundly defeated the Russian Baltic fleet in the Tsushima Strait battle, and nobody wondered why the Japanese could be excellent ship builders and fighting sailors but not aircraft builders and pilots.[12]

In 1939 the Chinese captured a Nakajima KI-27 (Nate) fighter plane on the ground. In the hands of a skilled pilot it was a very maneuverable aircraft. Chennault, of Flying Tigers fame, tested the airplane and sent a detailed report to Washington. He was answered that according to "aviation experts" a plane with the reported specifications and performance is impossible.[13] In 1940 Chennault tried to find out who were those "aviation experts" but found out that the report had "disappeared".

Towards the end of 1940 Chennault sent another report, now on the Mitsubishi A6M (ZERO) fighter that the Japanese started introducing in China. (See Fig. 3).

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9 Thomas Mahnken *Uncovering Ways of War (*Cornell University Press 2002) 160.

10 See for example Lt. Commander (IJN) Tota Ishimaru's book *Japan Must Fight Britain* (Hurst & Blackett) which was originally published in 1934 or 1935 and published in Britain in 1936. By 1938 four more English editions were published.

11 Budiansky *Air Power* 255.

12 In 1938, during the war against China, 20 Japanese flying boats took off from Japan and flew, without refueling, to bomb Shanghai, a round trip distance of 1,800kms. Western navies were amazed but this feat left no impression on British and American intelligence services. John Deane Potter *Yamamoto* (Paperback Library Inc. 1967) 46.

13 Claire Lee Chennault *Way of a Fighte* (G.P. Putnam's Sons 1949) 94.

He got the same Answer: a plane as described is aerodynamically impossible.[14] Chennault despaired of changing official Washington's attitude and developed a novel fighting doctrine which proved very efficient, with a kill ratio of 8:1.

Part of the problem stemmed from the American refusal to accept the fact that the Japanese thought differently. They saved weight by discarding self-sealing fuel tanks and pilot armor. This was completely different from Western practices. Admittedly, this design philosophy had its own problems, but it produced fast and nimble aircraft which for the time being the Japanese were happy with. The Americans (and the British) woke up to the facts of life on December 7th, and it took them nearly two more years to catch up. Accepting the notion that the Japanese might have known what they were doing could have saved those two years.

The American refusal to adopt the 17Lbs. gun

Until 1944 the American ordnance experts were against heavy armor and big caliber guns on American tanks. This was in part because they believed in high mobility. The smaller caliber guns were tested successfully against American tanks and this led to the curious conclusions that if the gun penetrates American tanks it will penetrate any foreign armor. No technical data on foreign developments entered the debate.[15]

The British suffered from organizational problems (which caused numerous delays) but one thing they did right. Because of their Western Desert experience (against the German 88mm, see Fig. 4) they knew that a high-muzzle velocity gun is a life-or-death necessity and so they developed the 17lbs anti-tank gun. (See Fig. 5).

When the British started purchasing the SHERMAN tanks from the US they had one look at its short-barrel 75mm and asked Chrysler if they would mind installing the 17lbs instead. Chrysler wouldn't mind and the SHERMANs, sans guns, were shipped to England and had the guns installed there. These tanks were named "FIREFLY". (See Fig. 6).

Towards the end of 1943, when the British production order for SHERMAN tanks was at full swing the British, again remembering the mauling they suffered from the German 88's, offered the 17lbs gun to the US ordnance. This was politely declined, as was the suggestion of copying the 88.

The head of the British (armour) purchasing mission in the US wrote thus:

"This inaction by the U.S. Ordnance was in keeping with their predilection for quantity rather than quality, coupled with an arrogantly nationalistic spirit which refused anything which had not been invented in the U.S.A. (N.I.H. – Not Invented Here.)[16] This was coupled to another problem: "….the ordnance necessarily

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[14] Jim Rearden *Cracking the Zero Mystery* (Stackpole Books 1990) 17.

[15] Stephen Peter Rosen *Winning the Next War* (Cornell University Press 1991) 188.

[16] Ross, G. MacLeod *The Business of Tanks 1933 to 1945* (Arthur H. Stockwell Ltd 1976) 41.

lacks military background….On the other hand, the ground forces lack staff with sufficient technical training and background….”[17]

The subject of these deficiencies in American equipment was brought up in a series of articles in the national press and the reporter even urged a congressional enquiry[18] but presumably, in the flush of the soon to come victory, this issue was swept under the rug.

The IDF’s “surprise” from the SAGGER anti-tank missile

The effectiveness of the tank on the battlefield brought about developments of various anti-tank weapons, culminating with the ATGM – the anti-tank guided missile. All the major powers did this and in fact the IDF was the first, in 1956, to utilize one, the French SS-10, (see Fig. 7) on the battlefield. This was a 1,500meters range, wire-guided missile with an effective warhead, if it hit its target, which was a big IF. In order to be seen at extreme ranges, it was equipped with a chemical beacon. But often the beacon’s flame masked the target. So the operator had to fly the missile parallel to the line-of–sight to the target and judge when to veer into it. It sometimes even worked. The resulting odds however were poor. On the average, about 10% hit probability and this with constant training.

The IDF soon wearied of this poor performance and gave up its AT missiles. Instead it went into improving its tank gunnery, with world-class results. On the other hand, the Arab armies, with massive coaching by the USSR, analyzed their own weaknesses, and decided to counter the Israeli qualitative edge in armor warfare with a massive acquisition of more advanced missiles – the AT-6 SAGGER, replacing former types of such first generation missiles. (See Fig 8).

This general trend was no real secret. Even the IDF’s professional magazine (MA’ARACHOT) alluded to this in general terms.[19] But even when detailed reports (on acquisition and training) started coming in, nobody got excited. Because such missiles were considered useless by the IDF, by projection they were useless for everybody else.[20] And although until the 1973 war the IDF Military intelligence authored 19 reports describing the SAGGER and anti-tank warfare in the Arab armies this information was not made available to the fighting formations.[21]

But here the IDF made three mistakes: from numerous occurrences during the 1956 and 1967 wars it concluded that once the IDF armour showed up, the enemy’s infantry would run away. Consequently, supporting infantry was considered superfluous and its numbers and quality were reduced.

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[17] Ibid, 316.

[18] Hanson Baldwin *The German Blow* (New York Times 4 December 1944, p. 4) and *German Royal Tiger* (NYT 5 January 1945, p. 4).

[19] S. Yiftah *About Missiles in Egypt* (Ma’arachot [in Hebrew] No. 217–218 September 1971) 25.

[20] This is the old problem of projecting your way of thinking on the enemy.

[21] Meir Finkel *On Flexibility* [in Hebrew] (IDF Publishing House 2007) 206.

Secondly, because of the aversion of the ground forces to electronic gadgetry, and particularly to guided missiles, the implications of the massive acquisition of SAGGERs and RPGs by the Arab armies, were not understood by the IDF. Consequently, no systematical thinking was devoted to the question of how to counter this new factor. So much so that a leading authority on the subject wrote:

"All these publications did not bring the Israeli operational planner to understand the threat inherent in the missile. The intelligence officer – who did not analyze the contribution of the missile to the fighting doctrine of the Egyptians (and the Syrians) and the capabilities it gave them in a simple and concentrated action of tank hunting teams at the front of the beachhead, could not prepare a potential pattern of employment for the enemy. The information on the AT missiles and their effects on the fighting tactics of the individual vehicle were studied, but not the cumulative effects of massive salvoes of personal AT missiles on the doctrine of the Israeli armor, which called for a rapid advance of the armor – even without artillery support and without mounted infantry."[22]

The third mistake, stemming from the previous one, was that the R&D community was not informed of, let alone consulted on, these developments, and was not requested to suggest solutions. Since it was accepted that a missile hitting a tank will cause considerable damage, possibly total destruction, this disregard of the proven capabilities of the local industry is puzzling at best.[23] It can only be explained by the confidence of the military that any weapon thrown at it could be thwarted by the bravery of the soldiers or by some tactical improvisation, and the "boffins" need not be bothered.

Concluding remarks

The examples described above constitute only a small sample of cases of technological failures and a full treatment of this phenomenon will fill a thick book. Just to point out a few more such failures we may mention the French refusal to understand the efficacy of the Long Bow, the US navy's doubts about the technology and performance of the Japanese "Long Lance" (type 97) torpedo, the problems of un-escorted daylight bombing missions, the German failure to adapt drop-tanks to their single seat fighters, the German navy's neglect to adopt the SHNORKEL, Hitler's meddling with the ME-262 and the initial opposition of ground forces commanders in the IDF to the introduction of UAVs.[24]

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[22] Dany Asher *From Directive 41 to Tahrir 41 – From Doctrine to War* (Ma'arachot (in Hebrew), No. 332, September–October 1993) 46–53; Zvi Lanir *Fundamental Surprise- Intelligence in Crisis* [In Hebrew] (Hakibutz Hameu'had 1983) 49.

[23] It should be pointed out however that even before the war the RAFAEL scientists considered the problem, at least at the theoretical level and consulted the armour people. This led eventually to the BLAZER reactive armor, although initially some tank people were not enthusiastic about sheets of explosives mounted on the tank.

[24] For a broader treatment of these topics see Azriel Lorber *Misguided Weapons – Technological*

It should also be pointed out that all these cases deal with situations where there was irrefutable information on the technology or the system (and its capabilities) being in the hands of either side. We did not include the problems encountered when dealing with ambiguous technological information and the resultant difficulties of such, a topic which deserves full treatment of its own.

Two final conclusions stand out from the above discussion: solid understanding of novel technologies and their potential effect on the battlefield is crucial for the decision makers, be they in uniform or mufti. Secondly, compartmentalization of knowledge, and restricting access to information, are most detrimental to understanding novel ideas and to the solution of problems, particularly in the field of military technology. While this conclusion will undoubtedly raise the hackles of many security officers, there is no other answer to coping with the multidisciplinary nature of modern technology and its effect on warfare.

FIGURES

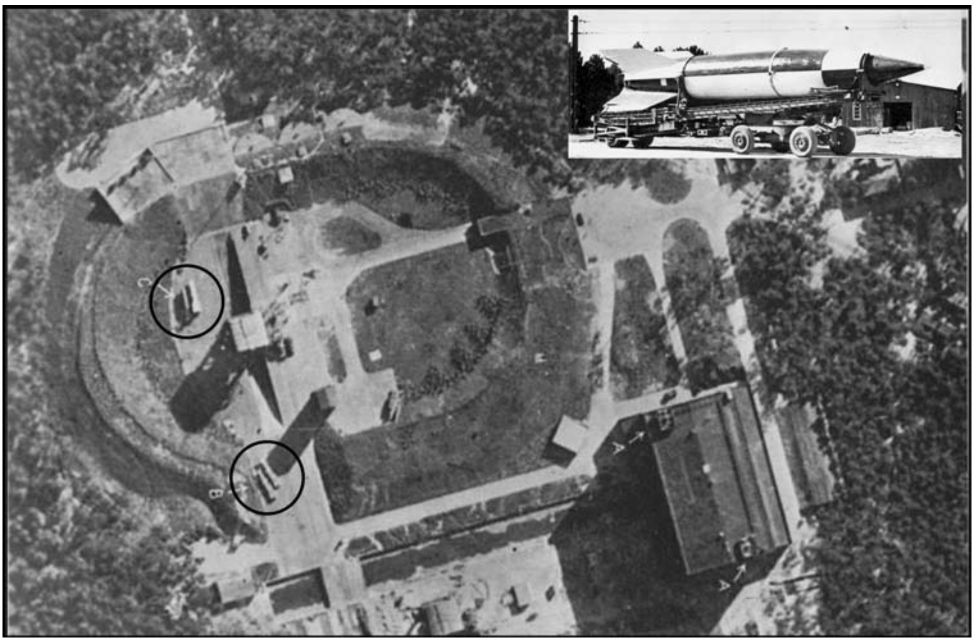

Fig. 1: A June 1943 photograph of Peenemünde. The "objects" are marked by circles. In the inset, a V-2 missile on a transporter. (UK Gov. photos)

Failure and Surprise on the Battlefield (Potomac Inc. [formerly Brassey's] Washington DC 2002).

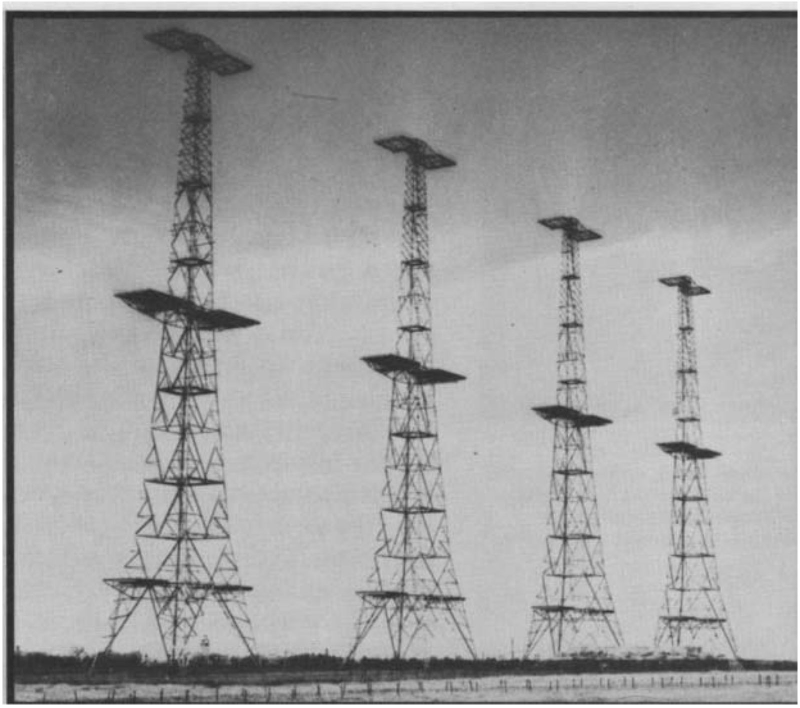

Fig. 2: The “Chain Home” radar towers. (Malvern/Crown copyright; in *War Winners,* by Ronald W. Clark, Sidgwick & Jackson, 1979, p. 45)

Fig. 3: The “ZERO” fighter. (IJN photo)

Fig. 4: the German 88mm anti-tank gun. (Photo by Mark Pellegrini)

Fig. 5: The British 17lbs. gun. (Photo by the author, at the IDF History Museum, IMOD)

Fig. 6: The “FIREFLY”` A SHERMAN tank with a British 17lbs. gun. (US Army Center of Mil His. photo)

Fig. 7: A French SS-10, wire-guided anti-tank missile. (US Federal Goverenment – PD-USGOV-MILITARY-ARMY – photo.

Fig. 8: A SAGGER missile with its control unit.
(Photo by the author, at the IDF History Museum, IMOD)

Joseph P. Harahan (USA)
Eliminating the 43rd Strategic Rocket Army in the 1990s: Using International Cooperation, Technology, and Management

In January 1991, General-Colonel Volodimir A. Mikhtyuk assumed command of the 43^{rd} Rocket Army, with 35,000 men, eight rocket divisions, five types of intercontinental ballistic missiles, and approximately 1,800 nuclear warheads. It was the largest rocket army in the Soviet Union's Strategic Rocket Forces. The army had hundreds of liquid-fueled missiles, concrete-hardened missile silos, buried command centers, nuclear storage bunkers, and facilities located over thousands of square kilometers. Then suddenly in December 1991, the Soviet Union collapsed and General Mikhtyuk found that his rocket army was based in two separate nations: Ukraine and Belarus. The army's command center was located in a third nation: Russia. The army's complex nuclear safety and surety systems had been disrupted, causing hundreds of warheads to build up in storage depots. The rocket army's officers and men began demanding transfers. Simultaneously, the new Ukrainian national government insisted that it had territorial control over the rocket army.

This situation was a dilemma which demanded a strategic-political solution, military cooperation, multinational diplomacy, international assistance, and financial aid. If a solution could be found then all of the rocket army's nuclear warheads would be relocated, all of the ICBM rockets would be deactivated and eliminated, the hardened rocket silos would be destroyed, the underground command posts would be deactivated and destroyed, all of communications cabling would be dug up and recycled, the storage depots would be destroyed, and all of the military officers and men would be relocated or retired.

Reality 1992–1993

Resolution of the dilemma of the 43^{rd} Rocket Army did not come quickly. Russia was the dominant power in the region and its military and political leaders established, with agreement of the leaders of Belarus, Kazakhstan and Ukraine, a new supranational command, the Armed Forces of the Commonwealth of Independent States. It set up a chain of command for all the strategic rocket armies and long-range bomber commands. It was a defensive command. General Mikhtyuk and the officers of the 43^{rd} Rocket Army were unsure what this new structure meant for the officers, men and weapons of the rocket army. General Mikhtyuk recalled that: "The signing of the CIS agreement created the following situation. Russia regulated the control and communications systems of strategic forces on the territory of the four independent states, but it was not able to relocate, reduce, increase, eliminate or store the resources that were outside of the Russian Federation. The other three republics did not control the usage ant their exploitation (operation) of the strategic armaments, (which were) located on their territory." Yet, the basic agreement stated that the CIS Commander, a Russian marshal, would be subordinate to the presidents of the four nations. The agreement created confusion within the 43rd Rocket army's officer corps; it influenced troop morale, training, operations, and possibly nuclear security.

Over the next eighteen months, Russian leaders gradually abandoned their commitment to the CIS command structure. In its place, Russian military and political leaders adopted a policy of seeking to become the only nation in the region with nuclear weapons and strategic forces. The Russian General Staff sent units into Kazakhstan, with orders to remove the strategic rocket army, and long-rang bomber commands. No permission was asked of the Kazakhstani government. Next Russian strategic rocket forces began removing long-range rockets located in Belarus; relocating them to Russian bases. Again, no permission was asked of Belarus. From the beginning, Ukraine resisted, citing territorial and nationalistic objections. Russia's president, Boris Yeltsin, tried to negotiate with Ukraine's president, Vladmir Kravchuk, terms to retain the Russian fleet in the Black Sea and to relocate all of the nuclear warheads to Russia. Negotiations were inconclusive. In April 1992 President Kravchuk ordered that the 43rd Rocket Army and the 46th Air Army forces and weapons be incorporated into the Ukrainian Armed Forces. The Ukrainian Armed Forces commander declared that "whoever does not take the oath of allegiance can resign." Few officers took the allegiance or resigned. High-level negotiations continued.

While these negotiations were underway two developments changed the situation. Inflation struck hard in both Russia and Ukraine. The military-industrial complexes collapsed as the national governments pulled their support for the central "command" based economies. In Ukraine rapid fire inflation set in, so much so that by the fall 1993 the currency rate was 25,000 hrivna to the dollar. Two years before it was a one to one ratio. The economic situation forced Ukraine to negotiate a new agreement with Russia. Second, the United States engaged both Russia and Ukraine in strategic arms control treaties, signing and rectifying the START Treaty and its protocols. The U.S. adopted a nonproliferation policy that called for no new nuclear states in the region, except Russia. It offered the nations in the region financial and technical assistance to eliminate their treaty-specific strategic weapons and forces. U.S. leaders helped negotiate a new three nation agreement, the Trilateral Agreement of January 1994.

Trilateral Agreement, January 1994

Russia, Ukraine, and the United States negotiated political, financial, and military terms to deactivate the 43rd Rocket Army and the 46th Air Army, and their warheads, weapons, materiel and men. In January 1994, President Yeltsin, Clinton, and Kravchuk signed the Trilateral Agreement in the Kremlin in Moscow. Ukraine agreed to sign the Nonproliferation Treaty and to allow the START Treaty to enter into force. Ukraine agreed to transfer an initial segment of more than 1,800 warheads to Russian military depots. The U.S. pledged to provide $60 million to cover the initial costs of transportation and dismantlement. Yeltsin stated that Russia would compensate Ukraine, Kazakhstan and Belarus for the value of the HEU in the nuclear warheads located on their territories. Russia agreed to send to Ukraine's nuclear power plants uranium fuel rods at no cost for five years, 1995 – 2000. The U.S. agreed to assist Ukraine financially and technically up to $195 million for the deactivation and elimination of the 43rd Rocket Army and the 46th Air Army. The United States declared that it would use funds from the Cooperative Threat Reduction program.

Work began immediately. Within weeks Russian military trains and nuclear technicians went to Ukraine and began removing the nuclear warheads. Planning began between the U.S Department of Defense, Ukraine's Ministry of Defense, and the 43rd Rock Army to dismantle and eliminate the weapons and facilities of the rocket and bomber armies. General Mikhtyuk was involved in multiple meetings with US defense officials and American contractors, with Ukraine's National Security Council and Parliament leaders, and with the rocket army's officers and men. In the beginning, the assumption was that the Ukrainian government would be responsible for dismantling and eliminating all of the strategic bombers and rockets, missile silos, command posts, communications cabling, storage depots and rocket army facilities. The U.S. would provide technical and financial assistance. Under the START Treaty, all missile and silo eliminations had to be completed within seven years.

Implementation: Ukrainian-U.S. cooperation, Secretary of Defense William Perry, Integrating Contractors, and Results

Ukraine developed a comprehensive master plan for decommissioning and eliminating its strategic rocket forces and long-range bombers. More than thirty agreements were signed between the two nations. Ukraine requested that the U.S. purchase and deliver technical equipment, such as mobile cranes, railroad cranes, all-terrain vehicles, storage tanks for liquid rock fuels, bulldozers, industrial containers, plasma cutters, power saws, impact wrenches and sockets, communications equipment, and other many items. The U.S. agreed. Ukraine needed fuels: it asked for two thousand two hundred tons of gasoline, diesel, and hydraulic fuels. The U.S. purchased the fuels within Ukraine. With the new equipment on order and fuels identified, General Mikhtyuk began decommissioning 13 SS-19 strategic rocket regiments, containing 130 missiles, 130 missile silos and 13 command centers. Work went slowly. During 1994 U.S. officials did not purchase and deliver the equipment swiftly; they made many more promises than deliveries; and inflation within Ukraine continued to slow all projects.

In early November 1994, Minister of Defense Shmarov flew to Washington for meetings with Secretary of Defense William F. Perry. Perry believed in nonproliferation, arms control treaties, and programs that would assist in transforming the region economically. He listened as Minister Shmarov explained that Ukraine was not financially capable of eliminating the missiles and bombers without additional American assistance. Perry was aware of the many difficulties in acquiring and delivering American technical equipment to Ukraine and he suggested a new approach: using American "integrating" contractors to plan, organize, and carry-out the management of large-scale projects. Perry, a man who followed carefully all of the missile and bomber reduction issues, believed that the elimination work could be organized on a much larger scale and that the treaty's technical requirements and phased deadlines could be achieved. Shmarov agreed, provided the contract would be defined by a joint US-Ukrainian team and that Ukrainian firms would be employed as subcontractors. Perry agreed; three weeks later the two delegations met in Washington to develop the scope of work for the contact. The final contract called for the integrating contractor to plan, organize, and manage the elimination of 130 SS-19 rockets, 130 fixed missile silos, 13 unified command posts, and specific infrastructure buildings over seven years. Following a competitive bidding, Bechtel, an experienced, international large-scale construction corporation won the contract. This corporation had organizational experience in working with obscure US government acquisition, contracting, and accounting laws and regulations. It also had extensive managerial experience in working with local and national subcontracting firms, local laws, and customs regulations.

Officials in the three nations monitored Bechtel's work closely. The first year's objective was to dismantle and eliminate 60 SS-19 missiles, 60 silos, and 6 launch control centers. Work was limited by weather and frost to nine months a year. When they began working in the spring 1996 from their offices in Kiev, Bechtel's managers worked closely with General Mikhtyuk and his senior officers. They organized the deconstruction effort into a forty-day schedule for removing a SS-19 missile, defueling it, dynamiting the missile silo and the underground launch control centers. Bechtel hired 12 Ukrainian firms, with superintendents drawn from the 43rd Rocket Army's retired senior officer corps and the workers from the army's retired officers and soldiers. Hundreds of workers were hired. They used the new American equipment purchased and shipped to Ukraine. Hundreds of pieces of equipment were used and maintained from a central location. By the end of the first summer, Bechtel had hired more than a hundred local firms. In the field, Bechtel's managers, all of whom spoke Russian, met each day with the division's general officer to go over the schedule, site access, work plan and safety issues. By the end of the first year, Bechtel had met the objective, the one outlined in the presidential schedule, of eliminating 60 SS-19 missiles, silos, and launch control centers. In the next two years, 70 SS-19 silos and missile complexes were decommissioned and eliminated. Few thought it would happen so rapidly; one observer stated it was "completely unenvisioned."

In both nations, the ministries of defense liked the "integrating" contractor method of organizing and conducting the elimination of the SS-19 missiles. General Mikhtyuk supported it, strongly. In mid-1997 Ukraine's president requested that a similar method be used to eliminate and destroy 46 SS-24 strategic rockets. From July through December a joint team worked out the scope of work for four large projects. Each required an "integrating "contractor. Three American international corporations won the contract awards: Bechtel, Morrison-Knudson, and Thiokol. Similar assumptions applied: an approved work schedule, follow site access rules, employment of local workers, and ensure safety and security standards. The U.S. insisted on paying all workers in cash dollars. More than a thousand local workers deployed to the missile fields to dismantle the missiles and silos, dig up the buried communications cables, destroy the underground command posts, and rocket facilities. It took four years. During that time, the concept of combining steady American funding with the methodology of using integrating contractors led to a series of missile and bomber elimination projects in Russia and Kazakhstan. The concept was used to eliminate and destroy the remnants of biological weapons facilities and a nuclear test site in Kazakhstan. It was used in Russia to design and build a new, large chemical weapons disposal facility.

Theoretical Model

Recently a new book was published in the United States which suggests a theoretical model of explanation. Michael Horowitz's ***Diffusion of Military Power; Causes and Consequences for International Relations*** (Princeton University Press, 2010) provided a theoretical interpretation of how states/nations undertook large-scale financial and organizational processes involving the development and fielding of new weapons systems. Let me test Horowitz's analyses on the United States large-scale, complex, multi-year projects to deactivate and eliminate the 43rd Rocket Army and the 46th Air Army in Ukraine. In his book Horowitz proposes a new "adoption-capacity" theory of military forces developing new technologies. New military technologies, such as the development and operation of naval aircraft carriers or supersonic fighter aircraft, have two elements: high financial intensity and a high degree of organizational capital. Because governments have difficulty have difficulty sustaining these two elements over many years, Horowitz asserts that few nations are capable of adapting their military forces to the new weapon systems.

While Horowitz is interested in the adaptation by states of new, war winning weapons, the theoretical analysis may be applicable to explain why the United States had such success in eliminating strategic missiles and bombers in Ukraine after the Cold War ended. The US Congress pledged funds, usually $400 million per year, for more than twenty years to assist the new nations dismantling their "inherited" nuclear, chemical, and biological weapons and facilities. That was the high "financial intensity" component. The other element, "organizational capital" was the use of American "integrating" contractors to plan, organize, employ, schedule and manage the dismantlement and deconstruction process. Horowitz defined organizational capital to be the military's bureaucratic capacity to transform itself along the lines of the new technology and to adapt to the emerging strategic and operational reality. Certainly these developments occurred in the U.S. cooperative programs with Ukraine. Secretary of Defense Perry directed the reformation of the defense bureaucracy, he directed in-country teams of bureaucrats to go to Kiev to work and live there. Perry suggested and supported the use of American "integrating" contractors. He demanded that American bureaucrats and corporations coordinate all work with the Ukrainian Ministry of Defense, General Mikhtyuk, the 43rd Rocket Army and the 46th Air Army. He insisted that new houses and apartments be constructed for the retiring strategic rocket officers and men. All of these elements suggest that the US assistance programs were changing, moving towards a new post Cold War strategic and operational reality.

So while Horowitz is interested in the development of new weapons systems and their diffusion, I believe that the critical elements of high "financial intensity" and "organizational capacity" could apply to an analysis of the United States large-scale effort to decommission and eliminate the treaty-specific weapons and facilities that Ukraine inherited after the Cold war ended and the Soviet Union collapsed. Theory can provide a useful lens through which one can comprehend reality.

Conclusion: Opinion of the Russian General Staff

Of course, the Russian General Staff and especially the commanders of Strategic Rocket Forces carefully watched the destruction of the 43rd Rocket Army in Ukraine. Lieutenant General Vasily F. Lata served as the First Deputy Chief of Staff, Strategic Rocket Forces. "The eliminations in Ukraine," Lata recalled, "were the first time we had ever seen the (decommissioning and dismantlement) process carried out at such a rapid pace. So, later we relied on General Mikhtyuk's experience with missile eliminations."

As the director of strategic plans, Lt. General Lata briefed General Igor Sergeyev, commander and the Strategic Rocket Forces' leadership on the decommissioning and dismantlement of the 43rd Rocket Army. Lata explained that the discussions went far beyond the briefing. General Sergeyev had his senior staff review and study how the Americans worked with the 43rd Rocket Army in Ukraine; how Bechtel's managers worked with Ukrainian subcontractors; and most significantly, how to transfer that experience to the Strategic Rocket Forces. Although the Russian government and the Russian Ministry of Defense never followed the Ukrainian-American organizational model exactly, the intense scrutiny by general officers, planning staffs, and government ministries persuaded many Russian officers and senior defense leaders that American assistance might, if controlled, work.

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Bamboo Spear as Indonesian Traditional Weapon: Study Case on Singaparna Struggle in Tasikmalaya, West Java, Indonesia, 1944

Introduction

1. Background

Indonesian country has been colonized in the past time. The Dutch has occupied Indonesia for approximately 350 years (1602–1942). The occupation was continued by the Japanese Military Authority (1942–1945) as result from its victory of invading Indonesia on the Pacific War in 1942. Colonialism has aborted the rights of freedom because generally, the colonizers suppress the people and explore natural resources of its colony. Every people in every country should not want to be occupied, include Indonesia. Therefore, Indonesian people took struggle against colonialism in obtaining freedom and sovereignty of the country.

Indonesian people's warfare against colonialism required great struggle and invaluable sacrifices. Many Indonesian peoples became victims of that warfare. In conducting a war required planning, preparation, tactic, strategy, warrior, and equipment such as weapon for war. Weapon becomes important component in war because it is a tool or instrument that used to destroy such a structure and defeat the enemy in order to obtain victory.

Weapon is a result of thought, creative work, and instrument that created from technological development. Technology is the making, modification, usage, and knowledge of tools, machines, techniques, crafts, systems, and methods of organization, in order to solve problem, improve preexisting solution to a problem, achieve goal or perform a specific function. Therefore, weapon is kind and result of technology that used to achieve a particular goal, in this case is winning the warfare.

Indonesia has a number of typical traditional weapons used in warfare against colonialism on each region in Indonesia. However, the most popular traditional weapon and used by the most fighters on regions in Indonesia is bamboo spear. This Bamboo spear became mass weapon that used by the people which trendily replaced the use of other traditional weapons on each region. Besides the easy of using, bamboo spear was believed as effective weapon at that time and the material was easy to find in the land of Indonesia. This study is interesting as problem in this writing.

2. Problems

a) Why and how could bamboo spear become traditional weapon on the struggle for independence in Indonesia?
b) How could bamboo spear become one of traditional weapon that used on Singaparna Struggle in Tasikmalaya, West Java, Indonesia, to encounter Japan in 1944?

3. Objectives

a) Describing bamboo spear that used as a traditional weapon on the struggle for independence in Indonesia.
b) Describing the use of bamboo spear as traditional weapon to encounter Japan on Singaparna Struggle in Tasikmalaya, West Java, Indonesia in 1944.

4. Scope of writing

This writing is limited by scope of writing as follows definition, characteristics, and the use of bamboo spear as traditional weapon on the history of struggle and warfare in Indonesia. The warfare itself is the Indonesian warfare against colonizer country (Dutch and Japan) since 1602 till 1949. The study case of this writing is Singaparna Struggle against Japan on Tasikmalaya, West Java, Indonesia in 1944.

Discussion

1. Definition and Progression of Bamboo Spear

Bamboo Spear is a kind of weapon which used by the Indonesian people in Indonesian Independence warfare. This weapon is made from bamboo as similar form as stick which one end cut sliced until very sharp.[1] Bamboo Spear is simple traditional weapon which usually used on warfare in Indonesia in the past time.

[1] *Ensiklopedia Nasional Indonesia (15)*, PT Delta Pamungkas, Jakarta, 2004, pg. 111.

Bamboo spear is actually not much different with the spear. The original spear was made from wood which attached by iron or sharp metal on its end. However, in making such a spear would require strong wood material, long time, trained maker, and quite much cost. It is different with bamboo spear which has simple form and easy to make, but has same function and effectiveness.

The technique of using bamboo spear is not too much different with the spear. A bamboo spear is handed by two hands and then its sharp point is punctured to the enemy's body. Bamboo spear could also be thrown at the enemy as similar as javelin. The wound caused by the puncture of bamboo spear will damage the organ of body and the most fatal effect is death.

There are many kind of traditional weapons in Indonesia such as *Rencong* from Aceh, *Piso Surit* from North Sumatra, *Tombak Trisula* (trident spear) from South Sumatra, *Golok* (Machete) from Jakarta, *Kujang* from West Java, *Keris* from Central Java and Bali, *Clurit* (sickles) from East Java, *Sumpit* from West Kalimantan, *Mandau* from East Kalimantan, *Pasatimpo* from Central Sulawesi, *Badik* from South Sulawesi, *Parang Salawaki* from Moluccas, *Pisau Belati* (Dagger Knives) from Papua, *Sundu* from NTT, etc. Those weapons are the unique traditional weapons on each region in Indonesia and used as weapon in the battle of kingdoms and the Dutch colonization period.

Since 1602, the Dutch gradually occupied the area which known recently as Indonesia. The kingdoms in Indonesia with its soldiers at that period tried to fight against Dutch colonization in such warfare used each traditional weapon. On that period, the use of bamboo spear was just in small number as additional or replacement weapon. The Netherland Indische Government has finished occupy Indonesia till 1942 after Japanese armies were able to invade and defeat the Dutch armies in Indonesia at Pacific War (1942–1945).

According to folklore, Indonesian people knew that a blade of bamboo could be dangerous after saw the Dutch soldiers set up approximately thousands of bamboo spears at the Kalijati airbase in West Java, Indonesia. The Dutch set up a trap for the Japanese soldiers who came and invaded the Java Island as part of Pacific War strategy. According to its planning, when the Japanese paratroops landed, they would be killed by bamboo spears that have been stuck on the ground. Unfortunately, this trap failed because the Japanese soldiers did not land at Kalijati area but at Eretan Beach, near Subang Regency in West Java on the end of February 1942.[2]

Japan was inaugurated 3.500 young men who were recruited as *Seinendan* members on April 29th 1943. It had correlation with the defeat that suffered by Japan since 1943 in Pacific War. That situation forced Japan to attract public sympathy, especially by giving military training for the youngsters who were

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2 http://bamburuncing.wordpress.com/bambu-runcing/.

expected helping Japan against Allied Forces. However, *Seinendan* members were not real army, so they were not allowed to hand gun, got dormitory, and other army's rights. Bamboo spear became a substitution weapon during marching exercise and military training.[3]

A sharpened bamboo and used as a weapon is common and became a tradition for Japan. The Japanese call it *takeyari*. However, *takeyari* cannot be made from usual bamboo, but a kind of yellow bamboo. Yellow bamboo is smaller than common one but stronger and not easily weathered. In the land of Indonesia, bamboo plants grow fast and very easy to find.[4] These could be the reasons of why Japanese used bamboo as weapon for *Seinendan* member.

Since that time, Indonesian people began to recognize bamboo spear as weapon to fight. This occurred on Singaparna Struggle in Tasikmalaya, West Java, Indonesia on February 25th, 1944. Sukamanah troops on Singaparna Struggle used bamboo spears against the Japanese soldiers attack. After that, some incidents of Indonesian people who fighting against Japanese colonialism broke out on other regions even in small scope with simple weaponry.

These resistances happened because the nationalism spirit of Indonesian people began to grow together with the rise of national consciousness and independence spirit as well as free from colonialism. It was started by the forming of Boedi Oetomo organization on May 28th, 1908 as the first national organization with main spirit of nationalism. Then, followed by the declaration of Indonesian Youth Pledge on October 28th, 1928 that realized the spirit of unity as a nation and state of Indonesia. The national political situation also showed well progress which strengthens the national spirit to free from colonialism. One example resistance occurred at Blitar, East Java where the *Pembela Tanah Air (PETA)*[5] soldier on February 29th, 1945 rebelled because they felt angry to see the suffered of people. The Indonesian people had no modern weapons such as rifle, machine gun, or cannon. They were bounded to use traditional weapon. Hence, the selected weapon and mostly used by the struggler was bamboo spear because the form was simple and the making was easy as well as the using.

Indonesia country through its national figures, Ir. Soekarno and Drs. Mohammad Hatta proclaimed the independence of Indonesia on August 17th, 1945. Since that time, the spirit of independence and nationalism of Indonesian people became greater. The strugglers and paramilitary troopers appeared to cast out the Japanese forces, disarm them, and attack the Japanese armory that still exists in Indonesia. On that struggle and counterwork, the strugglers had no doubt

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3 Pusat Sejarah ABRI, *Badan-badan Perjuangan*, Jakarta, 1983, pg. 15.

4 http://bamburuncing.wordpress.com/bambu-runcing/.

5 PETA is a Japanese military unit that formed in Indonesia on October 3rd, 1943, during the Japanese occupation and had a big rule in Indonesian Independence struggle. (source: http://id.wikipedia.org/wiki/Pembela_Tanah_Air).

to use bamboo spear for fighting. This caused by the great number of strugglers and the limited plunder Japanese weapons which pushed most of the strugglers to use bamboo spear. A month after Proclamation of Indonesian Independence, Allied forces who were leaded by British troops and attached by NICA (Netherland Indische Civil Administration) landed in Indonesia to take over sovereignty from Japan. The Indonesian people who were felt free did not want to occupy anymore with the Dutch. The opposition against Allied forces was continued for keeping freedom that has been proclaimed.

Bamboo Spear became mass weapon that used by paramilitary struggler in its opposition against colonizers. On October 1945, at the District of Parakan, Temanggung Regency, Central Java, Indonesia, several Islamic public figures were believed to gild bamboo spear in order to give spiritual power and psychological confidence for braveness of the strugglers against the enemy. Those figures are KH Subkhi, KH Abdurrahman, KH M. Ali, KR. Sumomihardho, and KH Nawawi. The Bamboo spear was prayed and gilded in order to fill good luck and magic power. After that, it was ready used as weapon against the enemy. Besides bamboo spear, there were also other weapons which got bless and gilded such as spear, *keris, golok*, etc. This news spread out widely which result in more strugglers came to KH Subkhi's place at Parakan, Temanggung, Central Java. This place became very busy with the strugglers who wanted bless for their bamboo spear. Later on, KH Subkhi became popular as Bamboo Spear General.[6]

Several armed incidents were happened after the arrival of Allied forces on Surabaya City, East Java in 1945. The climax is when the Allied forces gave ultimatum for the Surabaya's people to surrender and collect their weapons on November 10th 1945. Surabaya's people refused to give up which result in attack of Allied forces to Surabaya City on large scale. Most of the strugglers used only bamboo spear to deal with the Allied forces. Their bamboo spears have been gilded at Parakan, Temanggung and poisoned by the strugglers themselves. Reputedly, when the gilded bamboo spear was thrown, it was able to reach quite long distance. This great battle occurred approximately 3 weeks. Many Allied soldiers died. In contrary, many more Indonesian Strugglers died as victims of this battle. This bamboo spear became symbol of Indonesian people against colonialism. Even though simple and traditional, but the strugglers are keeping fight with full of spirit without any fears for the independence. Therefore, bamboo spear became resource of spirit for Indonesian people in refusing colonialism.

The battle against colonialism was not only happened on Surabaya, but also on several regions in Java and outside of Java Island. The examples were on Semarang (Central Java) on October 14th – 19th 1945, Medan (North Sumatera) on December 10th 1945, Ambarawa (Central Java) on December 12th – 15th 1945, Bandung (West

6 http://bamburuncing.wordpress.com/bambu-runcing/.

Java) on March 24th 1946, Margarana (Bali) on November 20th 1946, Palembang (South Sumatera) on January 1st – 5th 1947, and other areas. During the revolution period (1945–1949), the opposition against Dutch troops who wanted to re-occupy Indonesia frequently happened. All of the people moved to fight; hence the warfare happened was the whole people warfare. Generally, the struggler realized and used bamboo spear for war besides another traditional weapon. Bamboo spear spread widely as mass weapon which very popular, recognized, and used for the struggler in whole of Indonesia.

2. Study Case: Singaparna Struggle in Tasikmalaya, West Java, Indonesia

Singaparna struggle was Singaparna's people counterwork against Japanese occupation that occurred in 1944 on Singaparna, Tasikmalaya, West Java, Indonesia. On that counterwork, Sukamanah troops together with Singaparna people used bamboo spear and other traditional weapons to fight with Japanese soldiers. Singaparna struggle was led by KH Zaenal Mustafa.[7]

K.H. Zainal Mustafa who was born at Bageur, Cimerah, Singaparna, Tasikmalaya, in 1899, got religious studies at several Islamic Boarding Schools in Tasikmalaya for about 17 years. Hence he was fluent in Arabic and has wide religious knowledges. After finished his pilgrim in 1927, he established Sukamanah Islamic Boarding School at Cikembang Village, Singaparna, Tasikmalaya. Besides that, he also actively conducted *syiar*[8] to the rural outposts in Tasikmalaya. He entered *Jamiyyah Nahdhatul Ulama (NU)*[9] and was appointed as Vice of *Ro'is Syuriah NU*[10] for Tasikmalaya Regency in 1933. Through the NU, he grew up and became figure of leader which charismatic, patriotic, farsighted, and succeeded in generating struggle spirit on the areas of West Java against colonialism.

Since 1940, KH Zaenal Mustafa openly conducted activities that evoke the spirit of nationalism and attitude of colonial opposition by attacked the political colonial policy. Hence, he often got warning from the Dutch government. On November 17^{th,} 1941, KH Zaenal Mustofa was arrested by the Dutch with accusation of inciting people to rebel. He was detained in Tasikmalaya Prison

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7 Arya Ajisaka, *Mengenal Pahlawan Indonesia*, Kawan Pustaka, Jakarta, 2012, pg. 110.

8 *Syiar* (Arabic) is the spread of science, theory, and understanding based on Islam.
(source: http://id.wikipedia.org/wiki/Syiar).

9 *Jamiyyah Nahdhatul Ulama* (Arabic) is member of one major Islamic organization in Indonesia which established on January 31$^{st, 1926}$ and moved in education, social, and economic sides. On the NU adopts *Ahlussunah waljama'ah*, a mindset that takes the middle way between the extremes *aqli* (rationalist) with the extreme *naqli* (scripturalists). Therefore, the source of ideas for the NU not only al-Qur'an, *Sunnah*, but also use common capability with empirical reality. The NU is currently the largest Islamic organization in Indonesia.
(source: http://id.wikipedia.org/wiki/Nahdlatul_Ulama).

10 *Ro'is Syuriah* (Arabic) is Supervisor and Steering Council on NU Organization.
(source: http://id.wikipedia.org/wiki/Nahdlatul_Ulama).

and then moved to Sukamiskin Prison at Bandung, West Java on next day. He was released on January 10th, 1942 but re-arrested at Ciamis Prison on the end of February 1942.

On March 8th, 1942, the sovereignty of Dutch was end and Indonesia then occupied by the Japanese Military Administration. KH Zaenal Mustafa was released from the prison by one Japanese Colonel. The Japanese Colonel hoped that he would like to help Japan in realizing its fascist ambition and creating the Prosperity Environment of Great East Asia. However, KH Zaenal Mustofa firmly rejected it. He also opposed the execution of *Seikeirei*, which was the way to give salutation for the emperor of Japan by subjecting the body to the direction of Tokyo. He still refused the execution of *Seikerei* although under the threat of gun.

In the end of 1943, KH Zaenal Mustofa arranged total rebellion concepts against Japan Fascism as follows:

(a) Short Time Plan Actions:
   1) Kidnap the Japanese authority officers in Tasikmalaya.
   2) Sabotage the telecommunication tools.
   3) Release the political prisoners, etc.

(b) Future Plans, were based on political evaluation:
   1) Indonesian political groups will definitely burn out the spirit of total rebellion against Japan.
   2) The suffering of people on village and city will raise spontaneous total rebellion against Japan.
   3) The political moving such as establishment of *Putera (Pusat Tenaga Rakyat)*[11] or "People's Power Center" by four national figures on March 9th 1943, then followed by the establishment of *PETA (Tentara Pembela Tanah Air)* or Homeland Defense Forces, *Heiho,*[12] *Kaigun Heiho,*[13] *Kenpeiho*,[14] etc, as a step for taking over the authority.[15]

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[11] *Putera* (Bahasa) is an organization established by Japan government in Indonesia on April 16th, 1943 and led by four figures, namely Soekarno, Hatta, Ki Hajar Dewantoro and Kyai Haji Mas Mansyur. *Putera's* purpose is to persuade the Nationalists and intellectuals to contribute thought and energy for war againts Allied Forces and through the leaders from Indonesia, the people will fully support these activities. (source: http://id.wikipedia.org/wiki/Putera).

[12] *Heiho* (Japanese) is Indonesian forces formed by Japan Military Authority during World War II on September 2nd, 1942 and began recruiting members on April 22nd, 1943. *Heiho* was originally established to help military for grunt work such as building camps and trenches, keeping prisoners, etc. However, *Heiho* was deployed on the battlefield in progress. (source: http://id.wikipedia.org/wiki/Heiho).

[13] *Kaigun Heiho* (Japanese) is the *Heiho* forces under the Japanese Navy. (source:http://id.wikipedia.org/wiki/Pembicaraan:Daftar_kata_serapan_dari_bahasa_Jepang_dalam_bahasa_Indonesia).

[14] Kenpeiho (Japanese) is the assistant of helper of *Kempetai*. (source:http://id.wikipedia.org/wiki/Pembicaraan:Daftar_kata_serapan_dari_bahasa_Jepang_dalam_bahasa_Indonesia).

[15] Adeng Harmaen, *Ichtisar Riwajat Perdjoangan KH Z. Mustofa*, Tasikmalaya, 1970, pg. 3.

KH Zaenal Mustofa then formed Sukamanah Troops from his student, consist of 5 groups with total 590 soldiers. KH Zaenal Mustofa planned rebellion on February 25th 1944. This was the first rebellion in West Java for the occupation of Japanese Military Authorities.[16] In preparing this plan, he asked his students to prepare weapons as well as bamboo spear in great amount, practice *Pencak Silat* (Indonesian traditional martial art) and spiritual exercises.

This preparation was known by the Japanese Government. Immediately, Japan sent the Major of Singaparna with 11 staffs and escorted by several police officers to make arrests. This arresting effort failed. They were detained at KH Zaenal Mustafa's house and released on the next day (February 25th, 1944) at 8 a.m.. Suddenly, around 1 p.m., four *Kempetai* [17] officers came and waved his hand for asking KH Zaenal Mustofa to get closer to them. This impolite action made KH Zaenal Mustofa's followers angry. These Kempetai ordered KH Zaenal Mustofa to meet with Japanese government in Tasikmalaya. This order was firmly denied and then chaos broke out which result in the death of three *Kempetai* officers. One alive was injured and run with brought an ultimatum. On that ultimatum, the Japanese government was required to liberate the Island of Java started from February 25th, 1944. On that incident, a Sukamanah student named Nur was shot die by one of *Kempetai* officer.

After that, the situation on Sukamanah Islamic Boarding School was so strained. Sukamanah area was blockaded from all directions by 6 companies of *Tokubetsu Keisatsutai*.[18] Almost all of the students were already standby with their weapons. Most of them took Bamboo Spears and the rest took other traditional weapons. At around 4 p.m., several trucks approached the front of Sukamanah defense line. Those trucks brought about one battalion of Japanese army from West Java area. They dropped out then ran closer to Sukamanah Islamic Boarding School. The Sukamanah troops were ready to blockade that attack. The strategic plan of KH Zaenal Mustofa was linear defense system. They will attack and conduct frontal battle against the enemy. They were very surprised after quite clearly saw that they are dealing with the Indonesian people. Japan actually sent Indonesian youngsters who were recruited as Japanese soldiers in front of the attackers then followed by Japanese soldiers behind. After KH Zaenal Mustafa had seen that the

[16] Ben Anderson, *Revolusi Pemuda, Pendudukan Jepang & Perlawanan di Jawa 1944–1946*, Jakarta, 1988, pg. 56.

[17] Kempetai (Japanese) is the Japanese military police unit in Japan, including areas of its colony. *Kempetai* is similar with *Gestapo* units owned by Nazi Germany in terms of same duties as a secret military police officer. *Kempetai* is very famous for its discipline. (source: http://id.wikipedia.org/wiki/Kempetai).

[18] *Tokubetsu Keisatsutai* (Japanese) is special police force formed by Japan's military government on April 1944. Japan wanted to form a backup power that can be moved quickly and have a high mobility. If circumstances require, it can act as a combat force. (source: http://brimobpolri.wordpress.com/sejarah-brimob/).

attackers were from Indonesian also, he ordered his troops for not taking the fight before the enemy entered the normal distance of fight. This also created a doubt for Sukamanah troops to fight.

Japan also supported by five air craft which flew around Sukamanah area. Japanese soldiers ran closer to the Sukamanah posts and shot firstly as signing for the fighting. The Sukamanah troops run ahead to attack but Japanese soldier shot them by rifle. The front line troops were killed but the troops behind ran in and attack Japanese soldier which result in direct and close contact fighting. The great number of Japanese soldier and Sukamanah troops made the fighting became crowded and brutal. Sukamanah troops tried to kill the enemy by punctured bamboo spear to the enemy's body. The other weapons used were sword, machete, etc. However, Japanese soldiers who equipped by rifle, gun, and grenade responded the Sukamanah attack with the shoot and grenade throw. Certainly it would be easier to kill someone by gun rather than bamboo spear because gun can kill in far distance. Hence, many Sukamanah soldiers killed at that time. Japanese soldiers tried to win the battle and pushed Sukamanah troops to surrender. They finally defeated Sukamanah troops and stopped the battle and also destroyed The Sukamanah Islamic Boarding School in 90 minutes. This is because their more complete weapon and more skill of battle. This incident was known as Singaparna Struggle.

The students who died on that battle were totally 86 students and many more got injuries or disabilities. Before arrested, KH Zaenal Mustofa gave secret instruction to his students and followers for not claimed involved on the opposition planning against Japan. The whole responsible was under he himself.

A day after that incident, approximately 800 people were arrested and put into Tasikmalaya Prison. On the other hand, 23 people and KH Zaenal Mustafa who presumed fault were brought to Jakarta City for judgment. Then, after this incident, the Sukamanah Islamic Boarding School was closed by Japan and did not permit doing any activities. KH Zaenal Mustafa was executed on October 25th, 1944 and buried at around Holland Graveyard/ Erevele on Ancol, Jakarta. Indonesian government awarded title of National Hero for KH Zaenal Mustofa based on SK Presiden RI No. 064/TK/1972. Then finally on August 25th 1973, the skeleton of KH Zaenal Mustofa's corpse was moved to Sukamanah National Graveyard on Singaparna, Tasikmalaya (West Java).

Conclusion

In the history of Indonesian independence struggle, bamboo spear as one of the traditional weapon has been able to become mass weapon that recognized and used to fight colonialism for independence of Indonesia. This is caused by several factors:

a) The substance of bamboo spear as traditional weapon is simple. The form is similar like spear but it was made from bamboo. The material is easy to find, the making is quite easy and fast, requires no specific skill (technology), and can be made in large quantities. Its establishment as weapon in Indonesian independence struggle period was due to the limitation of weapon whose owned by the struggler that could be took over from Japanese army. In case of Singaparna struggle, the Sukamanah troops who led by KH Zaenal Mustofa struggled in obtaining freedom from Japan colonialism. Therefore, Sukamanah troops made bamboo spear as simple weapon because the limitation of modern weapon at that time. Bamboo spear became more popular when KH Subkhi who lived at Parakan, Temanggung, Central Java gave his contribution based on his ability to gild and give prayer on bamboo spear so that weapon had magical power and gave suggestions for the strugglers to have more braveness in the battle. Moreover, the end of bamboo spear was given toxic as power to defeat the enemy.
b) The philosophy of bamboo spear is a symbol of opposition from the weak against the strong. The weak party is the strugglers who have limitation in weaponry, but have high spirit to fight. Strong party is the party that has capability of modern weaponry and ruled as colonizer (Japan) which occupies the independence of another nation (Indonesia). Bamboo spear became a symbol of the struggler opposition for the independence of Indonesia. Singaparna struggle showed Sukamanah troops who used bamboo spear fought against Japanese soldiers' attack which equipped with more modern weaponry. Therefore, bamboo spear that used as weapon for the struggler has meaning as symbol of spirit and struggle against colonialism which just only used it as kind of traditional weapon.
c) Warfare which used bamboo spear created essential psychological effects of war. On Singaparna struggle, Sukamanah troops fought in braveness even just only used bamboo spear. This spirit of fight psychologically increased the courage of fighting against the enemy. During its progression, bamboo spear could be a symbol of spirit of Indonesian people's struggle in fighting against invaders, although the risks were loss of live or even soul. The enemy could be scared when confronted with numerous fighters used bamboo spears. It was very simple, but the most fatal effect was death. Moreover, the bamboo spear in progress was filled with poison; hence the injury could become disease or even death. Generally, the fighting used bamboo spear was close and direct battle. The psychological compete on a warfare used bamboo spear had essence as spirit of opposition against colonialism.

According to the history of warfare in Indonesia, there were no full victories resulting from the use of bamboo spear. However, on Indonesian struggle history, bamboo spear was symbol of Indonesian people's struggle against colonialism. Almost all regions in Indonesia generally recognized and used bamboo spear for the weapon of struggle on each region. Bamboo spear could be mass weapon which recognized and used by many strugglers in Indonesian independence warfare. The essence of this weapon is spirit of fighting against all forms of colonialism that emerged from the people for the independence of nation.

It is important for learning (lessons learned) of Indonesia's young generation at this time that the spirit and high sense of nationalism are required in the situation of facing all threat forms, harassment, etc., from both inside and outside. The feeling of similar fate and live from the former struggler made a lesson for the younger generation to strengthen national unity. Bamboo spear became symbol of national unity and the basis of nationalism spirit. Besides that, bamboo spear has also become symbol of confidence for the struggle. Inheritance of this spirit and confidence could be an asset for Indonesian young generation to continue and fill the independence now and future.

In progression of modern weapon technology, bamboo spear was the weaponry history that used for Indonesian struggle in the past time. Now, bamboo in Indonesia became an important commodity and useful for society as home building material, household furnishing, and other people's good. In addition, bamboo became basic material for Indonesian traditional musical instruments, such as the *angklung*, flute, *jegog, kolintang*, etc. Moreover, it popularly used as basic material for handicraft which has high artistic values. This showed that bamboo is Indonesian natural resource which multi-functions from independence period till recently.

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Dr. Alejandro Amendolara (Argentina)
"Inventiveness under Pressure: The Exocet Coastal Launcher in the Malvinas/Falklands War"

1. Introduction

"Exocet", name of a flying fish, only known by some ichthyologic experts or crosswords amateurs, was taken out from the shadows by an ingenious inventor to give it to an anti-ship missile, eventually addressing the name to a very different world, that of naval warfare.

During the Malvinas/Falklands Islands War in 1982 involving Argentina and Great Britain, the French-built Exocet missile wrote a new page on the effectiveness of missiles against warships.

Those who remember this war will recall the shock received on learning of the sinking of HMS Sheffield on May 4th, 1982. An air-to-surface Exocet AM-39 missile costing less than a half million US dollars, fired from an Argentine Super Etendard airplane, struck the one hundred and fifty million dollars British destroyer *HMS Sheffield* and took the lives of twenty sailors and twenty four were wounded. There was no warning, and the missile was only sighted when one mile off and, although the warhead failed to detonate, the resulting fire caused the ship to be abandoned, and she eventually sank in a storm few days after.

Few days later, two Exocets struck and sank the merchant ship *Atlantic Conveyor* on May 25th, and the last available Argentine missile had gone during the combined air raid against the core of the British Carrier Group, on May 30th. So effective were they that become the terror of the British Navy, some of whose personnel developed what Martin van Creveld described as *"Exocetitis"*.

HMS Sheffield's funeral pyre made horrific viewing when the film finally reached Britain. Her loss, despite the light casualty toll, caused severe irresolution at Westminster. Frantic efforts were made in Britain to find an ad hoc defense against Exocets. After Sheffield's immolation, the journalists goggled in horrid fascination over Exocet as though the missile was the death-ray of H.G. Wells' Martians.

Nevertheless, there were only five air-to-surface Exocet missiles in the Argentine inventory. Despite this lack of more air launched missiles, another sort of Exocet threat to the British ships still remained active.

2. Building the artifact.

Since the first naval bombardment of Puerto Argentino by British warships occurred on May 1st, 1982, the Argentine Navy began to evaluate the possibility to bring an Exocet surface-to-surface system on the islands to discourage British warships from approaching by night, since the Argentine Air Force could not operate against them in the darkness, and the field artillery in the islands had not enough range to effectively disturb the warships in their task.

Preliminary studies determined that removal of the Exocet MM-38 missile and its complex installation from a warship, would take a long time, considering the urgency of stopping the enemy naval bombardment.

Therefore, a whole home-made portable system was to be designed, consisting of a device to simulate the electrical signal that the ship's computer sends to the missile in its original mounting on board, a ground launch inertial platform, a cart transporting missiles, a target detection system and a generator to provide electric power.

This equipment had to be built quickly, by using the standard components that could be found in a naval workshop, which caused the installation be much larger than technically necessary.

The home-made system was developed by a lone naval officer, lieutenant-commander (*capitán de fragata*) Julio Pérez, and his small group of technicians, who in ten days managed to put together a makeshift Exocet coastal defense battery, by removing a pair of missile canisters from a destroyer and fix them onto a trailer, after testing and proving it manually at the Puerto Belgrano Naval Base, "misleading" the missile by electronic means to behave as if it was onboard a warship.

Thereby, a "simulator box" was built to allow measuring the flow of electricity and signals received and transmitted by the missile, to determine exactly how was the special feature in the electronic exchange of signals between the ITS and each missile. Once all the signals were known in detail, the remaining problem was how to generate and send them to the missile, and finally, to obtain the Exocet answer as if they had been sent by the computers on board.

Finally, after fifteen days of continuous work, the entire launching process could be simulated and could check that the missile had received all the information desired. When this could be replicated, the aim of replacing the entire system on board for the precarious installation was finally reached, and then tested no less than fifteen times to guarantee a proper operation.

Simultaneously, at the Workshop in the Arsenal of Puerto Belgrano, a platform was constructed to mount the missiles in their containers on a launch ramp, and for the electric generator, an old Siemens was found, with 1930's technology used for the searchlights of anti-aircraft artillery in the Argentine Marine Corps.

These two catafalques with the "simulator boxes", were the resulting system for the Exocet land-launcher. According to the launcher precariousness, it was jocose christened by its creators as the *"Poor Quality Firing System"* (*"Instalación de Tiro Berreta" – "ITB"*).

3. Airlift to the Islands

In the meantime in the Islands, the British warships detached from the Battle Group at sunset and took stations to the south of the peninsula on which Puerto Argentino stands, to harass every night the Argentine positions with naval bombardment, keeping the garrison awake and deterring any Hercules C-130 supply flights which might attempt to sneak in.

The Argentine Army field guns replied the duel with an increased heavier fire, showing they were learning the rudiments of firing at moving ships, pitching shells within fifty yards on occasions.

With the construction work finished, the Exocet launcher now had to be transported to the Falkland Islands. Two Air Force Hercules C-130 become available to load the carts, ramp, and a pair of Exocet containers with missiles, the Siemens electrical generator, and the simulator boxes with the ITB system, with an overall weight in the order of 28 tons.

In late May, was completed the first stage of moving from Puerto Belgrano Naval Base to the main airlift base at Comodoro Rivadavia, so the Hercules pilots could began to prepare the flight plan to Malvinas.

On the early evening of May 29th, the first Hercules took off, flying at very low-level skimming the waves, which splashed on the cabin windscreen. The reason for that was to avoid been identified by the radar of the British ships, positioned in "missile traps" off the airfield. From time to time, the airplane briefly rose to make a short radar scanning to detect if there was enemy ships and then returned to low altitude very close to the sea surface.

After a three-hour flight and about to arrive, both Hercules were informed that the airport was under enemy attack so they had to return to Comodoro Rivadavia. These flights were repeated for a second time the next day, and only in the third attempt both aircrafts managed to cross and land in the Falklands with their load. The first Hercules landed in the evening on May 31st, so the ITB could finally reach the islands, after three weeks since its initial conception.

4. Hiding the ITB from British Intelligence

With the ITB on the islands, the chief of the naval contingent in Malvinas, Rear-Admiral Jorge Otero, decided to hide the launcher from British intelligence. Equipment was located in the street opposite to the Naval Warehouse, hiding its presence with masking elements.

The components were scattered and located away from the launch site, to prevent aircraft and satellites from gathering intelligence. He also ordered the strictest secrecy about the operation, because it was suspected that the islanders were sending information to the British, who could consider it a tempting target for an attack with Special Forces. The assembly work was to begin at dusk (about 6.00 pm), and the best site to place it was in the paved road crossing the isthmus that links the airport's peninsula with the rest of the island. The launcher was first towed by hand. Then arrived the cart with two Exocet containers, and a self-propelled crane was used to lift the containers and place them on the launching pads, and then wired to the Fire Control equipment. After verifying the connections, the electric generator was started, and the missiles were ready for fire, so they only had to wait for a warship to cross in front of them. Otherwise, the launcher was dismounted around 4.00 am, before dawn, and hidden again.

5. Failed Launching

On June 1st came the first chance. In the first attempt, the propellant ignition failed due to undetermined reasons. The firing of the second missile was quickly prepared, but was launched with a wrong direction caused by errors provoked by the rush to fire again before the enemy ship moves away.

Information of the Exocet firing from the shore reached the British naval commanders early on June 3rd and advantage was taken of the weather, which effectively prevented any Argentine air strikes on ships, to search for the launching site, with helicopters and Harriers making a visual and photographic reconnaissance along the coast.

The British Battle Group had suspended its bombardments on the area until the Exocet threat had been more clearly examined. As a first step, a destroyer was detached to operate outside the Exocet range, to the south of the airfield. The ship flew off her helicopter, carrying a large, home-made radar reflector; the helicopter flew slowly to the "gun-line" area to the south of Puerto Argentino and pretended to be a bombarding ship, in the hope of attracting an Exocet. Although the helicopter was tracked by many Argentine types of radar, no missile was fired on the occasion.

6. Launching

The British continued with the naval bombardments the following nights, without notice of the Exocet threat. The fact was that there were no Exocet replacement missiles in the islands, so they had to be sent from Argentina again by air. Again, after three attempts, two Hercules airplanes could run the British blockade and deliver fresh missiles on the night of June 5th and 6th.

The ITB was ready again, but the British frigate's movements were limited by the Exocet threat, avoiding the area that was assumed within the missile range.

On the night of June 11/12, three British ships were detached for more Naval Gun bombardment operations in support of the land attack against the hills surrounding Puerto Argentino. They had to get pretty close in, within Exocet danger range, and while awaiting the call for fire, they tucked themselves in very close to East Island. The orders were to be back with the carriers group by dawn, to avoid get caught in daylight by Argentine pales.

On land, the Argentine team passed the nights with tense waiting for the prey. Somehow, British ships began making an erratic path in their bombardment course and, in general, did not enter in the range of ITB (38 kilometers). Sometimes they were within the missile range, but not of the RASIT radar (30 kilometers). This monotonous and frustrating waiting caused a situation that brought a touch of humor to the drama of the moment.

One of the team members proposed to perform an Indian-style dance around the missile launcher. With nothing to lose, Perez authorized the initiative, thinking that at least they would become warmer with the physical-exercise. Under the oath to never tell anyone what was to happen, the men began to dance around the launcher shouting *"Uka-Uka"* imitating the Indians, with the hope that it would cause a British ship to enter within range of the launcher.

About three hours later, the RASIT radar detected a ship entering the firing zone, at the far limit. Immediately, the entire firing procedure was performed and a missile was launched.

This time the prey was the British destroyer *HMS Glamorgan* when she was heading away from the coast, after ending her Naval Gun Support mission against Argentine land positions.

7. Handbrake!

In the ship's control room, an approaching radar contact was detected. It resembled, in the size of the echo and its speed, one of the artillery shells which had been tracked before. But, at ten miles north of the Glamorgan, it was recognized as an Exocet. The navigating officer, Lt-Cdr Ian Inskip, saw on the radar plot a small "blip" travelling at high speed towards the ship. Interpreting this correctly as an Exocet, he ordered the ship to turn away from it, to reduce the target-echo. Thanks to this quick thinking, there was a gap of 40 seconds during which the ship could swing around and present her stern to the missile. The destroyer held her fire until the missile was within a mile and then launched a Seacat missile. At 2.37 am, the incoming missile struck the port upper deck edge, slid diagonally across the deck into the hangar and exploded.

There was a small detonation, enough to wreck the hangar and send a shower of deadly splinters into the galley. The men there were killed and the helicopter was destroyed. In all, 13 men were killed and 14 were injured, and the fire which broke out took three-and-a-half hours to put out. Amazingly, although *Glamorgan* at one stage developed an 11-degree list, the vessel was operational again 36 hours later, but never attacked the Argentine positions again.

Puerto Argentino became illuminated by the glow of the launch. The explosion had been seen from many points in the Malvinas, by the Argentine and British troops still fighting on the hills, as a glow on the horizon on the open sea. But, the last Exocet impact, was hidden at home by Argentina and Britain to the enemy's intelligence and their public opinion, claiming an airplane attack or artillery fire instead.

On the morning of June 14th, when the Argentine positions envisioned the end of conflict, Captain Perez rallied in with a pair of hand grenades to blow up the launcher. When he was to throw in the explosives, then Admiral Otero approached to him and said, "*Look, Perez, Do the English have the Exocet?*". After the affirmative answer, he urged, *"Do not blow it up, they won't learn anything more on the Exocet, but when they see with what we hit a warship of theirs, they will be aware about the ability of the Argentine Navy".*

8. Conclusion

On July 10th the battered Glamorgan returned to Portsmouth. Her wrecked hangar was protected from the elements by a large tarpaulin, hiding the Exocet scars, and immediately went for repairs in the dockyard.

After the Malvinas War, Great Britain adapted the Exocet MM 38 to a coastal defense role; the resulting system was called *Excalibur*, with one battery been sited at Gibraltar. Obviously, this was nothing more than the improved Argentine ITB, but developed under normal circumstances.

Even before the war ended, the British worked at home on warships design according their experiences during the conflict. Among other changes, the American Phalanx short-range anti-missile system was fitted to HMS Illustrious in June 1982.

From 1986 the Dutch Goalkeeper system, was preferred for its heavier projectiles, and fitted to major warships. A third "Invincible Class" carrier was commissioned as Ark Royal in 1985, with many improvements, plus three Goalkeepers, all thanks to the Malvinas experience. The two earlier "Invincible" carriers were then upgraded to the new standard.

The Exocet missile was to return to the news headlines during the Iraqi air-attacks on oil tankers in the Persian Gulf, and even two Exocets struck the American frigate USS Stark, on May, 1987.

But, it was in the light of the newspapers and magazines during the Malvinas War that the Exocet missile carried its name worldwide, and its dramatic strike effects have aroused feelings in a mix of surprise and respectful fear that inspire the magical phenomena, joining Superman or the Zorro in the popular imagination.

To conclude, I recall the words from Henri Martre, Head of Aérospatiale, regarding the ITB: "*From unexpected to unusual: ¿How could you avoid saluting the ingenious improvisation from the Argentine team which, in a few days, "botched" an anti-ship surface-to-surface unit, to transform it into a coastal battery that hit the target with its sole shot?*"

Col. (res) Benny Michelsohn (Israel)
Tank protection in advance of the A/T weapons. The case of the MERKAVA – MBT

Historical Background

The Israeli War of Independence was, in effect, an infantry war. Operations of both, Israel and the enemy were waged by infantry formations. The few tanks deployed played no decisive role. Israel at that time had 40 tanks (only 11 obsolete Hotchkiss tanks participated in battles)[1], and the Arabs had 90.[2] Mobile and armored forces in the War of Independence were mainly equipped with half-tracks, armored personnel carriers, and armored vehicles with light guns. Israeli forces had 280 half-tracks and 20 armored vehicles with guns. Arab forces had 620 armored vehicles and armored personnel carriers, of which 180 carried guns.

The Sinai War of 1956 was characterized by mobile, armored warfare. Israel deployed 175 tanks in Sinai, versus 155 tanks deployed by the Egyptians.[3]

Since the Sinai Campaign, the land war between Israel and the surrounding Arab nations has become a war of highly mobile and armored formations. A total of 3,000 tanks were deployed during the Six-Day War by Israel and the enemies. 6,000 tanks engaged in combat during the Yom-Kippur war.[4] Since the Sinai War, thousands of tanks have been destroyed in battle.

Today, the tank is central to the art of war, and is (still) considered the primary decisive factor on the modern land battlefield.

Prior to the Sinai War, Egypt received, within the framework of the "Czechoslovakian Arms Deal", 350 Soviet tanks and tank destroyers, including 50 Stalin-3, 200 T-34 tanks and 100 SU-100 tank destroyers.[5] This was considered an impressive addition to the Egyptian armored fleet, which at that time numbered some 430 western armored vehicles, of various types.

Within the scope of the Middle-East arms race, Israeli weaponry was always inferior in both qualitative and quantitative aspects. Israel acquired Sherman tanks and AMX-13 tanks (not really tanks but rather light tank destroyers), while the

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[1] Amiad Brezner, **Origins of the Israeli Armoured Corps**, (Hebrew) Maarachot, Tel Aviv, 1995, p. 275.

[2] Benny Michelsohn, The Arab Armor in the War of Independence, **Shirion 29**, Latrun, 2008, p.70.

[3] Benny Michelsohn, The Political breakthrough that leaded to the Military breakthrough, **Shirion 24**, Latrun, 2006, p. 34.

[4] Benny Michelsohn (Chief Ed.), **The Struggle for Israel's Security**, Tel Aviv, 2000,p.133;177.

[5] IDF Ordnance Corps Veterans Association, **The History of the Ordnance Corps, 1948–1967**, Tel Aviv, 2004, p. 133.

Arabs obtained, with no problems, new and modern tanks from both east and west. Israel was forced to be satisfied with "junk": old and inoperable tanks, Second World War vintage Shermans, British Centurions and American M48's.

Not a single country agreed to sell new tanks to Israel. It is still not clear why some countries did allow Israel to occasionally buy new and modern means of battle, such as jet fighter planes, but persisted in their refusal to sell to Israel new tanks.

Given the need, Israel was forced to learn the technologies of armor, in order to rehabilitate the obsolete metal hulks, which IDF had purchased through programs of rebuilding, regunning and engine replacements.[6]

The race between Israel and the Arabs now became a direct confrontation between new Western and Soviet MBT's fielded by the Arab armies and old, rebuilt and improvised tanks fielded by Israel.

In the 1960's the Arabs were about to obtain T-62 tanks from Soviet Russia. This was the most modern operational Main Battle Tank (MBT) of its time, equipped with a high-powered 115-mm cannon. It. was clear that no improvisations or rejuvenation to tanks of the 1940s and 1950s would suffice to ensure the continued security, and indeed the existence, of the State of Israel.

At that time, in 1966, Britain came forward with a dramatically historic proposal. The British needed money in order to complete the development of their new tank of the future, the Chieftain, with its 120-mm cannon. This tank was designed to be the strongest and most modern in the west. In view of their financial constraints they proposed a "package deal". According to this deal, Israel would buy hundreds of obsolete Centurion tanks. UK, in exchange, would allow Israel to participate in the final stages of Chieftain Development program, would sell Israel Chieftains, and would help Israel build, in the country, an assembly line for Chieftains. This was seen as an ideal solution to the unacceptable predictions regarding the middle-eastern armor balance from both quantitative and qualitative points of view.

Israel cooperation with the British lasted for about three years. Two prototypes of the Chieftain tank were delivered to Israel. Israel invested heavily in the improvement and final development of the Chieftain in close cooperation with British officers and engineers, who worked with IDF in Israel.

However, Arab states intervened. They threatened Britain with sanctions, with pulling their monetary reserves out of British banks, and other actions. Demonstrations were held in Arab capitals and British embassies were attacked. In November 1969 Britain withdrew from its Chieftain deal with Israel.

The development, design and planning efforts of three years were wasted – and IDF were back at square one, with time lost which could not be retrieved.[7]

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6 IDF Ordnance Corps Veterans Association, **Ibid**, p. 158.

7 Saul Bronfeld, Perfidious Albion, **Shirion 37**, Latrun, 2011, p.26.

In view of this development, Israel considered the possibility of developing and manufacturing “made-in-Israel” tanks.

It was clear that a weapon system of primary importance was at stake, vital to Israel security, but which had been refused, selling to Israel by all nations. No change in this attitude was foreseen.

The question, which arose therefore, was not whether Israel should engage in development and manufacture of a homemade tank, but whether Israel would be capable of achieved the high levels of industrial and technological expertise required to succeed in such a project. To this was added the question of whether Israel would be capable of doing so at a reasonable price and without disrupting the Israeli economy.

In order to answer these questions, it was decided to conduct a study, presided by Major General Israel Tal. The study was conducted by experts of the Ministry of Defense and of the IDF Ordnance Corps, and was designed to answer two essential questions:

1. Would Israel be capable of planning, designing and manufacturing a Main Battle Tank from the point of view of technological know-how and industrial infrastructure?

2. Is there any economic sense in such a project – does it ensure economic viability in the broad sense, to the economy of Israel?

Findings of the study were positive. Israel would be capable of developing and establishing an infrastructure for the manufacture of tanks, which would be economically feasible from the point of view of the national economy. In addition, the proposed Israeli tank would compare favorably with others, would meet the specific requirements of the IDF and the specific needs of the middle-eastern theatre of war. In 1970 the decision was taken that the State of Israel would develop a tank for the IDF and for export in the future.[8]

Organization and Method of Development and Manufacture

The original plan was for the development of a tank to be based primarily on existing systems and assemblies. But even from the first years of development the need arose, in view of know-how restrictions, technological reasons and operational requirements which developed over time, to develop an entirely new tank which would be based on both original and new assemblies. The development task was modified accordingly. The need to shorten development time gave rise to an abbreviated development process, while knowingly taking risks, which later became known as the “telescopic development” process. This method was characterized by the start of serial production, based on prototypes, before completion of all development and demonstration stages. This was prior to the finalizing of production files.

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[8] Israel MOD, Tank Program Directorate (TPD), **Merkava Tanks**, 1989, p 5.

In order to reduce the investments needed for the establishment and management of a tank, manufacturing industry, Israel decided not to form double organization, with the backup services required for such a project (procurement, inventories, legal and economic service units, etc.). It was decided that the Project Administration would utilize existing MOD/IDF infrastructures such as Equipment Center facilities, spare part inventories, procurement and manufacturing controls, MOD legal advisor staff, MOD economic advisor staff, and others.

It was further decided to utilize the industrial infrastructures existing in the IDF- Ordnance Corps, the civilian and governmental military industries, and to expand the manufacturing potential of existing plant where necessary. To the extent possible inflated bureaucracies or the creation of new industries would be avoided. It was now decided that the existing IDF basic tank depot would be utilized as the tank's final assembly plant. In addition, two hundred industrial plants would be upgraded with new knowledge and capabilities, as required for the manufacture of the thousands of parts, assemblies and systems, needed for the Merkava tank.

A policy of regional distribution of manufacturing facilities throughout Israel was evolved, including development regions, with maximum utilization of civilian enterprises and no monopoly for the military industries.

It was decided that any technological knowledge, which was lacking would be acquired in part from abroad, and in part self-developed within the defense establishment, the industrial establishment and by Israeli research institutes.

The first Merkava tanks were supplied to the IDF in April 1979, nearly nine years after the decision to produce the Merkava tank was taken. The Merkava tank has been designed in accordance with experience gained from IDF armored battles in all Israel's wars since the Sinai War (1956).

The protection concept

The Merkava is unique in its basic concept, common to all generations of the Merkava, according to which armor and survivability of the tank are its basic features. The tank's protection is based on all-round spaced ballistic armor, and deployment of the tank systems around the crew, thus utilizing basic elements and systems of the tank to protect the crew and ammunition, in addition to their specific functions. The most striking example of this concept is placement of the power pack (engine and transmission) at the front of the tank.

Other factors contributing to the Merkava Mk. 1's survivability are:

- Low profile when in firing position.
- Elimination of flammable materials from the crew compartments.
- Storage of main gun ammunition under the turret ring, well to the rear of the hull, in heat-resistant containers.

The Technological and Economical impact of the Merkava program.

Defense is one of the principal engines of the modern Israeli economy and military R&D is often the catalyst for innovation in the civilian sector. Products derived from defense research form the basis for much of the country's high technology exports. Without the Merkava, the industrial base will lose an important infusion of technical know-how and investment.

The contribution of the Merkava Industry

Speaking at the Herzliya Conference in December 2003, Yaakov Sheinin, CEO of Economic Models Israel noted the enormous impact of defense on the Israeli economy.

Every dollar in Ministry of Defense orders produces $2.40 in defense exports, which have an added value of 66%. If the economy emerges from the recession with five percent growth in 2004, it will take until 2010 before employment falls to six percent.

According to the Israel Manufacturers Association (IMA), the Merkava program is responsible for between $200 million and $250 million in annual defense technology exports.[9]

Cost (1990 price)

Merkava Mk. 1 – 1.8 Million $.
Merkava Mk. 2 – 1.9 Million $.
Merkava Mk. 3 – 2.3 Million $.

Employment

At the present time, 220 companies (6,500 employees) supply subcomponents to the IDF, the Merkava's prime contractor. Of these firms, all but a handful are Israeli. Approximately 22% of the Merkava's content is of American origin.

Peace for Galilee War – 1982

The Merkava Mk. 1 tank participated with a high degree of success in Peace for Galilee War (1982). When the war started Israel had 164 Merkava Mk. 1 tanks in Lebanon. The Merkava Mk. 1 proved superior to all other tanks in IDF service that fought in the war. Only 20% of the heated tanks (by enemy a/t fire) were destroyed compare to 46% of the Paton tanks and 38% of the Centurions.[10]

Production of Merkava Mk. 1 continued up to 1983, when the IDF Armor Corps began to receive the Merkava Mk. 2 tanks.

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9 Fishbein H. Rand, Tank Tops and Heavy Metal: Armor's Enduring Appeal on the Modern Middle Eastern Battlefield **Nativ online**, June 2004.

10 Benny Michelsohn, Armor Lessons of General Moshe Bar Kochva from the Peace for Galilee War**, Shirion 27**, Latrun, 2007, p. 53.

Lessons learned from the operation of the Merkava Mk. 1 tanks were applied to the Merkava Mk. 2 tanks, mainly in the following:

- Improved mobility
- Improved fire control system
- improved special armor
- Internal 60mm mortar

The production of Merkava Mk. 2 tanks continued until the end of 1989, at which time Merkava Mk. 3 tanks started to come off the production line.

The Merkava Mk. 3 entered service in the IDF at the beginning of 1990. It is a sophisticated tank. The difference between the Mk. 3 and the Mk. 2 is in essence and not in degree. All systems and assemblies were new, and except for the engine, are of Israeli design and production.

Among the prominent features of the Merkava Mk. 3 were a new 120mm powerful gun, produced by IMI and a new 900 hp diesel engine developed by the German firm MTU, and, especially, a new and unique concept of armor. Ballistic protection is provided by special armor modules, which are attached to the tank by bolts. These can be easily replaced whenever better ballistic technology is introduced. Thus, the tank will remain "young" forever.

During the Merkava Mk. 3's years of production, a number of modifications have been introduced, the major ones being a modern fire control system with an automatic target tracker ("Baz") and significant improvements in ballistic protection.

Unlike other main battle tanks, the Merkava doubles as a troop transporter. Its rear entry design enables up to eight fully equipped soldiers to be carried safely into combat. A 60 mm mortar mounted inside its hull along with three 7.62 mm machine guns permits the crew to provide suppressive fire at close range while also using its main gun to deliver precision strikes against fortified enemy positions.

Operation Defensive Shield – 2002

The IDF employed Merkava tanks to dislodge Palestinian terrorists holed up in the fortified concrete buildings in the Jenin refugee camp. The Merkava was the weapon of choice for military commanders concerned that the use of F-16 aircraft and artillery to destroy terrorist positions would risk unacceptable collateral damage and lead to a high loss of civilian life within the densely packed refugee camp. Since the collapse of the Oslo process in September 2000, the Merkava has successfully supported Israeli military operations throughout the West Bank and Gaza.

Many of the changes were based on feedback and lessons learned through operational and combat experience in Lebanon, West Bank and Gaza. As a result, the IDF decided to gradually phase out the Centurion and M-60s, and moved toward an armored force based entirely on Merkava platforms. This process culminated in

2005, when the last regular unit, equipped with M-60s replaced the aging American tanks with the latest Merkava Mk 4 tanks.

The production of the Merkava Mk. 3 lasted until 2002, whereupon the Merkava Mk. 4 was first fielded to the Armor Corp.

Second Lebanon War – 2006

45 Israel Defense Forces tanks were hit by A/T missiles during the 34 day War in Lebanon. 30 soldiers and officers from the Armor corps were killed (25 crew tank members) and about 23 were injured, including three Company Commanders and two battalion Commanders...

About 380 tanks took part in the battles in Lebanon, and we can already posit that they stood against about 1,200 antitank missiles + thousands of advanced Rocket Launchers like RPG-7 with TANDEM warheads and RPG-29, most of them with excellent penetration capacities. It means that Hezbollah terrorists shot at lest 26 missiles to hit one tank.

It is possible to see from this that Hezbollah terrorists were familiar with the tanks, they prioritize the targets and dedicated the best missiles – KORNET (1,200 mm armor penetration capability), against the best tanks – MERKAVA Mk. 4, they study their characteristics and they knew when and where to shoot in order to inflict the most damage.

In the first 30 days of battles in Lebanon, the tanks did not move and shoot. They were be used for Infantry rescue & evacuation missions or were located in static positions for support missions where they remained 5 – 6 hours at one spot. Instead of taking advantages of the tank's many capabilities, especially the excellent traffic ability they underscored the tank's weakness.

The capabilities of the IDF's newest tank – the Merkava-4 – were barely utilized in the war.

Our tanks are the most armored in the world, but there's no such thing as 100 percent protected. Only if you take advantage of their capabilities, and use them along the Armor Warfare rules, like mobility, speed, indirect approach, exploiting tactical penetration into strategically one, joint operations that are a combination of fire and movement can you ensure Armor success and minimal casualties.

The conditions for the armored corps were so harsh that the tanks as a person with one hand tied behind his back that turns his cheek to be slapped...

The encouraging statistic: Twenty-two tanks sustained hits that penetrated their steal armor and there were 25 fatalities; in the rest, damage was caused to the vehicle and some of the crew was wounded. 8.5 percents of the tanks hit by missiles were destroyed. During 1982 "Peace for Galilee" War , this happened to 20 percent of the tanks, in the Yom Kippur war – 1973, 59 percent and during the "Six Day War" – 1967, 65 percent.

The IDF decided that four of the tanks could not be restore, two of which had been damaged by underbelly explosives (one of them a Merkava-4) and two of which had been demolished by antitank missiles.[11]

Operation “Cast Lead” 2008

During that operation, about 150 Merkava tanks took part. The tank units were part of 5 Armor Brigade Task-Forces who pass the border into Gaza strip, cut the strip in two parts and envelope the city of Gaza.

During that operation, the survivability of the Merkava tanks becomes clear. Although Hamas terrorists shot on them hundreds of RPG Rockets, mortar shells, use IED and small arms fire from a variety of calibers, only one tank was penetrated by a belly IED and was back in service after 18 hours.[12]

Summary

The analysis above proves that although the A/T penetration capability increase, the MERKAVA Tanks are with very high survivability.

Today, the Merkava is the centerpiece of Israel’s ground forces. It is the principal instrument through which IDF ground commanders are able to implement Israel’s version of lightening war, a doctrine which calls for the IDF to win all of its battles quickly and decisively and with the fewest possible casualties. When fully mobilized, Israel is able to increase its armored strength from 4 regular armor brigades to 25 armor brigades enabling the country to simultaneously defend against ground attack along each of its borders.

The press and the media, worldwide, create the impression that the new A/T missiles, especially the Russians Kornet and Metis are superior and the competition between the tanks and the A/T weapons is in A/T favor but I described here the process when the tanks, during the years, become more and more protected. At least the Merkava tanks in the Middle East conflicts.

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3. Fishbein H. Rand, Tank Tops and Heavy Metal: Armor’s Enduring Appeal on the Modern Middle Eastern Battlefield **Nativ online**, June 2004.
4. IDF Ordnance Corps Veterans Association, **The History of the Ordnance Corps, 1948–1967**, (Hebrew) Tel Aviv, 2004.
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6. Michelsohn Benny (Chief Ed.), **The Struggle for Israel›s Security**, (Hebrew) Tel Aviv, 2000.

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[11] Benny Michelsohn, The Armor in The Second Lebanon War**, Shirion 30**, Latrun, 2008, p. 33.

[12] Benny Michelsohn, The Armor in Operation “Cast Lead”, **Shirion 31**, Latrun, 2008, p. 12.

7. Michelsohn Benny articles in: **Shirion, the periodical of IDF Armor Association, Ex. No. 24; 37; 29; 30; 31.** (Hebrew).
8. Shinin Yaakov, **Herzlya Conference**, 2003.

System / subject	Mark 1	Mark 2	Mark 3	Mark 4
Main gun (caliber)	105mm	105 mm	120 mm	120 mm
Engine	900 hp	900 hp	1,200 hp	1,500 hp
Transmission	Semi-automatic	Automatic, 4 gears	Automatic, 4 gears	Automatic, 5 gears
Running gear	External, double positions, linear shock absorbers	External, double positions, linear shock absorbers	External, single, position, rotary shock absorbers	External, single position, rotary shock absorbers
Weight	63	63	65	65
Turrent control	Hydraulic	Hydraulic	Electrical	Electrical, advanced
Fire control	Digital computer Laser rangefinder Thermal/passive night vision	Digital computer Laser rangefinder Thermal night vision	Advanced computer Line of sight stab. in two areas TV & thermal auto-tracker Modern laser range finder Thermal night-vision TV channel Dynamic cant angle indicator Commander's sights	Advanced computer Line of sight stabilized in two axes 2nd generation TV and thermal auto-tracker Modern laser range-finder Advanced Thermal night
Heavy ammunition storage	Protected container for every four rounds	Protected container for every four rounds	Protected container for every four rounds	Protected containers for each round
Ready to fire ammunition storage	Six round magazine	Six rounds magazine	Mechanical drum case for five rounds	Electrical revolving magazine, containing 10 rounds
60 mm mortar	External	Internal	Internal	Internal, improved
Electromagnetic warning	Basic	Basic	Advanced	Advanced, 2nd generation
NBC protection	Overpressure	Overpressure	Combined overpressure and air cond. (in Baz tanks)	Combined, overpressure and individual, including air-conditioning (heating and cooling)
Ballistic protection	Laminated armor	Laminated armor + special armor	Modular special armor	Modular Special Armor, including roof protection and improved coverage areas

Friday, 31 August 2012

Vendredi, le 31 Août

Médecin-Colonel Jamal MEHSSANI (Morocco)

LA TELEMEDECINE
Évolution d'un concept et intérêt en situation opérationnelle

1. Introduction :

Les dernières décennies ont été marquées par une accélération vertigineuse des avancées technologiques. Il n'est pas de domaine qui ne soit affecté en profondeur par la mise en œuvre de procédures scientifiques de plus en plus élaborées.

Dans les armées, l'utilisation à grande échelle de la technologie a eu un impact frappant sur le mode et le déroulement des opérations militaires.

Dans cette optique, l'homme a toujours lié son ingéniosité technique à sa propension à combattre mais aussi à sauver des être humains.

La télémédecine fruit d'un développement technologique indéniable présente un intérêt certain pour les sociétés militaires du monde entier, puisqu'elle permet de rassurer et rehausser le moral des militaires engagés en promettant de leur offrir des soins de qualité et voire des interventions chirurgicales lourdes.

Le domaine militaire est un terrain d'application privilégié pour de nombreuses expériences nouvelles en matière de télémédecine. Le principe des systèmes d'information et de communication utilisé est de «rapprocher » et de mettre en adéquation les compétences médicales expertes et les besoins émanant des structures médicales déployées sur le théâtre d'opération.

Généralement, le terme «télémédecine» est utilisé pour décrire l'application des nouvelles technologies de la communication à la pratique médicale[1]. Nul ne doute que cela représente un domaine très vaste avec un potentiel énorme.

Pratiquement, la télémédecine se définit comme le transfert électronique de données médicales, du son, d'images statiques et dynamiques et de texte, en temps réel ou différé, afin de pratiquer la médecine dans son ensemble à distance : consultation, diagnostic, conseils et traitement ainsi que l'enseignement et le perfectionnement, au niveau régional, national et international[2].

Par ailleurs, l'activité de la télémédecine englobe plusieurs actes dont les plus reconnus sont : **la téléconsultation**, **la télé expertise, la télésurveillance et la té-**

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1 Taylor P., A survey of research in telemedicine : Telemedicine systems (Journal of Telemed and Telecare 1998) N° 4:1–17.

2 Strode SW; Gustke S; Allen A., Technical and clinical progress in telemedicine (Journal of the American Medical Association (JAMA) 1999) N° 281:1066–8.
Grigsby J; Sanders JH., Telemedicine : where it is and where it's going (Annals of Internal Medicine 1998) N° 129:123–7.

léassistance[3]. Pour éviter toute équivoque, nous donnons ici une brève définition de chacun de ces termes en le plaçant dans son contexte approprié :

- La téléconsultation :

C'est un acte médical qui se réalise *en présence du patient,* qui s'entretient avec le médecin *requérant* et/ou le ou les médecins télé consultants *requis*.

- La télé expertise :

Il s'agit d'échanges de données et d'informations entre spécialistes pour obtenir un deuxième avis. De façon plus large, la télé-expertise concerne tout acte diagnostic et/ou thérapeutique qui se réalise en dehors de la présence du patient, sur la base des données cliniques, radiologiques ou biologiques qui figurent dans le dossier médical de ce patient.

- La télésurveillance :

C'est un acte médical qui découle de la transmission et de l'interprétation par un médecin d'un indicateur clinique, radiologique ou biologique, recueilli par le patient lui-même ou par un professionnel de santé. L'interprétation peut conduire à la décision d'une intervention auprès du patient.

- La télé assistance :

Elle peut être un acte médical lorsqu'un médecin assiste à distance un autre médecin en train de réaliser un acte médical ou chirurgical. Le médecin peut également assister un autre professionnel de santé qui réalise un acte de soins ou d'imagerie, voire dans le cadre de l'urgence, assister à distance un secouriste ou toute personne portant assistance à personne en danger en attendant l'arrivée d'un médecin.

Après ces quelques éléments introductifs d'ordre terminologique, nous estimons qu'il est primordial de vous parler un peu de l'évolution historique de la télémédecine. Nous commencerons par son histoire de manière générale avant d'évoquer son volet purement militaire.

2. Histoire et évolution de la télémédecine

En effet, les prémices de la télémédecine commencent déjà en 1906, quand Einthoven publie ses travaux sur le télé-cardiogramme : premiers électrocardiogrammes envoyés par téléphone[4]. Cependant, une cinquantaine d'années sera nécessaire pour associer le son et l'image. Ainsi, la télémédecine proprement dite débute dans les années 60 aux Etats-Unis, avec notamment la mise en réseau de programmes de téléconsultation et de télé éducation autour du Nebraska Psychiatric Institute[5].

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[3] Simon Pierre ; Acker Dominique, La place de la télémédecine dans l'organisation des soins (Conseillers généraux des établissements de santé, Novembre 2008).

[4] Einthoven W., Le télécardiogramme (Archives internationales de physiologie 1906) N° 4:132–64.

[5] Larson G. E. et al., An evaluation of the clinical effectiveness of telemedicine : medical provider's perspective. In: Naval health research center (Report N° 98, 13 May 1998).

Ceci étant vrai, deux autres dates symboliques peuvent aussi servir de points de repère à l'émergence de la télémédecine[6]:

- 1965, date de la première visioconférence en chirurgie cardiaque entre les Etats-Unis et la Suisse,
- et 1973, qui nous renvoie au premier congrès international sur la télémédecine au Michigan, lequel fut l'occasion du lancement de nombreux projets.

Par ailleurs, grâce aux liaisons par satellites, la télémédecine va se développer vers la fin des années 1970 par le biais de programmes de recherche instruits par des organisations et/ou institutions spécialisées qui sont elles-mêmes confrontées directement au problème de l'accès aux soins de personnes situées dans des lieux inaccessibles ou difficilement accessibles.

Ainsi, la NASA va mettre en place des programmes de télémédecine pour ses astronautes. L'armée américaine fera de même en installant des systèmes de téléassistance pour délivrer les premiers soins aux blessés sur les champs de bataille du Vietnam[7].

Dans le même sens, les stations d'étude et de recherche en Antarctique, ainsi que les stations d'exploitation pétrolière dans les océans vont réfléchir au développement de technologies appliquant la télémédecine.

Enfin, l'US NAVY va développer des programmes d'expérimentation de la télémédecine.

Dès les années 1990, plusieurs programmes de télémédecine sont développés dans de nombreuses régions rurales des Etats-Unis, pays où la couverture sociale est faible, et dans des pays nordiques, où l'accès à des zones éloigné est difficile, dans le but de faciliter les soins et de diminuer les coûts de la médecine générale[8].

Pour ce qui est de l'évolution purement militaire de la Télémédecine, il faut noter qu'au cours des années 1980 et au début des années 1990, les progrès technologiques ont permis aux militaires de mettre en place des réseaux intégrés de soins de santé dans de nombreuses régions du monde.

Ainsi, lorsque l'ouragan Hugo a dévasté les Îles Vierges en Mars 1990, l'Alabama Army National Guard a déployé l'hôpital militaire chirurgical mobile (MASH) à Saint-Croix. L'armée américaine a utilisé le prototype de radiographie scanner de champs de bataille assistée par ordinateur, un numériseur, et un satellite maritime international (INMARSAT) pour transmettre des images des îles Vierges

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6 Simon Pierre ; Acker Dominique, La place de la télémédecine dans l'organisation des soins (Conseillers généraux des établissements de santé, Novembre 2008).

7 Ibdm.

8 Hassol A.; Gaumer G.; Irvin C.; Grigsby J., Mintzer C., Puskin D., Rural telemedicine data/image transfer methods and purposes of interactive video sessions (Journal of the American Medical Informatics Association (JAMIA), 1997) N° 4:36–7.

au centre médical militaire Walter Reed (WRAMC) à Washington DC, et au centre médical militaire Dwight D. Eisenhower à Augusta en Géorgie[9].

À la fin de 1992, les forces américaines ont été déployées en Somalie dans le cadre d'une mission humanitaire des Nations Unies. Nous nous rappelons tous qu'à cette date, la population de la Somalie avait été dévastée par la guerre civile, la famine ainsi qu'une variété de maladies infectieuses, y compris le paludisme et la dengue[10].

En outre, les systèmes de communication, de transport, et les infrastructures publiques ont été gravement altérés. Les soins médicaux étaient limités. Les unités médicales de soutien des troupes américaines en Somalie dépendaient d'un hôpital de campagne.

Par conséquent, au début de 1993, le système de communications cliniques à distance (CRCT) a été déployé pour transmettre des images numérisées et des messages vocaux à partir d'un terminal portable INMARSAT vers le WRAMC[11].

Plus encore, en 1994, l'armée américaine va acquérir une expérience supplémentaire en envoyant une équipe de télémédecine pour soutenir les troupes américaines à Haïti. Les moyens utilisés ont inclus la vidéoconférence et la transmission de haute résolution des images fixes numériques (y compris radiographique numérisée), ainsi que des caméras intégrés dans des outils de diagnostic (otoscopes, ophtalmoscopes, dermoscopes..) connectés à des équipements de téléconférence pour les consultations basé au WRAMC [8].

De même, en 1996, le Département américain de la Défense a établi un réseau médical en Bosnie connecté avec les médecins dans cinq centres médico-militaires régionaux aux États-Unis (Washington, Texas, en Californie, District de Columbia, et à Hawaii)[12].

Sur le même registre, d'autres armées vont s'engager dans la télémédecine, comme l'armée sud africaine, qui, depuis 2005, s'est dotée d'un laboratoire mobile, installé dans un conteneur et dans lequel trois techniciens peuvent travailler simultanément.

Ce laboratoire possède plusieurs fonctionnalités. Il est doté d'une liaison satellite permettant le transfert d'informations ainsi que la visioconférence. Il est transportable par avion et permet de réaliser de nombreuses analyses histopathologiques, dermatologiques, chimiques, hématologiques et microbiologiques, grâce au matériel embarqué.

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9 Garshnek V.; Burkle F.M., Applications of Telemedicine and Telecommunications to Disaster Medicine : Historical and Future Perspectives. In: JAMIA, 1999) N°6:26–37.

10 Laughlin L.W.; Legters L.J. Special report: disease threats in Somalia. In: The American Journal of Tropical Medicine and Hygiene, 1993;48(2):6–10.

11 Crowther JB, Poropatich R. Telemedicine in the U.S. Army: case reports from Somalia and Croatia (Telemedicine Journal 1995) N° 1: 73–80.

12 United Medical helps U.S. military build TM network in Bosnia. In : Telemed Business Newsletter, 1996:3.

L'intérêt de ce concept n'est plus à démontrer. Il s'agit de pouvoir assurer des soins aux troupes dans les zones en retrait mais aussi pour les populations rurales, sans transfert de patient.

Un autre exemple, plus récent, montre que la télémédecine se généralise et confirme donc son intérêt pour l'armée. Il s'agit du déploiement de la télémédecine en Afghanistan par l'armée espagnole. Le matériel mis en place dans les postes avancés permet d'envoyer en temps réel les paramètres vitaux du patient, tels que l'oxymétrie ou la pression artérielle, ou encore de faire une échographie à distance. Ce matériel permet à des spécialistes de l'Hôpital central de la Défense "Gómez Ulla", à Madrid, d'effectuer un diagnostic et d'assister le personnel soignant sur place. De plus, cette installation offre également un suivi psychologique des patients[13].

Pour sa part, l'armée française a initié le programme Infostructure Santé (ISSAN : 2009-2015) qui a pour but de réorganiser le Service de Santé des Armée (SSA) en y intégrant les technologies de l'information et de la communication (TIC). Plusieurs projets sont englobés par ce programme :

La numérisation des fiches urgence et épidémiologique, qui permet au centre de triage, à l'hôpital de campagne ainsi qu'à l'hôpital d'Instruction des armées (HIA) d'anticiper la prise en charge du patient et donc d'améliorer son efficacité.

Un kit d'aide au diagnostic à distance, un système de téléassistance médico-chirurgical par visioconférence, la création d'un centre de télémédecine et de télé-imagerie et un système de suivi physio-psychologique sont autant d'outils qui permettront au SSA d'optimiser l'utilisation de ses ressources, logistiques comme humaines[14].

En effet, la chaîne de santé débute à la réception du patient et s'étend jusqu'à son traitement dans l'hôpital d'Instruction des armées, en passant par son transport, le poste de secours et l'antenne chirurgicale aérotransportable.

Tous ces outils permettront donc d'assurer des soins de qualité en continu tout au long de ce parcours et donc de limiter le nombre de victimes.

Actuellement, et grâce à la technologie disponible sur le marché mondial, les médecins de première ligne (dans les unités déployées et petites cliniques des postes avancés) dans toutes les armées du mondes peuvent transmettre les images aux rayons X, aux ultrasons, la Tomodensitométrie et d'autres images médicales, ainsi que des vidéos à des hôpitaux à distance pour le diagnostic, et pour soutenir les médecins de première ligne et mêmes utiliser le système pour accéder aux dossiers médicaux informatisés et organiser les évacuations des patients.

Ainsi, après avoir donné un aperçu général de la genèse et de l'évolution his-

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[13] La télémédecine dans le domaine militaire. Lapayre J-C. ISIFC. Génie biomédicale. Année scolaire : 2011/2012.

[14] La télémédecine dans le domaine militaire. Lapayre J-C. ISIFC. Génie biomédicale. Année scolaire : 2011/2012.

torique de la télémédecine, en évoquant quelques aspects de ses nombreuses utilisations aussi bien civiles que militaires, voyons à présent dans un avant-dernier point quel est son intérêt.

3. Intérêt de la télémédecine

En effet, l'intérêt de la télémédecine trouve ses fondements dans l'amélioration de l'accès à des soins spécialisés (démontré dans toutes les spécialités) et qui se traduit par des actes permettant de:

- éviter ou faciliter les évacuations médicales motivées par le besoin d'un deuxième avis ;
- améliorer la qualité des soins en permettant la consultation multi-spécialités rapide ;
- et enfin, optimiser des ressources médicales humaines et techniques.

Pour illustrer tout ceci, nous nous référons encore une fois au cas somalien. Le système de télémédecine installé par l'armée américaine dans ce pays a permis, pendant 13 mois de fonctionnement, la réalisation de 248 images concernant 74 cas qui ont été transmises. Pour plusieurs patients, l'évacuation aérienne ou des interventions chirurgicales ont été évitées grâce à la télémédecine[15].

Un deuxième exemple est celui de la Bosnie, où sur les 63 téléconsultations documentées, une seule a donné lieu à l'évacuation ; et parmi les 153 évacuations réalisées auparavant, 11% pouvait être évitées avec une téléconsultation[16].

Nous arrivons maintenant au dernier point de notre intervention et qui porte sur les nouveautés et les perspectives d'évolution de la télémédecine.

4. Nouveautés et perspectives

Commençons tout d'abord par le domaine civil où plusieurs logiciels ont été développés par des sociétés privées pour faciliter les échanges de données médicales entre les hôpitaux et les structures de soins partout dans le monde :

En effet, l'exemple de La société Aurora MSC qui a développé un « viewer » universel permettant de saisir toutes sortes d'images et de vidéos dans différents formats numériques est très significatif à ce sujet. Elle a par ailleurs développé une plateforme permettant de lire ces images à travers un réseau et d'interconnecter différents hôpitaux et services afin de les gérer et de les intégrer dans d'autres systèmes. Les images peuvent être intégrées dans un dossier patient ou dans un système d'information de laboratoire. Un test est en cours entre les trois services de pathologie des hôpitaux militaires parisiens et un projet est en cours de dévelop-

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15 Crowther JB, Poropatich R. Telemedicine in the U.S. Army: case reports from Somalia and Croatia (Telemedicine Journal 1995) N° 1: 73–80.

16 Garshnek V.; Burkle F.M., Applications of Telemedicine and Telecommunications to Disaster Medicine : Historical and Future Perspectives. In: JAMIA, 1999) N°6:26–37.

pement entre hôpitaux militaires français, espagnols et allemands[17].

Sur le plan militaire, les applications de la télémédecine s'étendent vers de nouveaux horizons. Ainsi, l'armée américaine développe des capteurs avancés et des matériaux intelligents, dont le « moniteur d'état personnel » (Personnel Status Monitor : PSM) qui est un dispositif miniaturisé ressemblant à une montre-bracelet ; il sera porté par les soldats comme faisant partie de l'uniforme de combat. Il combine des détecteurs avancés pour l'environnement et des capteurs physiologiques non invasifs avec un processeur, un récepteur de géo-positionnement (en interaction avec les satellites de positionnement global) et une radio sans fil de faible puissance. Le PSM suivra en continu les signes vitaux du soldat (la fréquence du pouls, la température, la respiration, la pression sanguine)[18].

Si les signes vitaux du soldat s'écartent de manière significative des normes établies, le PSM transmet l'emplacement et les signes vitaux jusqu'à ce qu'il soit arrêté par le personnel médical. Ce système permet aussi aux médecins de diriger les soins à distance. Le PSM peut réduire la mortalité au combat en localisant précisément les soldats blessés et en commençant le triage dès les premiers moments de la blessure. Il permet aussi la détection d'agents chimiques et biologiques et l'avertissement du sujet[19].

Conclusion :

En définitive, nous pouvons dire que le domaine militaire est un terrain d'application privilégié pour de nombreuses nouvelles expériences en matière de télémédecine, dans la mesure où le soutien médical des forces est souvent pratiqué dans des pays éloignés. La mobilité des troupes est maximale sur le terrain et les contraintes de l'opérationnel, en matière de transmission, sont souvent draconiennes. Les missions sont variées : guerre, maintien de la paix, aide humanitaire ou secours en situation de catastrophe : partout, la télémédecine a fait ses preuves en contribuant effectivement à la sauvegarde des vies d'un nombre de civils et de militaires et à donner de l'espoir pour d'autres.

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17 Développements en télémédecine et télésanté. Journée d'échanges DGA – Service de Santé des Armées : Recueil de technologies (Ecole du Val de Grâce, Paris 29 janvier 2008).

18 Satava R.M., Jones S.B., Military applications of telemedicine and advanced medical technologies. In : Army Medical Department Journal, Novembre–Deccembre, 1997:16–21.

19 Zajtchuk R., Sullivan G.R., Battlefield trauma care. In : Military Medicine, 1995;160:1–7.

Professor Brian McAllister Linn (USA)
The US Army, Technology, and Atomic Warfare in the 1950s

In 1953 General Lyman L. Lemnitzer, a future Army Chief of Staff, informed a war college audience that, "Wars are fought by men supported by weapons—wars are not fought by weapons supported by men." Lemnitzer's statement encapsulated the US Army's ideological commitment to the 'warrior spirit,' but his declaration came just when the ordinary soldier seemed likely to be displaced on the battlefield by a technology-inspired 'atomic revolution.' President Dwight D. Eisenhower's "New Look" enshrined the atomic bomb, and the US Air Force's intercontinental bomber, at the center of US military policy, while cutting almost half-a-million troops from the Army. In the much-anticipated war with the Soviet Union, the army's assignment was to occupy territory devastated by the Air Force abroad and maintain order and stability in the continental United States. In response to this technologically centered national policy of strategic nuclear warfare, the 1950s army went through a "military transformation," a term that in current usage refers to a radical revision of an armed force's concepts, organization, and equipment. Breaking with World War II definitions of landpower and conventional warfare, Lemnitzer and other officers extolled their army's role in 'limited atomic warfare"—thus avoiding the nuclear holocaust implicit in US national strategy. In 1956 the Army reconfigured its combat divisions into the "Pentomic" organization designed specifically for atomic war. The changes in army technology were even greater. In barely a decade, it created an atomic shell for its 280mm cannon, developed a long-range anti-aircraft missile whose atomic warhead could shatter enemy bomber formations, and deployed an atomic weapon that could be used by an infantry squad. This paper assesses the US Army's transformation initiative and highlights some of the problems that resulted from its effort to develop a new way of war.

The end of WW2, and its immediate replacement by the Cold War, brought a host of technological problems to the US Army. The creation of an independent US Air Force in 1947 drained the army's technical services, which lost not only thousands of skilled personnel but also much of their research and development resources. The transfer of personnel, equipment, depots, bases, and so forth took years to resolve. At the same time, the army created an Equipment Board to assess its wartime equipment, anticipate its future needs, and avoid the delays and bottlenecks that had hampered production in WW2. The Board's report addressed a war much like the one that had just been fought, but this time with the US immediately deploying its entire military means for the total destruction of the enemy. It identified the service's immediate and future technological priorities as atomic weapons, guided missiles, air mobility (defined as the ability to transport an entire division and its equipment by air), a new generation of armored fighting vehicles (tanks, self propelled artillery), and anti-aircraft defense. In addition, it proposed a variety of other improvements for lighter, simpler, and more transportable "GI" equipment for combat soldiers. The Board also provided two guiding principles to design, test, and produce this next generation of equipment. Firstly, the US Army must "accept a more austere standard" than comparable civilian equipment, eliminating frills in favor of simple equipment that could be easily manufactured, easily taught, and easily maintained. Secondly, the service should seek stability in its designs, making modifications only when they were absolutely essential to combat missions.[1]

The Equipment Board's ambitious agenda was hobbled by postwar realities. Both the public and politicians demanded that defense costs be slashed and industrial production freed to satisfy demands of the civilian economy. Having spent billions on weapons and equipment in the war, the army was hard-pressed to justify spending even more billions on new equipment in peacetime. Why did a service that had received 45,000 M-4 medium tanks between 1943 and 1945 need to build thousands of new tanks in 1949, especially when the atomic bomb made a conventional land war so unlikely? Congress steadily cut equipment funding, so that by 1949 army policy was to do only the minimum necessary to maintain existing (largely wartime) equipment. The service contributed to its own financial problems. From its post-war analysis, it concluded that future warfare would be heavily influenced, if not determined, by the advanced weaponry that arrived quite late in the war and had been put into limited production, or had never been produced at all. Concluding that most of the service's wartime equipment was already obsolete in 1946, planners demanded new and expensive technologies such as guided missiles, electronic targeting, air mobility (airplane and helicopter), and long-range anti-aircraft fire direction systems. Even the Infantry, historically exemplifying the heroic spirit, expected future weapons to be air-transportable anywhere in the globe and began planning for body armor, air-assault vehicles, and armored personnel carriers.[2] Indeed, the US Army's postwar equipment programs were an-

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1 US War Department Equipment Board, *War Department Equipment Board Report*, 29 May 1946 (Stillwell Board), copy in MHI; [HQ, AGF?] to Director of R&D, WDGS, Sub: Estimate, 11 November 1946, Box 13, E54, RG 337; OCAFF, "Report of the Army Equipment Policy Panel," 10 August 1949, Entry 126-UD-WW [Misc. Corr. CONARC, 1947–61], Box 3, RG 546, both in National Archives 2, College Park, MD [hereafter NARA2]. There is a small but high quality literature on the creation of the atomic army,Andrew J. Bacevich, *The Pentomic Era: The U.S. Army Between Korea and Vietnam* (Washington 1986); John P. Rose, *The Evolution of U.S. Army Nuclear Doctrine, 1945–1980* (Boulder 1980); Ingo Trauschweizer, *The Cold War U.S. Army: Building Deterrence for Limited War* (Lawrence 2008)

2 "Report of Engineer Development Items Not Yet Covered by Technical Service Projects of Studies," 1946, File 400, Box 13, E54, RG 337, NARA 2; [HQ, AGF?] to Director of R&D,

tithetical to the philosophy behind wartime "GI" equipment. Compounding the problem, military project officers conditioned by their WW2 experience of unlimited funding, rapid technological change, and immediate production, often revised their designs mid-stream, delaying production and producing numerous models of what were sometimes fundamentally flawed designs. By 1951 inspectors visiting a depot where many of these new models were being tested noted that "the size, weight, cost, complexity, and probable difficulty in training men for the operation of these machines is staggering."[3]

While postwar boards and military futurists planned a new generation of technological marvels, soldiers in the field struggled to maintain the residue of WW2 equipment. Technical units scoured battlefields and depots to locate, repair, redistribute, and restock wartime materiel. Concurrently, army specialists tried to fix the numerous technical problems in specific wartime technologies rushed into production to resolve immediate tactical problems.[4] In 1948 Lieutenant General J. Lawton Collins, Army Deputy Chief of Staff, reported that simply equipping the Army's divisions with their allotted materiel (most of it WW2-era technology) would consume almost half the service's budget. That same year, an Army Ground Forces inspection team reported that the average vehicle had two-and-a-half major defects. From Vienna to Tokyo, officers shared similar experiences to that of the battalion commander who had 100 of his 135 vehicles "deadlined" (inoperable), and who only kept the remainder running by stealing spare parts from the depot.[5] To modernize these divisions with crucial antitank weapons, tanks, antiaircraft artillery, radios, and so on would require billions more. And meanwhile, the service had to deal with the problems of losing its air force and providing resources to China, Greece, and numerous other countries.[6]

The outbreak of the Korean War in June 1950 proved a mixed blessing for the Army. The positive side of the Korean War was an enormous buildup in men, materiel, and funding. In June 1950 the US Army numbered roughly 600,000 soldiers, with an annual budget of $6,000,0000,000. Three years later the Army had over 1,500,000 personnel and a budget of $15,000,000,000. Between the war and

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WDGS, Sub: Estimate, 11 November 1946, Box 13, E54, RG 337, NARA2; LTC Fred L. Walker, Jr., "Your Next War," *Infantry Journal* 61 (August 1947): 34–41.

3 Material Requirements Review Board DA Visit to Second Army Area, 6 December 1951, Box 29, E 1, RG 337. Presentation by BG Aaron Bradshaw to Army Commanders Conference, 29 November 1949, Box 49, E 32B, RG 337, NARA 2.

4 G. K. Heiss, "Major Maintenance Problems in Overseas Theaters of War," 22 January 1954, Lectures AY 1953-54, AWC Archives, Military History Institute, Carlisle, PA [hereafter MHI].

5 Lieutenant General Eugene P. Forrester Oral History, 1985, 4 vols., 1: 112–14, MHI.

6 J. Lawton Collins, "The Role of the Army in Future Warfare," Lecture to Air War College, 5 October 1948, Service School Speeches File (2), Box 43, J. Lawton Collins Papers, Dwight David Eisenhower Presidential Library, Abilene KS; Army Major Command Inspections, 1948, Box 27, E 32B, RG 337.

international aid, the Army managed to dispose of much of its WW2 inventory. But for the most part, General Omar Bradley's comment that Korea was the wrong war, in the wrong place, at the wrong time also described the Army's technological modernization efforts. In some cases experimental designs were approved for production, then given crash redesigns based on perceived lessons from the battlefield or to incorporate even more experimental technology. Some of this equipment proved essentially useless, such as the tank gun sight that only worked while stationary in an air-conditioned vault. Most needed drastic redesign, at great cost and delay, and the diverse models required an ever-expanding array of spare parts. Between the lag time in production, the growing and immediate demands of the war, and its requirement to equip allied forces, the Army's materiel inventory was dangerously depleted. Military units, schools, and training cadres were stripped of personnel, while depots and storage facilities were raided for equipment, most of which needed rebuilding. Barely a year after the beginning of the war, the 2nd Army, stationed in the United States, reported that 40 percent of its tanks were deadlined for maintenance, while most of the newly arrived vehicles could not be used for training because they lacked spare parts.[7] Conditions were equally bad in Europe, where an Army inspection team lamented the "age and decrepitude" of the machinery, from radios to antiaircraft guns, and the prohibitively high cost in both money and time of keeping this balky and obsolete equipment functioning.[8] In 1954 Major General John E. Dahlquist, the head of the agency responsible for overseeing Army doctrine and training, noted that on the average it took five years to develop, test, produce, and issue even the simplest equipment. The implications were clear: "unless our tactical concepts and development concepts are more objective and futuristic [our] equipment will be obsolete by the time it can be produced in quantity."[9] The Army had to create a vision of future warfare and then design and produce the technology to fight it.

The Korean War offered only a partial vision of the future. To the UN commander, General Matthew B. Ridgway, the war's lessons were obvious. The war demonstrated the fallacy of a US national security strategy predicated on General War with the USSR, and nothing else. To Ridgway, Korea indicated that future

7 Visit to Second Army Area, 6 December 1951, Box 29, E 1, RG 337. The situation was equally bad in other US-based units, see HQ Division Artillery, Command Historical Report, 10 December 1951, 1st Armored Division, Box 2, E NC3-338-81-14, RG 338. On Army materiel deficiencies, see "Review of the Current World Situation and Ability of the Forces Being Maintained to Meet US Commitment," 24 April 1953, JCS 370 (5-25-48) Sec 11, Box 128, RG 218, NARA2.

8 Mark W. Clark (CAFF) to C/S, Sub: Inspection of United States Army Troops, European Command, 6 December 1951, Report of Army Field Forces Inspection of European Command, 333.144, Box 41, E 55B, RG 337, NARA 2.

9 MG John E. Dahlquist, "Transcription of Artillery Conference," 23–25 June 1954, 337 File, Box 20, E 55F, RG 337, NARA2.

wars were likely to be limited in both objectives and force, and in order to fight these limited wars the US would require powerful, mobile, and immediately deployable ground forces.[10] But Korea also demonstrated that US forces would need more firepower, and specifically atomic firepower, to overcome their opponents' manpower advantages. Reflecting the Army's experience with Chinese "human wave" attacks in Korea, as well as Soviet materiel and manpower superiority, one study concluded

> *Enemy combatant manpower is the real tactical hurdle. Any weapon or operational system which will destroy that manpower or neutralize its effective tactical employment will point the way to successful ground operations against enemy forces. If by mass destruction of combat personnel the enemy can be forced to revise steamroller tactics and disperse units more thinly over a given area, conventional operations in conjunction with tactical air can defeat enemy land forces on any selected objectives. Under favorable circumstances, the Atomic Bomb is a weapon which can produce mass battle casualties*.[11]

As one Army intellectual declared, "Atomic warfare is a challenge to both American leadership and science, which, boldly met, will neutralize an aggressor's reliance upon reckless expenditure of lives to pound out victory in land warfare."[12] Other Army intellectuals, most notably George C. Reinhardt and William R. Kintner, soon joined these pioneering efforts to develop and by 1953 a substantial body of literature existed tactical--or what the Army termed 'limited'--atomic warfare.[13]

The Army's heightened interest in the potential of atomic warfare also represented a challenge to President Dwight D. Eisenhower's military reform program, or New Look. In order to possess a credible deterrent, reduce skyrocketing defense expenditures, and avoid another Korea-type surrogate war, Eisenhower increased the budget of the US Air Force's Strategic Air Command and appeared to be willing to unleash "massive retaliation" on Soviet cities. As a corollary, he drastically

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[10] GEN Matthew B. Ridgway, "The Army's Role in Today's World," (lecture, AWC, 24 August 1953), Lectures AY 1953–54 boxes, AWC Archives, MHI; Matthew B. Ridgway, *The Korean War* (Garden City, NY 1967) vi.

[11] OCAFF, "Tactical Employment of the Atomic Bomb," 7 October 1951, 000.9/35, Box 4, E 55B, RG 337, NARA2.

[12] George C. Reinhardt, "Notes on the Tactical Employment of Atomic Weapons," *Military Review* 32 (September 1952): 37.

[13] George C. Reinhardt and William R. Kintner, *Atomic Weapons in Land Combat* (Harrisburg 1953); George B. Sloan, "Design for an Atomic Army," *Combat Forces Journal* 4 (June 1954): 13–17; Edward L. Rowny, "Ground Tactics in an Atomic War," *Combat Forces Journal* 5 (August 1954): 18–22.

slashed Army budgets and manpower. The Army's resistance to Eisenhower's policies and to USAF dominance over atomic warfare was spearheaded by Chiefs of Staff Matthew B. Ridgway (1953–1955) and Maxwell D. Taylor (1955–1959), both of whom eventually published best-selling books.[14] At the same time they criticized Eisenhower's reliance on strategic atomic warfare, Army officers embraced the president's decision to emphasize atomic firepower. The Commandant of the Army's Command and General Staff College, described the atomic battlefield of the future:

> *As we visualize it, the battle area may well be likened to a seething mass of brewer's yeast covered with the bursting bubbles of coordinated but separate, dispersed actions, with the all-important leaven of forceful leadership controlling and applying the force generated to accomplish the directed field army mission. Spread over hundreds of square miles in width and depth as a defense against 'A' and 'H' bombs, we will see small, isolated, hard-hitting, self-sufficient mobile battle groups either holding or denying key terrain features by fire, or attacking separately, or as part of an overall planned operation. ... Units will mass rapidly from widely dispersed positions, remain concentrated only long enough to take the objective and then redeploy rapidly into dispersed formations. Offensive operations will be designed to deliver decisive blows at enemy targets. These atomic strikes will be followed by attacks by highly mobile, semi-independent, self-contained exploiting forces which can either continue the advance, hold or deny a critical piece of terrain, or break contact to withdraw and strike again in a more favorable location. Airborne troops or fast-moving armored columns, of course, are a natural for seizing objectives deep in the enemy zone, while special helicopter-borne units strike at closer-in enemy objectives*.[15]

As the Commandant made clear, this bubbling vision of atomic war required new technology.

In order to fight atomic warfare, the US Army required both highly motivated warriors and the latest technology. But which was the higher priority? Army Vice Chief of Staff Charles L. Bolté apparently answered this question in 1954, when he told students at the Army War College: "The most important element in war is man himself. Whatever our future weapons system, the brain and backbone and guts of it will be human intelligence, human leadership, and fighting spirit—and by these the issue of war will be decided."[16] Throughout the 1950s the service maintained

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[14] Matthew B. Ridgway as told to Harold H. Martin, *Soldier: The Memoirs of Matthew B. Ridgway* (New York 1956); Maxwell D. Taylor, *The Uncertain Trumpet* (New York 1959).

[15] Lionel C. McGarr, Speech to South Central Business Association, 5 November 1957, Box 26, E UD3, RG 546, NARA2.

[16] Charles L. Bolte (VC/S), "Land Power," lecture AWC 1 April 1954, Lectures AY 1953–54, AWC Archives, MHI.

that it was fundamentally a soldier-centered rather than a technologically-centered force. After interviewing the Army Chief of Staff, one correspondent reported, "the Army is convinced that in the next war the basic weapon will be--as it has been in all other wars--man. In the Navy and Air Force, the function of men is to serve machines; in the Army the function of machines is to put men into action."[17] The service's intellectuals and spokesmen also recognized that officers and men would be fighting on a battlefield of unprecedented stress and lethality, isolated and alone, enduring weeks of unremitting and unsupported combat. Victory in the "actual battlefield conditions of the atomic era" was dependent on "the resourceful, steadfast American soldier with the sound tools of his trade and the will, determination, courage, skill, and offensive spirit to use them well."[18] But the service's championing of traditional Heroic virtues conflicted with its tendency to see organizational and technological solutions to the challenge of atomic war. Increasingly, a service that defined its highest value as the "human element" depended more and more on specialists and technicians.

In 1956 the Army adopted the Pentomic reorganization, specifically intended to fight limited atomic war. The Pentomic infantry division was smaller (13,750 instead of 17,500 personnel) and organized into five "battle groups" of about 1400 combat troops each. To make up for its loss in manpower, the Pentomic infantry division substituted firepower and mobility: some 30,000 weapons and 3,529 vehicles. The division's combat units could, at least theoretically, be deployed over 500 square kilometers with its organic firepower "dominating" an area of over 4,000 square kilometers.[19] As the Secretary of the Army confessed in 1958, "the pentomic Army necessarily draws much of its power from new weapons. Indeed, it is the weapons themselves which, in some instances, have prescribed the design of pentomic units."[20] Yet because weapons (and the ability to direct them) determined the Pentomic division's effectiveness, the service had to constantly adapt to new technologies: "at the same time as tables of equipment are being readjusted,

[17] Charlton Ogburn, "The United States Army," *Holiday* 28 (September 1960): 102.

[18] LTC Duane S. Cason, "Introduction to the New Armored Division," *Armor* 66 (November-December 1957): 11. COL George C. Reinhardt, "Stars, Stripes, and A-Bombs," *Combat Forces Journal* 5 (April 1954): 19–21; COL L. E. Browning, "The Impact of Atomic War on Medical Services in the Theater of War," (lecture, Army War College, 19 January 1955), AY 1954–55, AWC Archives, MHI.

[19] GEN Willard G. Wyman, "Lead Time for Combat Readiness," briefing for SecArmy 31 July 1958, *Selected Readings in Leadership in Higher Commands*, 15 August 1960, CGSC, Box 39, RG 498. The term "Pentomic" was devised by Maxwell Taylor as a catchy way to 'sell' the new organization. It combined "penta" (a reference to the five battlegroups" and "atomic." Much of this discussion on Pentomic is drawn from Paul C. Jussel, "Intimidating the World: The United States Atomic Army, 1956–1960" (Ph.D. diss., The Ohio State University, 2004), especially pp. 122–63.

[20] *Semiannual Report of the Secretary of the Army, January 1 to June 30, 1958* (Washington, DC: GPO, 1959), 198. Richard W. Kredzior, "Evolution and Endurance: The U.S. Army Division in the Twentieth Century," (Santa Monica 2000) 23–27.

technology is continuously working to develop newer items. These new items are still more costly and complex than their predecessors."[21]

The Pentomic division was intended to be lighter, more mobile, and more lethal than its Soviet counterpart. And since the US and its NATO allies could not match the quantity of the Red Army's massed armor formations, the Pentomic division needed qualitatively better vehicles. Yet as the decade following WW2 had proved, this was a near impossibility. Immediately after World War 2, US Army planners had outlined a systematic process to produce three new tank models. Budget cuts, the abundance of WW2 surplus, and the understandable desire to incorporate the best of allied and enemy tank technology all slowed tank development. By 1950, there were still only a few prototypes, and all suffered from numerous and serious defects. The panic engendered by the success of Soviet-model tanks in the Korean War prompted the Army to rush two tank models (M-47, M-48) into production despite glaring technical defects, and in many respects, the 1950s Army never recovered from this decision. Not only did the ensuing Patton tanks require "hundreds of man hours ... in repair, replacement, modification, expediting and procurement of parts," but maneuvers in 1954 revealed neither model was suited for Army concepts of atomic warfare.[22] Nor could any US tank match its Soviet counterpart, much less the heavy Soviet models. Yet Pentomic's armor units were comparatively well off compared to the Infantry battle groups. For over a decade the Army struggled to produce an armored personnel carrier that could carry troops across a radioactive battlefield and arrive ready to fight. But the result, the M-59, proved underpowered, mechanically unreliable, and unable to keep up with an armored convoy. Similar efforts, such as an all-purpose air transportable vehicle for the airborne units, or a powerful, mobile combination mortar-howitzer for the field artillery, were no more successful. Designed to fight high-speed, firepower-intensive mobile warfare, the Pentomic Army never had the necessary vehicles to do so.

The army had better success with another key component of Pentomic: increasing its firepower's range and lethality through the new technology of missiles. In Fiscal Year 1957 (July 1956-June 1957) the Army devoted 43 per cent of its research and development budget to its missile program, and barely 4 per cent to artillery. The following fiscal year it increased the missile budget by $60,000,000 – to $170,000,000--whereas artillery development received only $10,000,000.[23] Chief

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[21] Colonel R. H. Connerat, "Army Materiel Requirements," (Lecture, 20 February 1957), AWC Lectures AY 1956-1957, MHI

[22] G-4 Comments, Army Field Forces Training Inspection, VII Corps, 1954, Box 8, E 55F, RG 337. Department of Army Visit to Second Army Area, 6 December 1951, Box 29, E 1, RG 337, NARA2; Exercise Oberver Reports: Exercise INDIAN SUMMER, enclosed in LTC John W Callaway to COl John A. Heintges, 15 October 1954, 354-Folder 2, Box 28, E 55F, RG 337, NARA2.

[23] *Semiannual Report of the Secretary of the Army, 1 January to 30 June 1958*, 121; Bacevich, *Pentomic Era*, 100.

of Staff Maxwell D. Taylor was convinced that "the missile today is the artillery of the future. With our operational missiles such as Corporal and Honest John, it may be said that to a degree the missile is the artillery of the present."[24] In theory, Corporal provided corps commanders with a highly accurate 4,500-kilogram missile with a range of over 100 kilometers and the capability of using either conventional or atomic weapons. The Corporal was intended to attack deep behind enemy lines and target logistics, communication, and troop concentration centers. The Honest John, a 762mm rocket with a predicted range of up to 35 kilometers, would simultaneously reduce the size of the infantry division's artillery by a quarter while allowing the commander to shatter Soviet tactical formations. Both weapons illustrate the success and failure of the Atomic Army's efforts to apply technology. Both represented impressive technological advances, including a dramatic increase in missile range, accuracy, and warhead size. But in practice, neither the Honest John nor the Corporal proved adequate for the high-speed, fluid, dispersed warfare the Pentomic division intended to wage.[25] The Corporal, nearly 14 meters long and weighing over 29,000 kilograms, required 173 motorized vehicles and another 130 vans for transport and firing. Moreover, it was plagued with motor burnouts and electronics failures, as well as the Army-wide problem of insufficient spare parts. The Honest John's initial tests were so promising that the Army committed itself to a crash program, only to discover that designing a launcher for the rocket took almost as much time and money to develop as had the missile. Lacking a guidance system, the Honest John could not provide the precise firepower needed to destroy Soviet columns. Moreover, its size and weight meant that a motorized division could carry only a few into combat and it could not be air-transported on the battlefield. The Army thus had to devote more resources and time in an effort to create a smaller and lighter version, the Little John.

If creating the firepower necessary to fight atomic war proved frustrating, so too did communications. As one officer noted, it was impossible to "overemphasize the importance of communications …on the nuclear battlefield. Without communications we do not have control, and without control there is panic and confu-

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[24] Maxwell D. Taylor, Remarks at Conference of Civilian Aides to the Secretary of the Army, Fort Bliss, TX, 6 April 1956, Speeches of Gen Maxwell D. Taylor Folder 2, Box 1, Winant Sidle Papers, MHI. LTG Carter Magruder, "Army Logistics," (Lecture, Army War College, 15 February 1957), AWC Lectures AY 1956-1957, MHI. On the Army missile program, see Bacevich, *Pentomic Era*, 84-101.

[25] Report on Corporal Firing by Battery B, 259th Field Artillery Missile Battalion on 29 June 1954, 353.1 File, Box 27, E 55F, RG 337; James P. O'Donnell, "The World's Newest Army," *Saturday Evening Post* 228 (1 October 1955): 36-37, 119-23; LTG J.E. Moore, Memorandum for Chief of Information, "Consideration in the Employment of Nuclear Weapons and Nuclear Weapons Development of Interest to Infantry," 1 December 1958, 337 Record Temp January 1, 1958 File, Box 30, E NND 957387, RG 319

sion."[26] The former plans and operations officer for 7th Army confessed that his service in the early 1950s left him humbled: "how to command these tremendous forces in the field with their insatiable demand for electronically provided data is something that is beyond me. I don't know how to do it."[27] As the Army adapted to atomic warfare's demands for smaller but more numerous tactical and supply units, and deeper and wider frontages, problems increased until by 1958 one signal officer confessed: "We have spread out so far we cannot communicate."[28]

The Army attempted to compensate for this by increasing its communications capacity by more than 400 per cent. The Pentomic reorganization added 560 tons of signal equipment to each infantry division. This increase of tonnage occurred despite technological developments such as transistors that shrank the size and weight of communications equipment. But instead of making communications easier, the meteoric speed of transistor development created a situation in which Army "contracts for centralized radio systems let in one month would be outdated the next; requirements changed almost as fast as new uses for the transistor were created."[29] Moreover, developments in other communications equipment did not keep up. As a result, in the 1950s any command post above the company level required truck-borne radios, with forty-foot antennas, cable switchboards, and a plethora of other heavy, cumbersome, and time-consuming equipment. And within each command post might be several models of radios (each requiring a separate spare parts catalog), an obsolescent switchboard, an assortment of trucks, and a bewildering variety of equipment representing the spectrum of technological progress. Not surprisingly, one officer recalled of his service with a target-acquisition unit "We spent most of our time trying to keep [equipment] operating instead of being able to use them on a battlefield, or even understanding how to use them on a battlefield."[30] The implications were serious. Because the technology for locating and targeting enemy formations was notoriously unreliable, field commanders often used individual soldiers in forward observation posts. But as one officer bluntly stated, however useful in training, reliance on individual observers was "insane" when army doctrine assumed Hiroshima-sized blasts would be the norm.[31]

In assessing the Army's transformation efforts in missiles and communications, it is clear that the service was unable to harness the progress of two radically changing technologies to work in tandem. On one hand, the service overcame

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[26] Capt William T. Ellis, "A Concept of Organization and Operation of a Military Police Unit Assigned to an Infantry Division,", 1960-61, SP MP School, Box 5, E439B, RG 389.

[27] Hamilton Howze Oral History, 1972, SOOHP, MHI, 3:49.

[28] COL William H. Connerat, "Army Materiel Requirements," (Lecture, 9 May 1958), AWC Lectures AY 1957-1958, MHI.

[29] Jussel, "Intimidating," 148.

[30] Louis C. Wagner, Jr., Oral History, 2 vols., 1996, SOOHP, MHI, 1:55.

[31] Connerat, "Army Materiel Requirements."

enormous obstacles in the development of rocket fuels, small atomic warheads, guidance systems, launchers, transistors, and so on. But because progress was so uneven, a particularly 'leap ahead' technology, such as an improved transistor or an improved missile, created a cascade of further requirements. At any stage in the process, the full use of a new technology could be bottlenecked by a legacy technology, and until this changed soldiers might have a state-of-the-art weapon that they could not deploy, or could not launch, or could not aim with any accuracy. And without accurate information and long-range missile firepower, the small, isolated Pentomic battle groups remained at risk of being quickly overrun by Soviet columns.

The 1950s US Army's efforts to fight atomic warfare are an excellent example of the complexities of military transformation and the problems of integrating technology. In surveying the birth and evolution of the 'atomic army,' some broad themes emerge. First, both external and internal threats fueled the Army's transformation agenda. The Cold War and the threat posed by the USSR represented tangible strategic dangers that warranted a radical reassessment of military priorities. In order to reassert its place on the post-WW2 battlefield, the Army developed a new vision of limited atomic war, which it then implemented through 'transformational' doctrine (limited atomic warfare), organization (Pentomic division), and a massive equipment modernization program (missiles, tanks, communications, etc.). However, in practice none of these three areas of transformation were successful. Moreover, the focus on atomic warfare threatened/eroded the Army's traditional emphasis on martial virtues and the human element and elevated the technician as the most important element in warfare. By 1962 the Army had largely repudiated limited atomic warfare and was divesting itself of much of the technology it had developed to fight it. Historians have credited this transition to the policy of flexible response initiated by President John F. Kennedy and to an increased focus on conventional land warfare. But this transition also reflects the Army's recognition that its vision of limited atomic war could not overcome the constraints of 1950s technology. Seen from a broader perspective, the problems the 1950s US army encountered assimilating atomic war technology anticipated many of the service's cultural, technological, personnel, and doctrinal problems in Vietnam. Both veterans and historians have concluded that Vietnam "broke" the US Army. But historians need to be more aware that the force that went off to fight in the jungles of Southeast Asia was already breaking down from the stresses and fractures caused by the effort to integrate atomic technology into its traditional Heroic vision of war.

Colonel-Major Omar EL OUADOUDI (Morocco)
Compte rendu critique de l'ouvrage « Perspectives tactiques » de son auteur le Général Guy HUBIN

Je voudrais tout d'abord m'adresser à l'assistance pour lui transmettre les salutations du Général de Corps d'Armée Bouchaib ARROUB, Président de la Commission Marocaine d'Histoire Militaire, salutations qu'il a tenu lui-même à qualifier de chaleureuses et profondément amicales.

Le travail que j'ai l'honneur de présenter devant vous consiste en un compte rendu synthétique et critique d'un ouvrage traitant de la tactique et qui n'est pas passé inaperçu dans les milieux de culture militaire française. Il s'agit d'un ouvrage de qualité intitulé «Perspectives tactiques» de son auteur le Général Guy HUBIN. Un ouvrage brillant de par la variété des conceptions abordées autant que par la diversité des données prospectives étudiées.

Il s'agit indéniablement d'un ouvrage sur l'histoire, celle de Fernand BRAUDEL qui ne veut pas qu'elle soit « *condamnée à n'étudier que les jardins bien clos de murs, sinon ne faillirait elle pas à une de ses tâches présentes qui est aussi de répondre aux angoissants problèmes de l'heure* ». D'ailleurs et c'est ce qu'évoquait René Rémond lorsqu'il écrivait : « *il n'est pas impossible à l'historien du présent de faire preuve de la même volonté d'objectivité que sur le passé* ».

Dans la foisonnante production de cette nouvelle histoire, l'histoire immédiate, ce livre paru dans l'édition Economica de l'année 2000 est rédigé d'une plume vivante dans un style clair et direct, empreint de rigueur mais dépourvu d'aridité. Il reflète la personnalité du Général HUBIN et le caractère affirmé de l'officier qui fait honneur à l'Arme Blindée et qui a accompli l'essentiel de sa carrière au sein des Troupes Aéroportées.

Situons d'abord l'ouvrage dans son contexte historique et soulignons ses apports pour l'histoire militaire. Depuis le Maréchal FOCH, les auteurs militaires français n'avaient plus produit de traité général sur la théorie tactique. Parmi les facteurs qui expliquent ce tarissement : le contexte de la guerre froide, on le sait, le choix conceptuel d'alors était le feu nucléaire et non celui du succès par la guerre conventionnelle, les guerres de décolonisation et peut être aussi, je cite le Général de Corps d'Armée Pierre GARRIGOU GRANDCHAMP, «*la répugnance à l'écriture d'une génération marquée par la défiance tenace dont elle était l'objet depuis la guerre d'Algérie*».

Les déstabilisations et les affrontements qu'a connus le monde après l'effondrement du bloc soviétique ont déclenché un regain d'intérêt pour la tactique. L'armée française naguère méprisante à l'égard même du mot doctrine s'est progressivement rendue compte de ce qu'est l'absence de doctrine. Le concept absolu de la guerre est repris tel qu'il résulte de l'histoire, la bataille est redevenue un horizon possible. Le Général HUBIN qui a vécu cette évolution, a suivi avec beaucoup d'intérêt et beaucoup d'admiration, les innovations technologiques majeures mises en œuvre pendant la première guerre du Golfe contre l'Irak qui ont « détrôné la tactique classique » et bouleversé la pensée militaire.

Fasciné par les exploits de cette guerre, il rédige la première édition de son livre en 14 chapitres, et plaide pour un renouveau doctrinal. Tout en renouant le fil à sa manière avec les grands prédécesseurs de la théorie tactique, il prône une refonte du corpus doctrinal et considère que la tactique d'aujourd'hui doit nécessairement se débarrasser du conformisme, soulignant avec vigueur que « *les conditions du combat de demain vont connaître, dans de nombreux domaines, des modifications telles que la nature même de la tactique va s'en trouver affectée* ».

Quels sont donc ces domaines concernés par les bouleversements techniques ? Nous les traitons pour les besoins de la présentation en 2 volets : les performances technologiques et les domaines de leur application et nous étayons ensuite par une synthèse de la manœuvre future, telle qu'elle est préconisée par l'auteur, avant de livrer à votre réflexion quelques commentaires critiques de l'ouvrage.

I. Les performances technologiques :

1) D'abord **la précision des navigations et la localisation des unités**. Hier, on se contentait de connaître le centre de gravité de la force en manœuvre qui devait rester groupée pour ne pas perdre son efficacité tactique et se confiner dans la rigidité des dispositifs qui alourdissaient les opérations.

Ces contraintes vont désormais disparaître grâce aux systèmes inertiels et satellitaires tels les GPS. Ce nouveau contexte permettra les adaptations permanentes des dispositifs et des remaniements continuels de leurs articulations.

2) **Le tir en mouvement** également qui va permettre d'annihiler l'immobilité et la linéarité des dispositifs. Cette performance est désormais accessible aux engins blindés modernes et aux munitions intelligentes.

Il est donc probable, poursuit l'auteur, qu'au lieu d'entraîner la fixation respective de dispositifs linéaires, le combat de rencontre débouchera sur l'imbrication et l'action tournoyante.

3) **La précision des tirs** de l'artillerie et de l'aviation valorisée par la transparence du champ de bataille impliquera des modifications tactiques très significatives et contribuera à l'allègement du fardeau logistique de la force blindée mécanisée qui doit aussi tirer sa force de sa mobilité, contraindre les forces ennemies à la concentration sur un terrain donné et permettre dès lors aux vecteurs aéroterrestres de délivrer leurs feux indirects pour la destruction. Les moyens permettant de réaliser cette performance deviendraient l'élément essentiel d'une force aéro-terrestre autour desquels la manœuvre viendrait s'organiser.

4) **L'identification ami/ennemi sur le champ de bataille** acquise grâce aux

interrogateurs répondeurs du type IFF (Identifications Friend or Foe) s'imposera dans les combats. L'auteur n'écarte pas dans un avenir proche, que toute séquence de tir débutera par une identification. Le tir libre, sans identification préalable, restera l'exception réservée aux seuls éléments de tête ou de flanc-garde.

5) **La lisibilité du champ de bataille**. Aujourd'hui, il n'est plus possible de dissimuler la masse de manœuvre. Grâce à la prolifération des capteurs, la lisibilité du champ de bataille est devenue presque totale et permanente. Dans ces conditions, la concentration conduit au désastre.

Au bilan, dissimulation impossible et concentration risquée conduiront les belligérants à maintenir la dilution et accepter l'imbrication pour éviter la destruction. Ce qui sera recherché dans la manœuvre c'est de contraindre l'adversaire à la concentration pour l'offrir aux feux indirects sol sol et air sol.

II. Les domaines d'application :

1) Dans le domaine de la **logistique**, la nouvelle perspective offerte à la manœuvre future consistant à varier les directions d'engagement tactique par rapport à la direction générale d'opération, amènera le logisticien à anticiper la demande et bannir les énormes convois pondéreux. Les équipages de transport sont capables de naviguer avec précision. La plate forme de combat dotée des mêmes moyens de navigation trouvera à côté de sa nouvelle position les recomplètements nécessaires. L'arrière continuera toujours à ravitailler l'avant mais à la noria classique se substituera la pulsation, aux flux le repositionnement et aux réponses l'anticipation.

2) Dans le domaine du **traitement de l'information, de la communication et de l'organisation**, la difficulté au niveau des différents échelons de commandement, sera de faire circuler le flux d'informations montant et descendant. Chacun aura une véritable image de la situation qui le concerne. La masse des informations disponibles et la puissance de calcul des ordinateurs permettront même de simuler les actions amis/ennemies pour opérer des choix finaux des actions à entreprendre.

Et progressivement, le partage des tâches des différents échelons tactiques futurs perdra son caractère vertical.

De même que les réseaux maillés intégrés vont autoriser n'importe quel échelon à contacter n'importe quel autre : la structure n'est plus verticale mais omnidirectionnelle.

« *Du schéma cloisonné verticalement par les sacro-saintes limites allant du corps d'armée à la section, et horizontalement par les échelons hiérarchiques successifs on passera, écrit l'auteur, à un schéma pluridirectionnel avec la possibilité d'ajuster les subordinations, de créer ou de supprimer des niveaux de responsabilité*».

3) Sur l'**organisation du commandement** (conception, conduite et exécution) l'auteur nous annonce un changement radical. Le système de commandement

napoléonien où la conception reste le monopole du grand chef tout comme la délégation de la conduite aux grands subordonnés au sein d'un travail d'état-major est une pratique qui appartient désormais à l'histoire.

Il faut abandonner le principe de l'intégration des grandes fonctions tactiques que sont la conception, la conduite et l'exécution au sein de chaque entité. Il s'agit de renoncer à l'enchainement hiérarchique vertical adapté à la manœuvre axiale et lui substituer un système de type contrôle de zone. Toutefois dans ce schéma opératoire, l'auteur reconnait que sa réflexion n'est que spéculative et ne saurait prétendre aller au fond des choses et définir une bonne fois pour toute la future organisation des outils tactiques. De nombreux essais et erreurs seront nécessaires avant de réaliser et déterminer parfaitement les règles. La pesanteur de ce que l'auteur appelle, je cite « *les ornières organisationnelles ancrées dans nos esprits* » entrave les efforts même au sein de l'armée américaine « *si on veut donner tout leur rendement aux techniques nouvelles et décupler ainsi les capacités de la manouvre, alors il faut rompre la relation existante entre l'importance du niveau de responsabilité et le volume des subordonnés* », le principe divisionnaire n'a plus sa raison d'être.

4) **les liens tactiques :**

Le caractère physique des relations au sein d'une force militaire a longtemps constitué un facteur essentiel dans la cohésion sous tendue par des liens tactiques qui relient les militaires entre eux. Briser ces liens, l'ensemble s'effondre. Les liens tactiques assurant la cohésion de l'armée irakienne avaient été détruits par l'offensive aérienne et électronique qui avait précédé les troupes au sol. Dès lors, il n'y a pratiquement eu aucun combat.

Quelle sera la nature des liens tactiques dans les armées du 21°siècle, S'interroge l'auteur ?

Dans le contexte du combat obligatoirement décentralisé et de l'organisation purement éclatée, les vecteurs des liens entre les acteurs perdront leur caractère humain pour s'appuyer sur les supports électromagnétiques, et il n'y aura que des liens conceptuels et immatériels entre les soldats « *le vieux lien féodal du suzerain et du vassal, qui imprègne nos mentalités militaires je cite l'auteur, devra disparaître* ».

La nouvelle nature du lien tactique sera facilitée et valorisée par la profusion des moyens de simulation. C'est la technique et le service des armes qui formeront le dénominateur commun des soldats.

III. La manœuvre future :

Pour le Général HUBIN, les armées futures engerberont peu d'effectifs en raison de leur coût, la nécessité de la supériorité numérique chère au Maréchal de Saxe sera dépassée. Elles seront observées de l'air et de l'espace, les concentrations seront donc interdites. Ce seront alors des forces légères mobiles et performantes où la place des aéronefs et déterminante. Cette force aéromobile, constituant la masse de manœuvre, se rassemble pour un temps très court pour éviter la fixation et créer l'effet de surprise.

La maitrise de l'information tactique sera la 1er bataille à livrer. La guerre du Golfe nous rappelle l'auteur a été caractéristique de cette situation. Les Américains ont remporté d'emblée la bataille du renseignement grâce à une supériorité spatiale aérienne et électromagnétique totale.

Au schéma fixation concentration, percée ou débordement se substituera « imbrication, dilution, destruction » avec des combats isolés et tournoyants.

C'est le système éclaté qui portera d'emblée l'action à l'intérieur des dispositifs. La somme de toutes les actions individuelles concourra au résultat final, et les succès locaux contraindront l'adversaire à réaliser des concentrations. C'est à ce moment que sa perte et consommée.

Après avoir esquissé sa manœuvre future, l'auteur propose quelques pistes de réflexion qui vont permettre d'accompagner et d'accélérer l'évolution nécessaire au sein des armées européennes et en particulier de l'Armée Française. Pour l'essentiel ces pistes sont axées sur l'instruction, la simulation et la prévalence de l'action offensive :

> 1. La cellule d'emploi même très petite met un nombre de spécialités si élevé qu'il est impossible en son sein de réaliser une instruction convenable.
>
> L'auteur préconise des centres d'entrainement au combat préparant réellement à la guerre à base de simulation. Il n'est plus question de ressasser les expériences du passé pour tenter de préparer l'avenir, « ces expériences où cohabitaient chez les instructeurs l'étroitesse de vue et l'agressivité caractéristique du pédagogue incertain », s'exclame l'auteur.
>
> En décuplant l'efficacité des processus de préparation au combat les moyens modernes d'entraînement rendront possible la maîtrise des dispositifs éclatés, en améliorant non seulement l'instruction de chacun mais surtout en transformant les liens tactiques assurant la cohésion de l'ensemble. Aux liens qui relèvent encore de l'ordre émotif se substitueront les liens tactiques reposant sur la maitrise technique et l'homogénéité de la culture.
>
> Ainsi la tactique sortira des cartons poussiéreux et des vieux thèmes ressassés pour bénéficier de la puissance de la simulation, fonction matrice de la tactique.
>
> 2. Fervent défenseur de l'action offensive, l'auteur rappelle que le mythe de la puissance soviétique et le cadre de la doctrine de dissuasion ont accentué le phénomène en enfermant la réflexion tactique dans un carcan où l'offensive était exclue.
>
> La réussite de la manœuvre ne pourra être obtenue désormais qu'au travers d'une action résolument offensive.

Le succès des systèmes futurs reposera sur le rythme des engagements, la fluidité des enchaînements et la brutalité des actions. Seule une solide culture tactique offensive sera de nature à servir de cadre à de telles entreprises. L'auteur ne renvoie à aucune réflexion sur la défensive théorisée par Clausewitz et ses successeurs.

Commentaires et critque :

L'auteur mérite beaucoup de félicitations pour le courage et les efforts qu'il a consacrés à la rédaction de cette étude.

Sans prétendre à une quelconque prise de position intangible ni pêcher indûment pour une modestie intellectuelle envers cette contribution précieuse à la profession des armes, je me limite à 3 observations que je considère essentielles :

1ère Observation :

L'ouvrage est une référence très utile en matière de tactique. Néanmoins certains aspects étudiés de la manœuvre sont simplement descriptifs et ne donnent pas au lecteur assez d'instruments conceptuels et dialectiques lui permettant de saisir la complexité de la tactique théorisée et de gérer l'incertitude. C'est l'interprétation des notions développées et l'importance que le lecteur va apporter à tel ou tel concept pour construire son propre raisonnement qui fait la richesse d'une théorie. C'est cette approche qui a permis à l'œuvre de Clausewitz de traverser 2 siècles et de rester toujours pertinente. Peut-on considérer avec le Général Hubin que l'étude historique n'aura qu'un intérêt secondaire pour la tactique, laissant la fonction motrice à la simulation ?

L'auteur relègue cette question à la réflexion opérative. Il ne fait appel à l'histoire militaire qu'à titre d'illustration, les multiples exemples historiques qu'il fournit pour étayer sa thèse sont pris parfois en un sens univoque et exprimés de manière unidimensionnelle, pour mettre en exergue la désuétude des concepts, citant par exemple Napoléon : « *Moi et 50.000 hommes égalent 150.000 hommes* » ou s'efforçant un peu artificiellement de passer au crible les principes de la guerre introduits dans l'enseignement militaire français par le Colonel Maillard. En tous cas l'histoire ne constitue pas le fondement de son raisonnement tactique.

Une telle approche atténue la dimension de la réflexion théorique et appelle de notre part un commentaire emprunté à notre éminent et regretté professeur Cauteau-Bégarie que je cite : « *Les prodigieuses transformations techniques auxquelles nous avons assisté durant les dernières décennies et dont la guerre du Golfe contre l'Irak a constitué un champ d'expérimentation en grandeur nature, n'ont pas pour autant invalidé les concepts et les méthodes des pères fondateurs* ».

2ème Observation :

On peut noter la détermination de l'auteur à rechercher le modèle de la manœuvre idéale applicable par tous et contre tous les adversaires. L'auteur tire des conséquences et souligne des tendances pour modifier l'approche tactique dans un cadre restrictif des combats symétriques.

Les thèses développées sont cohérentes quand elles sont rapportées aux milieux propices aux manœuvres projetées dans les bons « carrés » et les charodromes recevant des dispositifs n'atteignant pas la masse critique des zones urbanisées. Or force est de constater aujourd'hui que dans la réalité de la transformation et dans les opérations actuelles de stabilisation et de normalisation, il est devenu nécessaire de densifier la présence des forces pour assurer la sûreté et s'afficher auprès de la population. Les liens sociaux sont déterminants pour l'efficacité opérationnelle. Il est confirmé aujourd'hui que face à un adversaire asymétrique, la seule supériorité technologique n'emporte pas toujours la décision. La totalité de l'ouvrage traite exclusivement du combat symétrique alors que l'affrontement asymétrique constitue le principal défi que devront relever les forces armées de demain.

Le Général Guy HUBIN n'a pas gardé le silence sur cette question s'en tenant au niveau tactique qui le concerne. C'est ce qui l'a amené à réagir à travers la réédition de son ouvrage dans la bibliothèque stratégique en 2007, où il annexe un chapitre succinct intitulé « l'étonnante convergence » soutenant que l'important n'est pas dans l'équilibre des rapports de forces mais plutôt dans la similitude de la nature des buts de guerre et dans cette logique les principes qu'il avait énoncés pour la manœuvre future s'appliqueront aussi bien au symétrique qu'à l'asymétrique et que les évolutions technologiques des armées modernes vont les faire converger vers les principes de leur redoutable ennemi à condition de dépolariser le champ de bataille d'organier l'information et je cite « *prendre à notre tour l'adversaire à son propre jeu* ».

Oui mon Général, mais la médaille a un revers !. « La réalité de la guerre diffère du discours de la guerre. Les modèles sont par nature des simplifications et par la même inexacts et incomplets » comme le souligne le Professeur John LYNN dans son ouvrage « De la guerre » tirant sa conclusion de Clausewitz : « la nature imprévisible de la guerre condamne les plans rigides ».

Le Général Hubin ignorant à l'époque, les limites implicites du discours dominant sur la guerre asymétrique, avait sanctionné une certaine réalité des combats dans son étude. Le refus de catégoriser la contre-insurrection par exemple comme mode d'action dans son étude, pourrait être interprété comme un rejet du discours pourtant modifié. De ce fait il ne pouvait que préconiser la manœuvre que les militaires veulent mener quitte à transformer en conflit normal les situations nécessitant d'autres approches et non pas celle que les militaires doivent mener.

3ème Observation :

Offensive aéroterrestre, opérations d'intervention, destruction à large échelle, le Général Hubin n'est pas loin de la tendance du Général William WESTMORELAND commandant les troupes américaines au Vietnam de 1964 à 1968 et qui définissait ainsi la victoire : « Nous savons comment mener cette guerre. Nous allons investir une puissance de feu massive sur nos cibles parce que c'est ainsi que nous avons procédé pendant la Seconde Guerre mondiale et en Corée : C'est la méthode de guerre américaine ». En lisant « perspectives tactiques » du Général Hubin, nous ne sommes pas dans le futur. Les munitions guidées de précision (MGP) sont entrées dans l'arsenal américain depuis les années 70 et employées contre le Vietnam vers la fin de la guerre.

Si les opérations aériennes ont remporté un succès sans précédent en Irak, dont les nouvelles technologies furent largement créditées, c'est en partie parce que cette région est désertique ne favorisant aucune dissimulation.

En outre, ce que d'aucuns parmi les lecteurs peuvent noter comme « technolâtrie » dans l'ouvrage du Général Hubin, c'est que le commandement digital, les munitions intelligentes, ou le géo-référencement considérés comme des développements intangibles, sont en réalité susceptibles d'être altérés ou contrés par d'autres systèmes. Les contre-mesures peuvent remettre en cause leur paradigme originel. La technologie n'a pas changé la guerre, elle a simplement modifié l'image de la guerre. Les avancées technologiques sont telles que l'apparition de systèmes d'armes nouveaux est susceptible à tout moment de modifier les équilibres existants y compris économiques et financiers.

N'est-il pas prudent de combiner les concepts tactiques novateurs reposant sur la technologie avec le meilleur de la tactique classique ? « *L'emploi de la force dans toute son étendue n'exclut en rien la coopération de l'intelligence* » affirmait Clausewitz. Ceux parmi les spécialistes qui se sont attelés positivement et amplement à cette réflexion n'ont pas sombré dans l'utopie parce qu'ils ont mis en évidence la filiation entre les précurseurs et leurs héritiers. Nous n'en citerons comme exemple que celui du français David Galula dont la théorie de l'approche globale, elle-même héritée des maréchaux Gallieni, Foch et Lyautey, est en train de prendre aujourd'hui forme dans la pensée américaine et de faire preuve sur le terrain.

« Perspectives tactiques » n'est que le « récit » de l'opération « Desert Storm » et de ce point de vue faute de réflexion historique achevée, l'ouvrage ne pourrait être appréhendé comme modèle idéal en matière de théorie tactique pour l'Union Européenne de 2020.

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Dr. Richard W. Stewart (USA)
"It Seemed Like a Good Idea at the Time."[1]

It was the early days of the Cold War, just as Korea went from being a hot war to being just a lukewarm war. The United States Army, the heir to the Army of World War II and the principal ground force of the NATO alliance, faced two formidable enemies. These enemies were skilled and ruthless and would stop at nothing to achieve victory for their ideology. Despite endless negotiations and face to face meetings, it did not look good. Their strength continued to grow and their expenditures were dwarfing those of the U.S. Army. These enemies were, of course, the U.S. Navy and the U.S. Air Force whose influence within the national military structure and budgets were on the rise. The battlefield was the Pentagon in Washington, and the goal for the Army was to gain its fair share of the shrinking defense budget.

Interservice competition between the Navy and the Army had, of course, been legendary for the years running up to World War II and only simmered on the back burner during the war itself. With the creation of the Air Force in 1947 out of the Army's hide, the competition was now a three way struggle. It was a struggle for budget, but it was also a struggle for the soul of the Army and even its very existence. In the new nuclear era of the early Cold War, an idea thoroughly exploited by the Air Force, it seemed as if land warfare itself was rapidly becoming obsolete. The phrase "pushbutton war" was beginning to make its appearance with all that entailed of remote control operations and surgical strikes. Wars of the future were going to be clean, clinical, affairs fought with missiles and bombers and in the research laboratories. There was to be none of this crawling around in the mud so there was no need for a large land force at all. In this new type of warfare, typified by President Eisenhower's "New Look" national strategy of massive retaliation, the Air Force's intercontinental bombers and ICBMs along with the Navy's carriers and ballistic missile submarines were viewed as the most critical national assets for defense. The Air Force was pushing ahead with intercontinental bombers and missiles, soon to be organized under the Strategic Air Command. Not to be outdone, the Navy fought successfully for its fast moving nuclear carriers, carrier launched fighter bombers, and soon a nearly invulnerable fleet of atomic powered missile launching submarines. Thus the Navy and Air Force were the symbols of future war. They were modern and new and sleek and so, well, 20th century.

The Army, on the other hand, seemed to be a throwback to conflicts of the past, to "Old War." The Army was still committed to dominance in land warfare

[1] The opinions expressed in this paper are the authors, and are not in any way to be construed as the official policy of the U.S. Army or Department of Defense.

but suffered because of its seemingly limited effectiveness; the stalemate of Korea was very much on the public's mind. With the new strategy of massive retaliation, where any overt challenge from the communist world would be met by nuclear war, such a limited war would not need to be fought again and thus the value of the Army was severely undercut. Massive retaliation would keep the peace and the Air Force and the Navy were the key elements of such a strategy.

The Army thus faced a series of challenges, both philosophical and technological. It needed to overcome the public relations stigma of being "old-fashioned" and out of touch with modern warfare in order to retain its place at the defense table. And it needed to develop new technology of its own to compete for its share of the budget and to uphold its place in the defense hierarchy. It needed to be able to fight a new type of war on a new battlefield dominated by nuclear weapons but still fought on land. These needs pushed the Army into a series of experiments with new types of technology that would both capture the public imagination and provide the tools to fight in new ways. I'd like to discuss just a few of those attempts at revolutionary technology and discuss why although they seemed like good ideas at the time they led only to technological dead ends and failed doctrines.

Some of the earliest attempts to change the face of the Army, and especially of its critical and oldest branch, the Infantry, revolved around the need to improve the mobility of the individual soldier. The ubiquitous jeep and the essential cargo truck had made the Army of World War II the most mobile in history. But at the front lines the Infantryman still moved by his own legs and attacked at the speed of a fast walk. So to change this equation, the Army decided to develop new capabilities that would be both useful and modern: individual flying platforms for the soldier and flying utility vehicles, futuristic replacements for the jeep.

The Bell Rocket Belt

The dream of individual soldiers being able to fly around the battlefield was a science fiction dream dating from the 1920s Buck Rogers flying belts. But in the 1940s and 50s a number of companies began working with compressed nitrogen and hydrogen peroxide in various types of jetpacks and rocket packs. Their work was noticed by the U.S. Army who contracted with Aerojet-General and Bell Aerosystems to further develop the idea. The result was the famous "Rocket Belt".

The Bell Rocket belt weighed some 125 lbs. loaded and used hydrogen peroxide forced out of two rocket thrusters to lift the single pilot off the ground. Dramatic though it was, the Rocket belt was heavy, left little room for a soldier's pack or weapon, and, worst of all, could only stay in the air for about 21 seconds with the available fuel. It was bulky, slow, and noisy and made a soldier highly visible on the battlefield and thus highly vulnerable.

It was demonstrated before VIPs numerous times as a futuristic concept, most notably before President Kennedy at Fort Bragg, North Carolina in October 1961 as part of a Special Forces display. But despite the impressive looks, its short flying time doomed it and it was scrapped as being impractical.

The other individual flying systems that the Army experimented with included a variety of innovative, if limited, vehicles. Some of the first were variations of a "flying platform" including the De Lackner Aerocycle and Hiller VZ-1 Pawnee.

The De Lackner Aerocycle

The De Lackner Aerocycle was developed by the De Lackner Helicopter Company of Mount Vernon, New York, and was first tested in 1955. It basically put the counter rotating rotors of a helicopter directly underneath the pilot, or soldier, who would be standing on a small platform just above these "blades of death." The test flights were challenging even for the experienced test pilot, Captain Selmer Sundby, who later reported that non-pilots would have "considerable difficulty" flying it. It could go up to 70 mph and one of the test flights lasted almost three quarters of an hour so it did work. Unfortunately, in addition to the obvious problem of flying on top of rotating blades (it would make me nervous, certainly) when the blades got up to a high speed, they would wobble and change shape. On two occasions during the test flights—one where the pilot was going 30 mph and was 40 feet in the air—the blades flexed and then collided with each other, with catastrophic results. Captain Sundby survived both accidents and was awarded the Distinguished Flying Cross for his bravery, but the concept was abandoned in 1958.

The *Pawnee* Flying Platform

Not to be deterred by a few accidents, the Army also worked with the Navy and with the Hiller company to develop a different flying platform, the VZ-1 "Pawnee" air car. (The Office of Naval Research acted as the technical direction agent for the Army, but it was considered an Army project.)

The "Pawnee" used an inducted fan as a propulsion device and its earliest variant was tested in 1955. The pilot stood on a small circular platform above two shielded contra-rotating airscrews powered by two 40 hp engines. A five foot diameter duct held the fans and eight moveable vanes which controlled the lateral stability. Two further variants were tested in the late 50s with different size ducts and landing gear and even a seat for the pilot. While the Pawnee worked, and did not crash in its test flights, it was heavy, slow, and mechanically unreliable. Development was suspended in the early 60s and by 1963 all prototypes were grounded.

The Avro Car: The Army's "Flying Saucer"

One of the more spectacular new ideas for a new form of mobility was the Avro Car, looking suspiciously like a flying saucer, developed starting in 1952 by A.V. Roe Aircraft Limited of Canada. The U.S. Army and Air Force both liked what they saw and decided to invest in the capability which promised more than just lifting one individual. The Army wanted a light observation craft that might outperform helicopters—then in their early and unreliable phase—while the Air Force wanted a Vertical Take Off and Landing (VTOL) craft that could hover below radar and then rocket upwards quickly at supersonic speeds.

It was supposed to be able to reach speeds of 300 mph and an altitude of 10,000 feet, but actual testing of the machine provided very different and disappointing results. It only reached a speed of 35 mph in testing and when it was only a few feet above the ground it got increasingly unstable. Its nine turbojets provided the lift for the 5600 lbs. machine, but they also made it difficult to control.

That did not stop creative Army thinkers and artists from developing interesting concepts of flying artillery and mobile supply vehicles, but these were all flights of fancy based on a machine that never performed well.

The Air Geep

Perhaps the innovation that showed the most promise was a variant on the technology used in the Avro Car and that was a "flying jeep" or Air Geep developed in 1958 by the Piasecki Aircraft Company.

The Army contracted with Piasecki to develop a more efficient Vertical Take-Off and Landing Vehicle (VTOL) capable of operating at low altitudes and at speeds up to 70 mph. It was designed specifically to carry small loads of atomic warheads from storage sites to tactical nuclear weapons, just then entering the Army's inventory. It had two tandem, three-bladed, ducted rotors driven by two 180 hp piston engines and could carry a pilot and one passenger along with the cargo. The Army bought the idea and, after an engine upgrade, test flew it in June 1959. The idea showed promise and the Army invested in a modified version of the Air Geep in 1962.

The new Air Geep II, the VZ-8P (B) had two 400 hp turbo-shaft engines that were linked so that if one failed, the other would take over the mission of driving both rotors. It was bent in the middle to tilt the rotors and improve its flying characteristics. It also included ejection seats, just in case. The new version could operate either just off the ground or at altitudes of several thousand feet and was surprisingly stable. The only major drawback was that it was mechanically ill-suited to operations in the dusty, dirty, wet, environment of field operations and the Army turned instead to the more reliable, proven platform, of the helicopter, especially given the climate demands of the increasingly important battlefield in Vietnam.

The Air Geep was developed, in part, to help solve one of the problems that developed in Army doctrine and tactics as it attempted to remake itself into a ground force for nuclear war. Although sounding like a contradiction in terms, the Army in the Cold War was concerned, especially in Europe, with organizing itself to fight on a battlefield that might include exchanges of tactical nuclear weapons and it needed the Air Geep to deliver warheads to its planned dispersed force. Under pressure to modernize and reorganize for the "war of the future", the Army had developed a new organization: the Pentomic Division. As much a public relations ploy by then Army Chief of Staff Maxwell Taylor to show that the Army still had a role in warfare, the Pentomic concept organized an Army division into five battle groups of four line companies, a mortar battery and a headquarters company each so that they could be dispersed widely on the nuclear battlefield and not present too lucrative a target for the enemy nuclear forces. After extensive field testing a number of flaws showed up in the concept, not least of which was the insufficient mobility assets—trucks, armored personnel carriers, etc.—allowed the new division in their Table of Organization and Equipment (or TO&E). But it was an attempt to solve the problem of how to fight a limited nuclear war on the ground.

An additional aspect of that problem was how to provide this dispersed force with a tactical nuclear capability of its own. This brings us to our next innovation: the Davy Crockett nuclear recoilless rifle.

The Davy Crockett

Before the development of the Davy Crockett, the Army really had only two major weapons systems to deliver nuclear warheads: the 280 mm cannon, nicknamed the "Atomic Annie", and the Honest John artillery rocket.

The M31 Honest John artillery rocket was developed in 1951 and deployed to Europe in Honest John Battalions in early 1954 to be a nuclear weapons delivery system. It could also carry a 1500 lbs. conventional warhead, but was designed specifically to give a short range (about 30 miles for the improved M50 version) nuclear capability to Army divisions.

The M65 280 mm cannon, a long barreled, 83 ton towed artillery piece, was developed from 1949 to 1953 and could fire a 15 kiloton nuclear shell up to 20 miles. It was less mobile than the Honest John since many bridges in Germany could not carry that much weight. Only 20 were manufactured and they were controlled at division level, making them less than useful to smaller units such as Battle Groups or Companies. To fill that need, the Army developed the M-28/M-29 Davy Crockett a tripod mounted recoilless rifle capable of firing a small M54 nuclear round with a.1 or .2 kiloton yield (about 100 or 200 tons of TNT). That was about the smallest practical size and yield for a nuclear device.

The entire device with warhead weighed about 76 lbs and had a range of only about 2 kilometers for the smaller 120 mm M28 version and about double that for the 155 mm M29 version. By the time the Davy Crockett came out of development, the Pentomic Army Division had been replaced by the ROAD Division (Reorganization Objective Army Division) but the weapon was deployed anyway. It was assigned to the Heavy Mortar Platoon of the Headquarters Company of Infantry or Armor battalions, so in essence one had a nuclear capability down at a very low level of Army organization, a battalion commanded by a Lieutenant Colonel.

The problems with the Davy Crockett were many. Although quite mobile with a three man crew mounted in a jeep or an armored personnel carrier, matching up the tube with the nuclear round, stored in a distant special ammunition depot, proved logistically challenging. But the most critical shortcomings were that it was very inaccurate and short-ranged. So, one was firing a nuclear round and it would land, at best, 4 kilometers from ones position. This degree of accuracy was not a comforting thought and it gave a new definition to the warning: "Danger Close." Some 2000 of these "nuclear mortars" were produced in the 50s and 60s and they stayed in the force until 1968. In the meantime the development of small nuclear artillery shells capable of being fired from 155 or 203 mm artillery pieces with much greater accuracy and range rapidly made them obsolete.

The case of the Davy Crockett remains one of the more bizarre technological dead ends of the Army of the Cold War. The weapon was so small and so short-range, that a joke to that effect was still circulating in the Army into the mid-1970s that the next improvement of the Davy Crockett would be the nuclear hand grenade—a grenade that would have a bursting radius of 100 feet but that could be thrown only 50 feet. That obvious fictional absurdity was only slightly less bizarre than the reality.

Conclusions:

What can we make of these five case studies in technological dead ends? First, I think we can see that the Army really tried to make use of cutting edge technology to show that they were just as modern as the Air Force or Navy and still had a role to play in warfare. Secondly, the Army was trying to think outside the box in a number of areas to develop better methods of moving soldiers and supplies around the battlefield as well as bring new and more powerful sources of fire power further forward than ever before. All of this was consistent with what the Army saw at the time was the challenge of the future: operating dispersed but able to rapidly concentrate its forces on the nuclear battlefield. The major flaw was that none of the technologies were feasible to accomplish these goals. The personal hovercrafts, floating platforms and flying belts were heavy, unstable, mechanically unreliable, short-range, and often downright dangerous. The Davy Crockett was a recipe for disaster. The Army was perhaps thinking a little too far outside the box in that instance and wandered into complete unreality. So if we have any salient lessons we can learn from these technological dodo birds, it should be these:

1. Not all new ideas are good. Anyone saying afterwards that "It seemed like a good idea at the time" should have thought a little harder about the idea up front before investing millions into a technology in search of a mission.
2. Not all change is good or even necessary. The Army forced itself into thinking that nuclear weapons had changed everything about warfare but had failed to see how much would remain unchanged despite these new

weapons. In order to seem like a force of the future, in touch with the new nuclear world, the Army convinced itself that more had changed than really had. It tried to be trendy and frankly just ended up looking a little silly. Armies are often accused of being conservative, even hide-bound organizations. After all, armies held onto the long-bow and the horse long after technological change had passed them by on the battlefield. But slow to change is not always a bad thing since it can be a corrective to the over-optimistic or over-enamored proponents of fads in technology.

3. And finally, a key corrective to the urge to pursue the latest fad in technology—be it short-range nuclear weapons fired out of a tube or flying saucers—must be an objective analysis of just what a new technology is capable of and what it isn't and how it fits into warfighting doctrine. Technology can be a game-changer, but only technology that is thoroughly investigated, carefully tested, and integrated into the right weapons systems, organization, and doctrine. Only if all three of these elements are in-sync can technology be made practical, useful, and lasting. It avoids turning a bright new idea into a technological dead-end.

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38e Congrès de la CIHM : Remarques finales
Prof. ém. Dr. Luc De Vos (Belgium)
Président d'honneur de la CIHM

Ladies and Gentlemen,
Mesdames, Messieurs,
Meine Damen und Herren,

Most of you know that I normally switch from one language to another. I will not do this today. As the introductory speech from Prof. Pommerin was in English I will speak in French. Also because the organization asked me to do so for practical reasons. So, English or American speakers, and those who use this language as lingua franca, please put your headphones.

Si la technologie, entendue dans son sens le plus large, a toujours fait partie intégrante de l'art militaire, sa prise en compte par les stratèges est un phénomène récent : elle remonte, au plus tôt, à la seconde moitié du 19e siècle, lorsque les avancées de la première révolution industrielle ont commencé à produire leurs effets sur l'art de la guerre. Sous-estimée jusqu'à la Première Guerre mondiale, survalorisée ensuite, la technologie est devenue l'objet de toutes les attentions. Ces vingt dernières années, deux débats complémentaires ont enrichi notre questionnement : celui sur la "Révolution dans les affaires militaires", d'une part, qui concerne surtout les stratégistes, et celui, d'autre part, des "révolutions militaires" à travers l'histoire, qui est davantage de notre ressort, encore que les deux débats s'éclairent mutuellement. Notre 38e Congrès international d'histoire militaire tombait donc à point nommé pour apporter de nouveaux éclairages et tenter également de dresser le bilan de nos connaissances, qui se sont considérablement enrichies au cours des dernières décennies.

Les avancées de l'historiographie se sont produites à deux niveaux au moins :

– (1) Affinement de notre connaissance de certaines époques de l'histoire des guerres et du rôle joué par la technologie. Nous savons, notamment, beaucoup mieux quel est « l'effet » des armes du passé sur les combattants et leur rôle dans la tactique.

– (2) Plus globalement, une réflexion générale sur la place qui revient à la technologie dans l'art de la guerre, depuis les temps les plus reculés jusqu'à nos jours. C'est, entre autres, l'objet du débat sur les "révolutions militaires", mais pas seulement, des historiens s'étant aussi interrogés sur les dynamiques de l'innovation militaire en intégrant, par exemple, certains apports de la sociologie des organisations.

Tous ces questionnements ne peuvent être isolés de leur contexte, qui explique certaines orientations de recherche et thèses défendues par les historiens. Ainsi, la relative fascination dont s'est accompagnée la "Révolution dans les affaires militaires" des années quatre-vingt-dix, puis sa réévaluation dans le contexte des guerres asymétriques du début du 21e siècle, ne peuvent manquer d'avoir un impact sur la manière dont le thème de notre congrès a été abordé dans l'historiographie la plus récente et par nous-mêmes. Ainsi encore, les débats internes au monde académique ont suscité de nouvelles recherches et permis des approches plus nuancées de ces questions.

Comme historien et comme enseignant chargé pendant plus de trente ans d'initier à l'histoire militaire de futurs officiers et des étudiants en sciences politiques dans les universités civiles, j'axerai mes conclusions finales sur quelques propositions concernant la place de la technologie dans l'histoire militaire et son enseignement, mais aussi, plus largement, dans la formation de tous ceux qui pourraient être un jour appelés à prendre des décisions dans ce domaine. C'est là un programme tout à la fois ambitieux et modeste : ambitieux, vu qu'il oblige à voyager dans le temps et dans l'espace, comme les séances de notre congrès international nous y ont invités pendant la semaine que nous venons de passer ; et modeste, dans la mesure où il ne peut s'agir que d'un rapide survol. Mais c'est la loi du genre et force m'est donc de m'y plier!

J'ajoute qu'accorder une place à l'enseignement dans les propos que je tiendrai dans la demi-heure qui vient n'est pas non plus sans signification par rapport au thème de notre congrès. En effet, de nombreuses académies militaires toujours en activité ont été créées dans le contexte de la "révolution militaire des Temps modernes", qui a nécessité de former des spécialistes aptes au développement et au maniement des armes dites « savantes », au premier rang desquelles l'Artillerie et le Génie. Rappelons encore que tout un courant de l'histoire militaire professionnelle a trouvé sa source dans l'analyse critique des campagnes militaires du passé telle qu'elle s'est développée en Prusse à partir des années 1850, entreprise intellectuelle qui devait guider la minutieuse planification imposée par la guerre industrielle, tant au niveau de la préparation de la mobilisation que du développement et l'acquisition des matériels. Enfin, l'époque actuelle impose aussi des choix cruciaux en termes d'allocation des ressources, de recherche et de développement, de gestion des personnels et de leur formation dans le contexte de la gestion des crises actuelles. En étudiant comment ces choix se sont opérés dans le passé, quels ont été leurs motivations, leurs succès et leurs échecs, l'historien contribue aussi à sa manière aux débats actuels.

Avant d'aborder la technologie dans ses composantes intrinsèques, je ne crois pas inutile de nous interroger quelques instants sur la façon dont elle est perçue, car cette perception agit sur l'histoire et constitue par conséquent aussi un objet d'étude pour les historiens. Aux deux extrêmes, la technologie militaire fascine ou provoque le rejet (il y a, si l'on veut, d'un côté les « technophiles », et de l'autre côté, les « technophobes »). La fascination pour la technologie militaire se traduit de multiples manières et elle ne touche d'ailleurs pas seulement les spécialistes. Certaines maisons d'édition populaires mais de qualité ont fondé leur succès sur des ouvrages consacrés à l'armement, aux navires, aux avions, aux chars et autres matériels de combat. Le monde académique regarde parfois cette abondante production avec dédain, mais sans doute est-il pour nous beaucoup plus profitable de les envisager comme des "sources érudites", selon l'heureuse formule d'un historien[1]. L'intérêt pour la technologie militaire suscite aussi une forte demande, qui se traduit dans les films de guerre, dans les jeux de rôle et autres « wargames ». Les expositions et musées dédiés à l'histoire des guerres peuvent difficilement se concevoir sans une part substantielle dévolue à cette dimension matérielle immédiatement perceptible. Il était donc particulièrement judicieux de consacrer une séance à la muséologie militaire au cours de notre Congrès et de renforcer par la même occasion nos liens avec l'ICOMAM à travers la présence, notamment, de son président, mon compatriote et cher collègue Piet de Gryse. Cet intérêt pour les matériels militaires contribue aussi à l'attrait pour le métier des armes. Au dix-neuvième siècle, une partie de la génération romantique rêvait sans doute à de brillantes charges de cavalerie telles qu'elles sont notamment reproduites dans les nombreuses peintures de l'époque consacrées aux batailles ; les jeunes gens nés au vingtième siècle et qui se destinent à la carrière des armes ne s'imaginent-ils pas plutôt aux commandes d'un avion de chasse, d'un navire de guerre ou à la tête d'une unité blindée ? Le lien qui se tisse entre les combattants et les technologies qu'ils emploient dépasse d'ailleurs souvent l'aspect utilitaire pour acquérir une dimension affective, étudiée par tout ce courant de l'historiographie qui gravite autour de la notion de culture de guerre. Depuis les temps immémoriaux, les guerriers ont eu pour coutume de donner un nom propre à leur arme. Dans beaucoup d'armées du monde, on encourage les jeunes recrues à prendre soin de leur fusil comme de leur femme ! Sans doute est-ce un peu caricatural et je m'en excuse auprès de nos collègues féminines ici présentes, mais c'est une réalité historique (d'ailleurs, comme il y a maintenant beaucoup de femmes dans les armées, rien n'interdit de renverser la proposition) ! Porter une arme à feu est signe de fierté. Le prestige associé à l'uniforme varie aussi en fonction de l'arme servie. Les armes associées à la mobilité, à la vitesse, à l'offensive – l'aviation, les blindés – sont généralement survalorisées dans l'imaginaire militaire par rapport à d'autres fonctions perçues comme plus statiques, ou plus bureaucratiques. Plusieurs communications au cours de notre Congrès ont aussi rappelé l'utilisation de la technologie militaire de pointe comme argument de la propagande de guerre, depuis la guerre italo-turque de 1911–1912 où les avia-

[1] François Cochet, *Armes en guerre : XIXe – XXIe siècle. Mythes, symboles, réalités*, Paris, CNRS Editions, 2012, p. 16.

tions italiennes et ottomanes sont mises en vedette malgré leur rôle encore limité, jusqu'aux guerres contemporaines du 21e siècle, en passant par les guerres balkaniques, les deux guerres mondiales, etc. Le caractère démonstratif et spectaculaire de certaines technologies militaires participe aussi au prestige des nations, qu'il s'agisse des chariots de combats des royaumes orientaux de l'Antiquité ou des puissants vecteurs de l'arme nucléaire exhibés lors des défilés militaires pendant la Guerre froide. Outre la prise des drapeaux, montrer triomphalement les armes du vaincu fait partie de la célébration de la victoire. Ainsi, la *Siegessäule* (la colonne de la victoire) à Berlin, commémorant les victoires de 1864, 66 et 70, est décorée de canons capturés à l'ennemi. L'auto-sabordage de la flotte allemande à Scapa Flow le 21 juin 1919 privait le vainqueur de son butin de guerre, mais il réparait aussi symboliquement l'humiliation et la honte de la captivité.

A l'inverse, la technologie militaire peut susciter plusieurs formes de rejet ou d'aversion, notamment pour des motifs humanistes ou pacifistes. Le rêve du fusil brisé de l'entre-deux-guerres, la sculpture du revolver au canon tordu devant le siège des Nations unies à New York, on encore, dans un autre registre, la dénonciation du complexe militaro-industriel entrée dans l'histoire par la voix de l'ancien président des Etats-Unis, le général Dwight Douglas Eisenhower, tout cela reflète, à des degrés divers, une mise en cause de la technologie militaire comme facteur de déclenchement des conflits armés. Cette idée a surtout fleuri après les hécatombes de la Première Guerre mondiale, bien sûr, qui avaient un caractère complètement inédit à une telle échelle. La course aux armements et leur nature inquiétaient d'ailleurs déjà avant-guerre, d'où des tentatives de juguler leur emploi par les conventions internationales de La Haye[2]. Le Premier ministre belge Auguste Beernaert [on disait alors encore « chef de cabinet »], catholique flamand mais de langue française comme une partie de l'élite belge de l'époque, joua d'ailleurs un rôle important dans ce mouvement, et il recevra le Prix Nobel de la Paix en 1909 pour son apport. Le mouvement ne fera que se poursuivre et s'amplifier après-guerre. Une laborieuse tentative de classer les armes selon leur nature "offensive" ou "défensive" [l'armée belge n'avait pas officiellement de *chars* mais des *auto-canons*] trouve son origine dans la conception selon laquelle les armes dites "offensives" encourageraient le passage à l'acte des nations aux intentions belliqueuses ou les guerres préventives (ou préemptives). Mais les participants à la Conférence mondiale de désarmement de 1932 échoueront à se mettre d'accord. L'Allemagne, par exemple, considérait que les fortifications avaient un caractère *offensif* dès lors qu'elles se trouvaient près de ses frontières et favorisaient l'attaquant. Cet échec tient aussi à ce que les nations autour de la table ne raisonnaient pas dans l'abstrait en vue du bien général, mais en fonction de leurs propres inté-

[2] Il y avait des précédents dans l'histoire, telle l'interdiction d'utiliser l'arbalète entre Chrétiens dans l'Europe du 12e siècle.

rêts et capacités. Ainsi, les Etats-Unis et la Grande-Bretagne, qui possédaient une importante flotte de surface, lui attribuait un rôle défensif, mais considéraient le sous-marin comme une arme offensive ; les nations qui ne possédaient pas cette capacité avaient bien sûr un point de vue diamétralement opposé.

Tandis que certains mettaient en cause le rôle des armements comme encourageant au déclenchement des guerres, d'autres relevaient que les conflits armés accéléraient l'innovation et le développement de technologies qui pouvaient profiter par la suite aux sociétés civiles dans leur ensemble. Héraclite ne prétendait-il pas que « la guerre est la mère de toutes choses » ? J'ai moi-même dirigé autrefois un petit ouvrage collectif en néerlandais sur la question : *Des gaz de combats à la pénicilline: le progrès par les guerres ?,* ce qui montre aussi l'intérêt des éditeurs pour cette problématique et l'ancrage dans l'inconscient collectif de l'association entre guerre et avancées technologique. Les guerres, lorsqu'elles durent et s'enlisent, favorisent en effet la recherche de solutions technologiques capables de surpasser l'adversaire ou de répondre à ses propres avancées. Au cours de la Première Guerre mondiale, la fixation des fronts et l'enlisement obligent à chercher des solutions nouvelles pour réaliser la percée : gaz de combats, longues préparations d'artillerie (« Le canon conquiert, l'infanterie occupe », selon la formule de Philippe Pétain), guerre des mines et char d'assaut, entre autres. Parmi les avancées technologiques qui profiteront aux sociétés civiles, l'aviation, qui connaît des progrès fulgurants au cours de ce conflit, les télécommunications, la radiodiffusion, la transfusion sanguine et, plus généralement, les progrès de la médecine traumatique, de la chirurgie et de la psychiatrie. La Seconde Guerre mondiale jettera notamment les bases des technologies de l'information avec les premiers prototypes d'ordinateurs utilisés pour la cryptographie (notre collègue polonais nous a rappelés le rôle joué par quelques-uns de ses compatriotes dans le déchiffrement de la machine Enigma), de la physique nucléaire, de la chimie de synthèse afin de contrer les pénuries en biens de consommation courante et de carburant, des avions à réaction, des radars – ceux-ci existaient avant la guerre, mais connurent d'importants perfectionnements - et des antibiotiques. Bien entendu, ces apports ne compensent jamais l'ampleur des pertes humaines et des destructions et il ne saurait donc être question de mettre en balance les avancées technologiques et les ravages de la guerre. Par ailleurs, notre Président d'honneur André Corvisier disait pertinemment dans l'un de ses ouvrages qu'il faut relativiser le caractère d'aiguillon à la recherche scientifique que la guerre a pu constituer, et cela dans la mesure où, je cite, « elle a pu également constituer un frein en polarisant les efforts sur des objectifs limités[3] », fin de citation. On rejoint ici le problème de l'allocation des ressources et des cerveaux. Tout ce qui est consacré au développement des armements et des systèmes d'armes ne l'est pas à d'autres recherches,

3 André CORVISIER, *La guerre: essais historiques*, Paris, PUF, 1995, pp. 104-105.

sauf lorsque les applications civiles et militaires s'interpénètrent. Enfin, il n'y a pas matière à se réjouir de l'apparition d'arsenaux au potentiel destructeur tels que nous les connaissons depuis le vingtième siècle, même si ceux-ci ont contribué à éviter un affrontement direct entre superpuissances pendant la Guerre froide. Cette période très particulière de l'histoire, en revanche, permet de retourner l'argumentation "anti-technologique" en avançant les bénéfices de la dissuasion, qui rendent l'utilisation des armes de destruction massive suicidaire pour toutes les parties. C'est alors que le vieil adage latin : « Si vis pacem, para bellum [Si tu veux la paix, prépare la guerre] » a retrouvé une certaine actualité.

La méfiance vis-à-vis de l'innovation technologique est aussi venue du monde militaire lui-même. Parce qu'elles bousculent les traditions, parce qu'elles redistribuent les influences ou le poids respectifs des diverses armes, parce qu'elles modifient les façons dont le commandement s'exerce, les technologies nouvelles n'ont pas toujours été accueillies avec un grand enthousiasme, loin s'en faut ! « Rien de plus difficile, soulignait Nicolas Machiavel dans *Le Prince*, que de mettre en place un nouvel ordre des choses, car l'innovation a pour ennemis tous ceux qui ont prospéré dans l'ordre du passé. » Les discussions sur les uniformes autrichiens avant la Première Guerre mondiale nous rappellent cet adage. Cette observation s'applique aussi aux organisations militaires. L'arbalète, la poudre à feu ont été perçues comme inadmissibles selon une éthique voulant que le combat était un affrontement loyal, d'homme à homme. Avec l'arbalète, les boulets de canon, les balles perdues, la mort donnée ou reçue n'était plus – ou plus seulement - le fruit de l'héroïsme (le fameux « jugement de Dieu » des duels), mais du hasard, ce qui apparaissait comme un scandale presque métaphysique. Au début des Temps modernes, beaucoup s'émeuvent aussi de ce que la guerre devienne une affaire d'ingénieurs. Ces derniers mettront très longtemps à être admis à part égale avec les officiers, en charge de la partie "noble" de la guerre, et qui s'efforcent de protéger leurs privilèges. La réticence de Louis XIV à promouvoir Vauban au rang de maréchal de France est assez significative de cette mentalité. Autre monarque éclairé, Frédéric II ne traitait pas non plus très bien ses ingénieurs, semble-t-il[4]. Artilleur de formation, posant à l'homme de science et de progrès depuis la campagne d'Egypte, Napoléon Bonaparte dissoudra pourtant la compagnie des aérostatiers, si bien que l'observation aérienne expérimentée avec succès lors de la bataille de Fleurus de 1794 restera sous-exploitée au cours des guerres de la Révolution et de l'Empire. De même, tout le monde connaît le célèbre épisode de l'inventeur américain Robert Fulton, venu présenter sans succès ses projets de sous-marins. Alors qu'il s'apprête à envahir l'Angleterre, Bonaparte ne croît pas non plus en la marine à vapeur, que Fulton est en train d'expérimenter, sur la Seine notamment. Dans les décennies qui suivent, la vapeur tardera à s'imposer dans les marines

[4] Jean CHAIGNOT, *Guerre et société à l'époque moderne*, Paris, PUF, p. 200.

de guerre. Outres les imperfections techniques des débuts, le “romantisme de la voile” a certainement joué un rôle, de même que, dans les années 1920-1930, les troupes montées abandonneront avec beaucoup de réticence le cheval au profit des véhicules motorisés. Quant aux coques des navires, on hésite à abandonner le bois pour le fer, dont l’avantage n’apparaîtra dans toute son ampleur que lors de la Guerre de Crimée. Pendant ce même conflit, des officiers se plaignent des interventions incessantes du pouvoir politique sur les opérations grâce au télégraphe, ce « bout de fil de fer électrique », selon l’expression du maréchal français Aimable Pélissier, qui finira par donner sa démission tant il supporte mal que le civil empiète sur le militaire[5]. Les modes de communication et de transmission, que Martin van Creveld classe parmi ces technologiques civiles ou mixtes qui participent de l’infrastructure de la guerre, ont aussi un impact non négligeable sur la façon dont le commandement est exercé. Au 21e siècle, on note un phénomène comparable avec le court-circuitage des voies hiérarchiques traditionnelles et des échelons intermédiaires du commandement, que facilitent les échanges par messagerie électronique. L’impact des développements de l’informatique se fait donc ressentir jusque dans la nature des organisations militaires, en amenuisant la distance qui existait autrefois entre les niveaux inférieurs de la hiérarchie et les échelons supérieurs[6].

Si les freins aux changements et à l’innovation technologique sont puissants, quels en sont alors les incitants ? Distinguer temps de paix et temps de guerre s’impose pour plusieurs raisons. Il y a d’abord la question de la temporalité. Une longue période de paix favorise les innovations graduelles, mais celles-ci ne sont pas nécessairement perçues avec la même urgence. Par ailleurs, les simulations des nouveaux matériels ne remplacent pas l’épreuve du feu réel. En temps de guerre, le rythme s’accélère. Des impasses tactiques ou stratégiques poussent à trouver de nouvelles solutions, entre autres technologiques, aux problèmes posés. En temps de guerre, l’objectif est clair, l’ennemi connu ; les leçons sont immédiates et se sanctionnent en pertes humaines. En temps de paix, l’innovation technologique et l’acquisition de matériels nouveaux s’apparentent davantage à une gestion de l’incertitude qu’à cette dialectique innovation-parade qu’on peut observer lors de conflits qui s’installent dans la durée. Quels seront les ennemis de demain ? Quel sera leur propre potentiel ? Les ressources financières ne sont pas extensibles à l’infini, il faut faire des choix, tout en sachant que la guerre réelle mettra peut-être en cause leur pertinence. Ainsi, avant la Première Guerre mondiale, le rôle futur du sous-marin est mésestimé ; plus grave encore, il le restera dans l’entre-deux-

5 Cité par : Philippe Masson et Laurent Henninger, *Révolutions industrielles et militaires au XIXe siècle*, in : Thierry de Montrial et Jean Klein (sous la dir. de), *Dictionnaire de stratégie*, Paris, Presses universitaires de France, 2000, p. 462.

6 Delphine Resteigne, *Le militaire en opérations internationales. Regards croisés en Afghanistan, en Bosnie et au Liban*, Bruxelles, Editions Bruylant, p. 46, note 111.

guerres, si bien que la Royal Navy se retrouvera, en 1939, avec 10 fois moins de bâtiments d'escorte qu'en 1917[7]. A la surface des mers, la bataille de Jutland ne sera pas un nouveau Tsushima. La bataille d'anéantissement n'a pas eu lieu et, de ce point de vue, le formidable effort d'investissement d'avant-guerre dans les flottes de surface peut sembler avoir été du gaspillage. D'autres fausses leçons tirées de conflits antérieurs conduisent à des impasses technologiques. Dans la marine de guerre toujours, le retour en grâce momentané de l'éperon à la suite de la bataillé de Lissa en est un célèbre exemple. En France, le choix du torpilleur, promu par la *Jeune Ecole*, au détriment des cuirassés, repose tout autant sur des motifs irrationnels et idéologiques, que sur des motivations stratégiques ou techniques : la gauche, notamment, le pare de toutes les vertus démocratiques, y voyant un type de navire essentiellement défensif, la revanche de David contre Goliath[8]. Dans l'entre-deux-guerres, le porte-avions, qui jouera un si grand rôle pendant la Seconde Guerre mondiale, est lui aussi négligé.

Prévoir, planifier, gérer l'innovation technologique devient, à partir des années 1820–1830, l'activité essentielle – le « core business » - des organisations militaires en temps de paix, vu qu'une dynamique de progrès incessant et accéléré s'est enclenchée, qui oblige à s'y adapter pour ne pas être pris au dépourvu. Ces progrès toucheront les armements et les systèmes d'arme, mais aussi, peut-être plus important encore, les manières de se déplacer dans l'espace et de communiquer. Outre le développement des technologies, encore faut-il en intégrer toutes les conséquences au plan tactique, stratégique, organisationnel. Là encore, le temps de paix ne favorise pas toujours une vision claire. Un temps de décalage parfois long existe entre la maturation technique d'une innovation et son assimilation tactique. Les conséquences de l'augmentation de la puissance de feu à la fin du dix-neuvième siècle étaient mieux connues qu'on ne l'a parfois prétendu, mais, lorsqu'elles ne cadraient pas avec la doctrine, on préférait les ignorer ou en minimiser l'importance. Ainsi, du facteur moral, surévalué par certains observateurs de la guerre russo-japonaise de 1904-1905[9]. La guerre réelle permet-elle d'y voir plus clair ? Si les erreurs se paient « cash », l'entêtement dans des voies sans issue demeure parfois à défaut de moyens nouveaux ou faute d'opérer rapidement la révolution des mentalités qui s'impose. En témoignent les offensives meurtrières de la Première Guerre mondiale, qui perdurent pendant une partie de sa phase statique. Dans un premier temps, la tendance est d'en faire toujours plus, mais dans la même direction : la quantité - plus d'hommes, plus d'artillerie - plutôt que d'innover. Il est vrai que la

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7 Philippe Masson, *Histoire des batailles navales, de la voile aux missiles*, Paris, Atlas, 1983, p. 136.

8 *Idem*, p. 105–106.

9 Voir à ce propos : Olivier Cosson, *La « Grande Guerre » imaginée des officiers français : combat, représentations et anticipation autour de la guerre russo-japonaise*, in : Christophe Prochasson et Anne Rasmussen, *Vrai et faux dans la Grande Guerre*, Paris, La Découverte.

circulation de l'information en temps de guerre ne favorise pas toujours la lucidité. Reconnaître que l'on s'est trompé n'est pas une démarche facile. Les rapports des opérations sont rarement des modèles d'objectivité et de critique (il ne faut pas déplaire aux chefs !). Aussi l'innovation vient-elle parfois de la base, et non plus (ou plus seulement) des bureaux des états-majors. « Le développement des tranchées continues sur l'ensemble du front est un phénomène largement spontané », écrit ainsi Michel Goya, qui a étudié cette dynamique pour l'armée française lors de la Première Guerre mondiale[10]. Le lieutenant-colonel Dr. Christian Stachelbeck a étudié l'évolution de la 11ème division d'infanterie bavaroise au cours de ce conflit et constate la même chose[11], de même que le capitaine Tom Simoens, qui étudie les transformations de l'armée belge sur le front de l'Yser[12]. En temps de paix, lorsqu'il s'agit de gérer des fronts virtuels, l'innovation est généralement imposée du haut vers le bas ; en temps de guerre, le processus a tendance à s'inverser, l'expérience combattante remontant vers le sommet de la hiérarchie, qui l'analyse, en tire les leçons et les rediffuse par la chaîne de commandement à la troupe. Le haut commandement ne fait alors qu'officialiser des adaptations – des « micro-innovations » - nées sur le terrain.

Objet de débats passionnés depuis une vingtaine d'années, le concept de "révolution militaire" a placé la technologie au cœur des transformations de l'art de la guerre, et, plus globalement, des sociétés et de leurs rapports de force, d'où la diffusion de cette notion bien au-delà du cercle des historiens militaires. Elle a aussi offert des critères de périodisation qui ne sont plus nécessairement calqués sur les césures de l'histoire générale ou sur les guerres majeures de l'histoire. Comme les révolutions militaires ont eu tendance à se multiplier dans l'historiographie des dernières années tant la notion semblait stimulante, il n'est gère aisé de s'accorder sur leur nombre. Dans un livre récent traitant des transformations de l'art militaire depuis 1500[13], l'historien américain Max Boot en retient quatre : la révolution de la poudre à feu ou « révolution militaire des temps modernes », la première révolution industrielle et ses conséquences (grosso modo, de 1820 à 1920), la seconde révolution industrielle (de 1920 à mille neuf cent quatre-vingt-dix) et, enfin, celle toujours en cours, la « révolution de l'information ». Max Boot admet que son découpage du temps ne satisfera pas tous les historiens, mais il n'est pas contestable que les époques-charnières identifiées correspondent à des bonds en avant qui ont profondément modifié le visage de la guerre.

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[10] Michel Goya, *La chair et l'acier: l'invention de la guerre moderne (1914–1918)*, Paris, Tallandier, 2004, p. 185.

[11] Christian Stachelbeck, *Strategy "in a microcosm": Processes of tactical learning in a WWI German Infantry Division*, in: Journal of Military and Strategic Studies, Vol 13, No 4 (2011).

[12] Thèse doctorale en cours (Universiteit Gent et Koninklijke Militaire School).

[13] Max Boot, *War made New. Technology, Warfare, and the Course of History, 1500 to today*, New York, Gotham Books, 2006.

Si la notion de révolution militaire s'est heurtée à plusieurs critiques fondamentales, dont l'accusation de "déterminisme technologique", les constantes réévaluations de ce concept ont toutefois réduit la portée de ce reproche. La plupart des commentateurs soulignent l'importance des facteurs socio-économiques et organisationnels, toujours étroitement combinés au facteur technique. Lui seul, en effet, ne peut constituer un moteur de l'histoire si les innovations technologiques ne sont pas poussées à maturité et ne sont pas intégrées aux plan tactique et stratégique. Exprimée en termes d'offre et de demande, la relation technologie / organisation militaire s'opère dans les deux sens. La technologie ouvre en effet des potentialités qui sont développées en fonction des missions assignées aux forces armées. Le poids du politique n'est donc pas négligeable, il est même essentiel ! La trière grecque existait plusieurs centaines d'années avant que Thémistocle ne convainque les Athéniens de s'en équiper massivement et d'en faire l'instrument de leur défense, puis de leur domination sur le mer Egée. Dans cet exemple, le facteur économique, avec le rôle joué par les mines du Laurion dans cette décision, entre aussi en ligne de compte, comme c'est presque toujours nécessairement le cas (« Point d'argent, point de guerre !»). Un exemple un peu analogue est celui du Japon, à partir de l'Ere Meiji. Humilié par la politique de la canonnière que lui impose l'expédition du Commodore Perry en 1853, l'archipel nippon, après plus de deux siècles de fermeture au monde extérieur, s'ouvre volontairement aux technologies militaires occidentales. Ce transfert massif des technologies et leur parfaite assimilation en très peu d'années est un cas sans équivalent dans l'histoire et il peut d'ailleurs donner à réfléchir sur le caractère temporaire des dominations par le biais de la supériorité technologique. Dans le même ordre d'idées, il ne faudra que quatre années à l'Union soviétique pour se doter, après les Etats-Unis, de l'arme atomique.

Parmi les mutations induites par la révolution militaire des Temps modernes et ses suites : la professionnalisation, la spécialisation, et, corollairement, la nécessité d'une formation plus poussée au métier des armes. Cela se manifeste tant au niveau du drill de base qu'impose, notamment, l'utilisation des armes à feu, seules ou combinées avec d'autres armes, mais aussi, plus généralement, à travers l'ouverture, à partir du 17^{e} siècle, d'académies militaires destinées à préparer au service dans les armes à haute technicité, telles la marine, l'artillerie et le génie. De nos jours, une carrière militaire n'est plus envisageable sans une bonne connaissance des technologies qui sont omniprésentes dans l'accomplissement des missions au quotidien. Mais « Science sans conscience n'étant que ruine de l'âme », comme disait François Rabelais, une formation technique ne suffit pas. Le tout-technologique un temps vanté montre chaque jour ses limites. Plus personne n'oserait aujourd'hui se revendiquer de l'affirmation du général-major John Frederick Charles Fuller, qui prétendait que les guerres se gagnaient à 99 % grâce à l'armement et aux matériels, les autres facteurs ne contribuant que pour 1 % à la victoire ! Nos collègues chinois ont beaucoup insisté sur le facteur humain dans leur communication. Par ailleurs, comme certains conflits du présent nous le montrent, vous pouvez gagner la guerre grâce à une supériorité technologique écrasante, mais vous ne pourrez pas imposer la paix - ou l'imposer durablement - si les dimensions humaines du conflit ne sont pas travaillées en profondeur. L'histoire militaire, dans ce contexte, peut toujours apporter une forte valeur ajoutée dans la formation des officiers et des décideurs politiques. Elle montre, entre autres, que la guerre n'est jamais devenue un affrontement de machines dont les hommes ne seraient que les servants. Elle remet la technologie à sa juste place, qui est majeure, mais pas exclusive. L'histoire des conflits armés tend à démontrer, notamment :

– qu'une "supériorité" technologique n'est pas la panacée universelle, qu'elle peut être relative et temporaire, et que le tout-technologique procure par conséquent un faux sentiment de supériorité ou d'invulnérabilité ;

– que la dynamique innovation-parade permet des rattrapages, voire des renversements de l'équilibre des forces ;

– que des innovations tactiques peuvent aussi contrer ce qui est considéré à un moment donné comme le "nec plus ultra" en matière de technologie militaire. Je mentionnerai ici, liste non limitative : les "révolutions de l'infanterie" à travers l'histoire, qui, avec des moyens technologiques modestes, ont su ébranler, voire renverser, des dominations que l'on croyait acquises à jamais, telle celle du chariot de guerre des royaumes orientaux à la fin de l'âge du bronze ou celle de la cavalerie lourde médiévale ; les tactiques de la guérilla, capables de causer d'innombrables difficultés aux armées les plus à la pointe technologiquement ; les innovations d'un Horatio Nelson et de ses collègues britanniques, qui ont osé rompre avec le combat naval en ligne de file, lequel semblait irrémédiablement imposé par la technologie du temps et qui figeait la tactique en mer ; ceux qui, au dix-huitième siècle, préconisaient l'abandon de l'ordre mince, lequel paraissait également imposé par les armes à feu d'alors et menait, à l'instar des batailles navales, à des combats aux résultats souvent incertains. J'arrête ici cette énumération dont vous me pardonnerez le caractère un peu occidentalo-centrique. Les exemples de ce que je veux expliquer ici existent en tous lieux, dans toutes les civilisations et à toutes les époques.

Mesdames et Messieurs,
Chers Collègues,

Notre 38e congrès international d'histoire militaire nous a offert, encore une fois, un grand voyage multinational à travers le temps et l'espace, avec plus de cinquante communications en provenance du monde entier. Les Balkans ont été plusieurs fois à l'honneur : en effet nous avons eu des congrès à Istanbul, Athènes, Bucarest et maintenant Sofia. Avec l'arrivée de la Serbie et de l'ex-république yougoslave de Macédoine, nous pouvons espérer d'autres congrès dans les Balkans. Mais aujourd'hui il s'agit de la Bulgarie et je m'associe aux remerciements dus à notre ami de longue date, le Colonel Dimitar Minchev, et à toute son équipe, grâce à qui nous avons pu découvrir (ou redécouvrir) un pays parfois méconnu ou mal connu, mais dont on ne peut que tomber sous le charme profond si on la visité une fois dans sa vie. Il n'était pas simple d'organiser un tel congrès dans les conditions économiques actuelles, mais la persévérance de notre ami le Prof. Minchev est proverbiale. Tout cela mérite notre admiration et notre plus grande reconnaissance. Je vous remercie pour votre attention. Thank you very much. Danke schön. Muchas gracias. Grazie mille. Благодаря [blagodarja]. And, in real Bulgarian: Merci!

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XXXVIth ICMH Congress
Insurgency and Counterinsurgency: irregular warfare from 1800 to the present
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The UN and the unexpected insurgencies, Congo (1960) and Somalia (1994)

The views expressed are those of the author and do not reflect the UN official policy or position.

Foreword

Also the UN was confronted to irregular warfare and insurgencies. The two cases, hereby reported, marked the life and the fate of the organization, involved in operations of stabilization of countries/territories affected by serious turmoil.

The first case analyzed is the Congo crises were the UN troops, faced an insurgency that unexpectedly forced them to carried out several campaigns against different armed groups. This was the first time that a peacekeeping force was confronted to a military threat.

The second case focuses the troubled Somalia scenario, where firstly a UN-authorized and US-led force, named UNITAF, and then full UN flagged mission, UNOSOM-II tried to stabilize the situation. In this case the international forces, dispatched to protect the humanitarian aid distribution plan and then to made the first steps for a nation building project (the establishment of a minimum security environment), were massively attacked by local militias, before involved in a ruthless civil war, late united against the international presence.

The two operations, but especially the one in Somalia, were affected by the so-called “mission creep” and “mandate creep”. These two concepts are the expansions of a project/mission beyond its original goals, often after initial positive achievements. The terms often implies a certain disapproval of newly adopted goals by the user of the term. Both are usually considered undesirable due to the dangerous path of each success breeding more ambitious attempts, only stopping when a final, often catastrophic, failure occurs.

Congo

Congo, a former Belgian colony, became independent on 30 June 1960, however the Belgian commander refused to "Africanize" the officers' corps of the Force Publique (the local army). In the days that followed, disorder and mutinies broke out. While the Congolese President and the Prime Minister were trying to negotiate with the mutineers, the Belgian government decided to intervene to protect Belgians that remained in the country at the request of Moïse Tshombé, who advocated independence for the southern province of Katanga, one of the richest of the country. On 10 July, Belgian troops were sent to Elisabethville, the capital of Katanga, to control the situation and protect Belgian civilians. On 12 July, the Congolese government asked the help of the UN. The Secretary-General addressed the Security Council at a night meeting on 13 July and asked the Council to act "with utmost speed" on the request. Two days later, the Security Council established ONUC (Operation des Nations unies au Congo) by Security Council resolution 143 (1960) of 14 July 1960 (adopted by 8 votes in favour, including USA and USSR, none against, three abstentions), by which it decided "to authorize the Secretary-General to take the necessary steps, in consultation with the Government of the Republic of the Congo, to provide the Government with such military assistance as might be necessary until, through that Government's efforts with United Nations technical assistance, the national security forces might be able, in the opinion of the Government, to meet fully their tasks". In less than 48 hours, contingents for the newly established UN force, provided by a number of countries, especially Asian and African Member States, began to arrive in the Congo, with thanks to a massive air bridge, together with UN civilian experts to ensure the continuity of essential public services. The initial mandate of ONUC was to ensure the withdrawal of Belgian forces from Congo, to assist the Government in maintaining law and order and to provide technical assistance. The function of ONUC was subsequently modified to include maintaining the territorial integrity and political independence of the Congo, preventing the occurrence of civil war and was authorized to use force by resolution 161 (1961) of 21 February 1961, the Council urged that the UN "take immediately all appropriate measures to prevent the occurrence of civil war in the Congo, including arrangements for ceasefire, the halting of all military operations, the prevention of clashes, and the use of force, if necessary, in the last resort". Over the next four years, the task of the ONUC[1] was to help the Congolese Government

[1] The Special Representatives Of The Secretary-General and head of ONUC were: Ralph J. Bunche (US) July-August 1960; Andrew W. Cordier (US) August-September 1960; Rajeshwar Dayal (India) September 1960-May 1961; Mekki Abbas (Sudan) (Acting) March-May 1961. There were also, as Officers-In-Charge: Sture Linner (Sweden) May 1961-January 1962: Robert K.A. Gardiner (Ghana) February 1962-May 1963; Max H. Dorsinville (Haiti) May 1963-April 1964; Bibiano F. Osorio-Tafall (Mexico) April-June 1964.

to restore and maintain the political independence and territorial integrity of the country; to help it maintain law and order throughout the country; and to put into effect a wide and long-range programme of training and technical assistance. At its peak strength, the UN force totalled nearly 20,000 troops[2]. The arrival of first UN troops was the instant disagreement between Lumumba, the Congolese Prime Minister and the UN over the force's mandate. Because the Congolese army had been in disarray since the mutiny, Lumumba wanted to use the UN troops to subdue Katanga insurgency-secession by force. Referring to the resolution, Lumumba wrote to UN Secretary-General Dag Hammarskjöld: "From these texts it is clear that, contrary to your personal interpretation, the UN force may be used to subdue the rebel government of Katanga". Secretary-General Hammarskjöld refused. To Hammarskjöld, the secession of Katanga was an internal Congolese matter and the UN was forbidden to intervene by Article 2 of the UN Charter. Disagreements over what the UN force could and could not do continued throughout its deployment, despite the passage of two further Security Council resolutions. Passed on 22 July, Security Council Resolution 145 affirmed that Congo should be a unitary state and strengthened the call for Belgium to withdraw its forces. On 9 August, Security Council Resolution 146 mentioned Katanga for the first time, and explicitly allowed UN forces to enter Katanga whilst forbidding their use to "intervene in or influence the outcome of any internal conflict".

UN launches the crackdown of the insurgency

After one year of quasi-inactivity of the UN presence, was clear that Moise Tshombe, the leader of the self-proclaimed independent Katanga, had no intention to reunite it with the rest of the country. In particular, he had not complied with the UN Security Council resolution demanding the expulsion of foreign mercenaries and, at the contrary, increased the threats on the UN personnel. The FC of ONUC, the Irish General Sean McKeown[3] perceived the situation on the UN troops statio-

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2 The bulk of the ONUC was formed of infantry battalions from Ethiopia (2), Ghana, Guinea, India (3), Indonesia, Iran, Ireland, Liberia, Malaysia, Mali, Morocco, Nigeria (2), Sierra Leone, Sudan, Sweden, Tunisia, United Arab Republic; from February 1963 to June 1964 a battalion of the Congolese Army was directly incorporated within ONUC. Morocco and UAR dispatched also a company and a battalion of parachutists respectively. The command and support, military police, engineer, signal, medical, movement control, air and ground transport, logistic was provided by Austria, Burma, Brazil, Burma, Canada, Ceylon, Denmark, Ethiopia, Philippines, Ghana, India, Ireland, Italy, Liberia, Malaysia, Nigeria, the Netherlands, Sweden. There was also a group UN Military Observers dispatched from UNTSO; for the occasion was set up the OG-C (Observer Group - Congo) and small group of police officers from Ghana and Nigeria tasked to train and re-organize the Congolese police. The mission included a civilian support component with 600 international civilian and 2.000 locally-recruited staff. Canada, Switzerland USSR, UK and USA voluntarily provided the airlift of contingents and logistic necessary to launch the operation.

3 ONUC air component at the beginning included only transport airplanes, 16 C-119 Flying Boxcars provided by Canada, Italy and other countries air forces and around 20 civilian-chartered planes

ned in that region (mainly Indian and Irish) as dangerous. Facing 10.000 Katangan militiamen (called "gendarmes") and 4-500 mercenaries, ONUC, despite an increasing divide between the HQ in New York and the field in the way to interpret and manage the situation, launched on 28 August the *Operation Rumpunch*, focused to disarm the Katangan militiamen, capturing key secessionist military assets and arresting the foreign mercenaries who formed the leadership of the Katangan "gendarmerie". The operation was an apparent success, but only 250 out of 520 of foreign mercenaries were arrested and the potential threat of Katangese insurgency remained substantially untouched. On 9 September, UN launched *Operation Morthor* (Hindi word for "smash"). This time the UN troops matched a stiff resistance, but the superior firepower of the UN forces cracked out it in few hours, especially on North Katanga, while in the central Katanga meet mixed results. In addition, the Congolese central government issued the UN with arrest warrants for Tshombe and other key Katangan officials (the UN was able to act on these warrants because the new government of Cyrille Adoula was the internationally recognized authority). Originally intended as an arrest operation, *Morthor* quickly escalated into open warfare but it went badly from the start. The Katangan militias showed a strong resistance to the UN attempts to gain control of the area. Due to lack of experience on multinational operations in command, control and communication, ONUC was substantially ineffective despite the overwhelming number of troops, firepower and air/ground mobility. At the end of the first day of the operation, was announced by ONUC over Katangan radio that the secession was at an end. The statement, not coordinated with the UN HQ in New York, was premature and caused controversy because the ONUC was not specifically mandated to end the secession, but only to prevent civil war and expel foreign mercenaries. On 13 September Tshombe fled to Ndola in Northern Rhodesia (now Zambia) from where he continued to lead the insurgency. Reports about UN forces indiscriminate attacks involving civilian installations and people on Elizabethville caused anger in Europe and worsened the relationship with the local population. In the midst of Operation *Morthor*, UN Secretary-General Dag Hammarskjöld decided to intervene personally and negotiate a ceasefire with Tshombe. On the night of 17–18 September his plane crashed en route to Ndola, killing him and fifteen others on board. The exact cause of this was never determined. The next day a besieged UN garrison at Jadotville, after holding out for 6 days, surrendered to the insurgents

(C-47/53 Skytrain/Skytrooper, C-46 Commando, C-54 Skymaster) and helicopters. This was organized in transport wing led by a Wing Commander of Indian Air Force. Due to the appearance of the so-called "Katangese Air Force", with few Fouga Magisters and other aircrafts with relatively poor air combat capabilities, the UN organized a multinational combat wing, led by an Air Commodore of the Royal Canadian Air Force with 6 Canberra light bombers India, 4 F-86E fighter from Ethiopia, 5 from Philippines (gift from Italy, from the IAF 4th Wing, Grosseto) and 4 from Imperial Iranian Air Force, 12 Tunnan combat and reconnaissance jets from Sweden.

after running out of water and ammunition[4]. After this reversal, the last of a series, the UN agreed to a ceasefire, giving back public buildings and military posts to Katangan insurgent control. On 20 September Tshombe returned to Elizabethville and on 25 October a POWs swap was agreed. At the end of October, regular Congolese government forces, led an independent operation, not coordinate with the ONUC, attacked Katanga but were repulsed with heavy casualties.

UN Security Council Resolution 169

On 2 November 1961, the UN General Assembly unanimously appointed the former Foreign Minister of Burma U Thant as Secretary-General to replace Dag Hammarsköld while skirmishes involving UN forces continued in Katanga. The new Secretary-General was more open to generalize the use of the force than his predecessor, while on the ground the situation showed signs of continuous degradation. On 17 November the UN signed an agreement with the Congolese government giving the UN troops full freedom of movement throughout Congo. Thus, ONUC was given the operational freedom to conduct its operations. These agreements paved the way to the UN Security Council Resolution 169 (24 November) who mandated ONUC "to take vigorous action, including the use of the requisite measure of force, if necessary", to remove foreign military and other personnel not under the UN command. In this light, while was discovered a planned, major attack of the Katangese forces against UN, ONUC launched its major (and preemptive) military operation, *Unokat*, on 5 December. After heavy fighting and casualties on both sides, strategic objectives were achieved by the UN troops, while Katangan military assets were neutralised. In response, the insurgent leader threatened to blow up the dams and copper mines around Kolwezi, but on December 18 agreed to unity talks which, however run for a year without reaching agreement. *Unokat* was similar to other UN-led operations in Congo, where the "blue helmets" does implemented sophisticated anti-insurgency tactics, but only search and destroy operation within jungle area and with a constant air support (combat and logistic).

End of Katanga insurgency and termination of ONUC

In August 1962, UN Secretary-General U Thant proposed a plan that Katanga becomes an autonomous region in a federal state as last peace offer. Katangan "government" initially agreed with the proposal, but agreement was never concluded. In December 1962 the UN launched *Operation Jacaranda* and *Operation Grand*

4 In Jadotville, 500 Irish and Swedish soldiers, in an epic resistance, confronted a force between 3-5000 armed militiamen (Katangan gendarmes, irregulars and foreign advisers). The blue helmets suffered 7 KIA, but the insurgents suffered losses evaluated around 300 dead and 1.000 wounded. While a consistent part of the garrison was withdrawn by helicopter and by road, at the end of the resistance, 150 UN soldiers were captured by the insurgents.

Slam against Katanga's core political and military infrastructure with a consistent air support[5]. The operation was carried out with determination, and again with allegations of disproportionate use of force, despite the practical non resistance of insurgent forces, and by end of January 1963, Elizabethville was under full UN control, ending the secession of Katanga. In February 1963, after Katanga had been reintegrated into the national territory of the Congo, a phasing out of the Force was begun, aimed at its termination by the end of that year. At the request of the Congolese Government, however, the General Assembly authorized the stay of a reduced number of troops for a further six months. The Force was completely withdrawn by 30 June 1964. Although the military phase of ONUC was completed, civilian aid continued in the largest programme of assistance undertaken until then by the UN system, with some 2,000 experts at work in the nation at the peak of it, in 1963–1964.

Comment

ONUC marked a milestone in the history of UN peacekeeping in terms of the responsibilities it had to assume, the size of its area of operation, manpower involved and financial cost. Originally mandated to provide the Congolese Government with the military and technical assistance required following the collapse of many essential services, ONUC became embroiled by the force of circumstances in a chaotic internal situation of extreme complexity and assumed obligations well beyond normal peacekeeping duties and was the first case where the UN troops were mandate to use the force to implement the Security Council Resolutions. It should be mentioned that, aside to the insurgency/secession of Katanga, the UN troops faced deadly attacks of independent armed Congolese militiamen and the massacre of the crews of Italian Air Force planes, assigned to ONUC, kidnapped and killed by mistake by regular elements of Congolese forces showed how was difficult the situation on the ground.

As mentioned, the operation was a military controversial success. Despite a theoretical overwhelming superiority in number, fire power and air/ground mobility and protection, in reality the UN troops lacked in C3 (Command, Control, Communication) capabilities, interoperability experience and suffered some serious setbacks. The insurgents, thanks to a better knowledge of the terrain and an effective leadership, provided by the mercenaries, obtained some unexpected victories and forced the UN to humiliating agreements with repositioning of forces and POWs swaps. The cost of it was high, both human and financial (250 soldiers[6],

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5 The FCs of ONUC were Lt-Gen Carl C. von Horn, Sweden, July-December 1960; Lt-Gen Sean McKeown, Ireland, January 1961–March 1962; Lt-Gen Kebbede Guebre, Ethiopia, April 1962–July 1963; Maj-Gen Christian Roy Kaldager, Norway, August 1963–December 1963; Maj-Gen Johnson Aguiyi-Ironsi, Nigeria, January 1964–June 1964.

6 UN sources stated 245 military personnel and 5 international civilian staff, other sources stated 126 KIA, 109 died accidentally or from natural causes listing only military personnel.

and US$400 million), together with a deeper and bitter divide between Member States (East-West and North South crossed confrontations) and between the Member States and the organization.

Somalia

Following the downfall of President Siad Barre in 1991, a civil war broke out in Somalia between the faction supporting Interim President Ali Mahdi Mohamed and that supporting General Mohamed Farah Aidid. UN, in cooperation with the Organization of African Unity (OAU) and other international, regional organizations and Member States, sought to resolve the conflict, dispatched an envoy to whom all faction leaders expressed a verbal support for a UN-led peace role. The UN also provided humanitarian aid, in cooperation with relief organizations, to nearly 1million refugees and almost 5 million people threatened by hunger and diseases. Giving the ongoing civil war, the Security Council in January 1992 imposed an arms embargo against Somalia, while the Secretary-General organized talks between the parties, who agreed on a ceasefire, to be monitored by UN observers, and on the protection of humanitarian convoys by UN troops. In April, the UNSC with the Resolution 751 established the UN Operation in Somalia (UNOSOM), tasked to provide, facilitate, and secure humanitarian relief in Somalia, as well as to monitor the (first) UN-brokered ceasefire of the Somali Civil War. The operation was established in April 1992, but in reality the UN military presence was a small force[7] *de facto* under siege of the local factions in the area of the port of Mogadishu and the humanitarian relief activity was seriously affected and hampered by continued fighting and insecurity. The Security Council in August decided to deploy additional troops to protect humanitarian aid[8], but the situation continued to worsen, with aid workers under attack as famine threatened 1.5 million people. However, also these troops remained trenched in the port of Mogadishu, avoiding fights with the local militias. The US, pressed by mounting pressure of the domestic and international polls and media reports on this issue, in November 1992 offered to organize and lead an operation to ensure the delivery

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7 UNOSOM was authorized to be formed by 50 unarmed military observers 3,500 security personnel (formed military units), up to 719 military logistic support personnel, and approximately 200 international civilian staff. 8 UN troops were killed.

8 UN Security Council authorized to increase UNOSOM troop strength to 4,219 troops and further 50 military observers. 1992. In reality, the peak of UN forces in Mogadishu, before of the landing of UNITAF, was of 54 military observers and 893 troops and military support personnel, supported by a limited number of international civilian and locally recruited staff. The leadership of the mission was: Special Representatives of the Secretary-General Mohamed Sahnoun (Algeria) April 1992-November 1992; Ismat Kittani (Iraq) November 1992-March 1993; Jonathan T. Howe (US) March 1993-April 1994 (with UNOSOM II). Chief Military Observer (subsequently FC) Brig-Gen Imtiaz Shaheen (Pakistan) June 1992-March 1993.

of humanitarian assistance asking that the US troops were not put under direct UN command.

UNITAF, the 'quasi blue' deterrence

In the face of mounting public pressure and frustration, UN Secretary-General Boutros Boutros-Ghali presented several options to the Security Council. Chapter VII of the Charter of the UN allows for "action by air, sea or land forces as may be necessary to maintain or restore international peace and security" and Boutros-Ghali believed the time had come for employing this clause and moving on from peacekeeping. Significantly, this invocation of Chapter VII waived the need for consent on the part of the state of Somalia; effectively the first time the UN Secretariat had endorsed such an act. However, Boutros-Ghali felt that such action would be difficult to apply under the mandate for a UN force, giving that the organization did not have the skills to command and control it. Accordingly, he recommended that a large intervention force be constituted under the command of member states but authorised by the Security Council to carry out operations in Somalia. The goal of this deployment was "to prepare the way for a return to peacekeeping and post-conflict peace-building". The Security Council left it to "the discretion of the Secretary General" as to what should be done with the abortive mission (UNOSOM) and accepted the offer and authorized the use of "all necessary means" to establish a secure environment for the relief effort on 3 December 1992 with the unanimously adopted Resolution 794. The Security Council also urged the Secretary-General and Member States to make arrangements for "the unified command and control" of the military forces that would be involved. Prior to Resolution 794, the US had approached the UN and offered a significant troop contribution to Somalia, with the caveat that these personnel would not be commanded by the UN. Resolution 794 did not specifically identify the US as being responsible for the future task force, but mentioned "the offer by a Member State described in the Secretary-General's letter to the Council of 29 November 1992 (S/24868) concerning the establishment of an operation to create such a secure environment". The advanced parties of Unified Task Force (UNITAF), made up of contingents from 24 countries[9] led by the US, landed on Mogadishu on 5 December 1992, then the force quickly secured all major relief centres, and by year's end humanitarian aid was again flowing, while the international troops, with an heavy deterrence potential, discourage the militias to attacks the convoys and the

[9] The bulk of UNITAF's was provided by the US (25,000 out of a total of 37,000 personnel); other contingents were provided by Australia, Bangladesh, Belgium, Botswana, Canada, Egypt, France, Germany, Greece, India, Ireland, Italy, Kuwait, Morocco, New Zealand, Nigeria, Norway, Pakistan, Saudi Arabia, Spain, Sweden, Tunisia, Turkey, UAE, UK, Zimbabwe. They were coordinated by US Central Command. There where 44 killed (43 US, 1 Australia) and 156 wounded (153 US, 3 Australia).

area of Mogadishu was practically secured. UNOSOM continued to operate in parallel and coordination with UNITAF. As UNITAF's mandate was to protect the delivery of food and other humanitarian aid and the use the force if necessary, the operation was regarded as a success and it was approved the concept to enlarge the operational framework and mandate of the international troops and work for the stabilization of the country. At a meeting convened by the Secretary-General in early 1993 on Addis Ababa (Ethiopia), 14 Somali political movements agreed on a ceasefire and pledged to hand over all weapons to UNITAF and UNOSOM. This conference was followed in March by international donors conference and Somali-focused conference on reconciliation. Following these successes, the UNSC in March decided on a transition from UNITAF to a new UN peacekeeping operation - UNOSOM II (also on the Chapter VII) tasked to secure a stable environment for the delivery of humanitarian assistance and to assist in the reconstruction of economic, social and political life. But, while UNITAF had patrolled less than half of the country with 37,000 well-equipped troops, the 22,000 UN troops, with the substantial reduction of the firepower and mobility, mainly provided of US component, were given the mandate to cover all of Somalia. In reality, UNOSOM-II does not enlarged the AOR (Area Of Responsibility) of UNITAF, while the backbone of the US forces was re-collocated the QRF (Quick Reaction Force), separated by the UN[10].

The summer insurgency and the blue helmets

The factions, however, did not observe the ceasefires and did not send their weapons to the international forces. On 5 June, a UNOSOM unit (Pakistani troops) was sent to investigate an arms depot belonging to a Somali warlord vying for the Presidency, Mohamed Farrah Aidid, the most hostile to the UN. The militiamen attacked them and, according what it seemed a previously organized plan, several UN compounds. The day end with dozen of UN troops and hundreds of Somali insurgents killed. The UN escalate the answer; between 12 and 16 June 1993

[10] UNOSOM II authorized strength authorized, March 1993–4 February 1994: 28,000 military and civilian police personnel; approximately 2,800 international and locally recruited civilian staff; authorized strength 4 February–25 August 1994: 22,000 all ranks, supported by international and local civilian staff; UNOSOM authorized strength, 25 August 1994B2–March 1995: 15,000 all ranks, supported by international and local civilian staff; strength at the start of withdrawal (30 November 1994): 14,968 all ranks, supported by international and local civilian staff. The mission had 147 fatalities (143 military, 3 international civilian staff, 1 locally recruited staff). The leadership of the mission was: Special Representatives of the Secretary-General Jonathan T. Howe (US) March 1993–February 1994; Lansana Kouyate (Guinea) (Acting) February 1994–June 1994; James Victor Gbeho (Ghana) July 1994–April 1995; FCs: Lt-Gen Çevik Bir (Turkey) April 1993–January 1994; Lt-Gen Aboo Samah Bin Aboo Bakar (Malaysia) January 1994–March 1995; Police Commissioners: Chief Superintendent Mike Murphy (Ireland) April–June 1994; Chief Superintendent Selwyn Mettle (Ghana) June 1994–February 1995.

UN troops launched a massive operation attacking targets in Mogadishu related to Aidid. On 17 June, a $25,000 warrant was issued by the UN for information leading to the arrest of Aidid, but he was never captured. The hunt for Aidid characterized much of the UNOSOM II interventions. The operations carried out in Mogadishu caused heavy civilian casualties and deadly affected the relationship between the foreign troops and the Somali people; since then the situation degraded military and become almost unmanageable politically. Again, like in Congo, was recorded a lack of political and military coordination between the UN in New York and Mogadishu, between the organization and Member States and among the Member States regarding the management and strategic approach of the whole mission. The UN troops were easily portrayed as evil foreign interlopers by the militia leaders, particularly after incidents of civilian casualties caused by wholesale firing into crowds, like on July 12, when a compound where clan leaders were meeting was indiscriminately attacked by UN forces. The spectre of Islamic fundamentalism also began to rise, as militia leaders sought to use religion as a rallying point for anti-UN sentiment. As the international forces became more insular, the warlords began to reassert control of many Mogadishu districts. With each failure to apprehend Aidid, the militias grew bolder while, as mentioned, rifts between nations contributing to UNOSOM II also began to be very serious, in the meantime Somali insurgents increased targeting peacekeepers, causing casualties and as for consequences, mounting problems with the domestic public opinions of the troops contributing countries. The hunt for Aidid his lieutenants and allied (Aidid become a point of reference for the various militias, now re-united against the UN troops) led the battles of Mogadishu, resulting in heavy losses, especially among Somali civilians while in other locations of Somalia, the international troops were constantly attacked witnessing the worsening of the security situation. The US, especially a failed attack on 3-4 October 1993 (which cost them 18 KIA and 73 WIA) reinforced its military presence, but later announced that it would withdraw by early 1994, quickly followed by other Western states. On 4 November 1994, the UN Security Council voted unanimously to withdraw all forces in Resolution 954. UNOSOM II's mandate ended in March 1995 when a joint combined task force protects the withdrawn from Mogadishu of the last international contingents.

Comment

During the three-year effort, 199 international personnel had died, but till now Somalia is considered a "failed state". The UN never stops the humanitarian aid operations but these efforts faced lack of commitment to peace by the Somali factions and insufficient political will by Member States. However, under military point of view the UN operations in Somalia had a positive impact. Despite an apparent negative one, due the reluctance of Western States to dispatch forces under the UN flag; the follow up of Somalia operations "forced" the organization to improve her performances and led Member States, especially African, to reinforce their military apparatus with the financial aid and training advice of EU/NATO countries and allowing the "africanization" of the peacekeeping.

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