Transforming Joint Air Power
The Journal of the JAPCC

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Joint Air & Space Power Conference

09th – 11th October 2012

Warfare in the 21st Century

Decline or Rise of Air Power?

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2012 is an important and challenging year in which many countries have to deal with economic problems, budget cuts and overcome them in order to avoid unprecedented crises that could spread to the rest of the world. In the age of austerity, even the NATO Armed Forces will suffer significant budget cuts. A possible solution is considered to be a 'Smart Defense' that could ensure greater security for less money, by working together with more flexibility.

During such a crucial time the JAPCC is increasing its attention towards all Air and Space Power related matters, expanding its liaison to international organizations, institutions and industries involved in changes. The first visit of the Russian Federation to the JAPCC at the end of 2011 fits this view of future cooperation.

In the JAPCC Journal we are always keen on receiving input from outside sources. We are particular in finding relevant points of view from NATO and National military leaders to present to our readers. For that I would like to thank General Pinheiro, Chief of Staff, Portuguese Air Force, and Lieutenant General Kisner, Commander of NSHQ (NATO Special Operation Head Quarters), for their interesting and unique perspective. In this edition of the Journal we further offer our analysis of counter-piracy operations and provide you with an update to this delicate issue. Our Maritime Air expert will present the key results of an experiment conducted in gaining insights into potential commitment levels of A&S ISR platforms in the Region off the Horn of Africa.

The article on Libya gives insight and considerations on the performance of NATO in response to the most recent crisis. It looks at its success in the context of a strategic direction. The speed at which NATO acted on the Libyan crisis is commended; however, the willingness of all nations to contribute in an equal manner is questioned. Once again it is proven that Air Power cannot operate alone, especially with restrictive rules of engagement and the lack of technology to distinguish friend or foe.

Our article on Cyber Threats points out the importance of information flow and how its denial affects kinetic and non-kinetic warfare. Modern communications have become significant force multipliers for commanders. These same tools are weapons of destruction for adversaries keen on effecting our operations silently, without stepping onto the battlefield.

Air Power's Second Century is an article presented by Professor Sabin, a guest speaker at our Joint Air & Space Power Conference 2011. He takes a look at where Air Power stands as it enters its second century. Professor Sabin focuses on four aspects of military strategy to balance conflicting views of whether the best days of Air Power are behind or in front of us.

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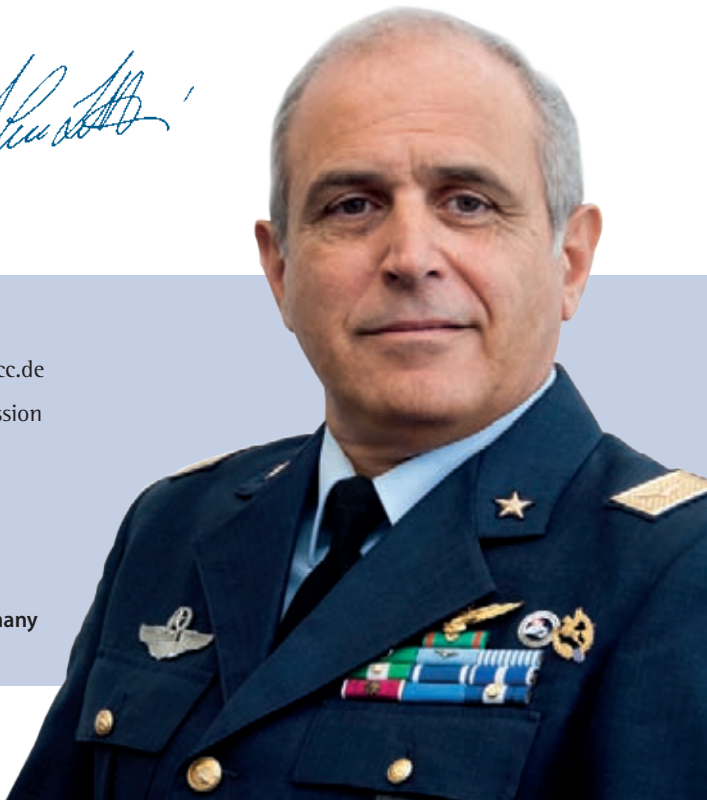

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M **Denotes images digitally manipulated**

The Portuguese Air Force

Facing Challenges Head-On

An Interview with General José Pinheiro,
Chief of Staff, Portuguese Air Force

Sir, threats have changed significantly over the last several years. How is the Portuguese Air Force prepared to attack these challenges?

The Portuguese Air Force (PRTAF) is well aware of the drastic changes the world is facing and the way it affects the defense environment and decision making process. The PRTAF is evolving to meet these new challenges head-on. In the past few years, we started an aggressive and ambitious modernisation process on military education, training and technical proficiency. We looked at our education system, military and technical, and introduced changes aimed at increasing the skill of our personnel, at all ranks, in order to cope not only with the technical sophistication of modern systems, but also to enable the understanding of new scenarios to 'read' the situations and be better prepared to decide and act accordingly. We also planned and put underway the

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modernisation of platforms and sensors, introducing modern systems, either through modification and upgrade or by means of purchasing new equipment, resulting in a decisive improvement of capabilities and readiness.

The sovereignty missions associated with national airspace defence are a constitutional obligation and, as such, they must receive full priority. We extended our sensors to cover most of our area of responsibility, and initiated the F-16A (Block 15) upgrade to the F-16AM Mid-Life Upgrade (MLU) in 2000 within the scope of the Multi-National Fighter Program (MNFP). Equipped with modern systems and sensors, such as the Advanced Targeting Pod (Lightening AT), Night Vision Goggles (NVG), Link 16 and Joint Helmet Mounted Cueing System (JHMCS), combined with capable weapons (laser-guided, INS/GPS-guided, or a combination of both), this fighter from the 70's was brought into the modern operational arena of the 4th generation combat aircraft. In average there is a new capability update every two years, which will allow the F-16 MLU to be around for years to come.

In 2006, the PRTAF replaced the SA-330 PUMA with a new generation helicopter, the EH-101 Merlin, for Search and Rescue (SAR), Transport and MEDEVAC purposes. This constituted a major capability improvement for a mission which, together with the previous mentioned sovereignty assurance, constitutes one of the most important roles performed by the PRTAF.

Starting in 2008, we replaced the C-212 Aviocar with the new (Airbus Military) C-295M. This new aircraft is designed and utilised as a Multi-role platform. With advanced technology and modular concepts there is clear potential to convert, on ground, for different roles. Indeed, it contributes to air transport, adds to our C-130 Hercules capability, SAR mission, and provides us with Intelligence, Surveillance and Reconnaissance (ISR) capability with its modern and more capable sensors.

In 2010, the P-3P Orion began its upgrade to the P-3C CUP+ (Capability Upgrade Program Plus). The new P-3C is one of the best equipped Maritime Patrol Reconnaissance

Aircraft (MPRA). With greater autonomy and the latest available sensor technology, this platform is fully capable of Maritime Patrol, Anti-Surface Warfare (ASW), Anti-Subsurface Warfare (ASuW), ISR and long range SAR.

We are also looking forward to a decision on upgrading our C-130 Hercules fleet in the near future.

It's important to mention that we put lots of effort into our SAR mission. This is due to accomplishing the lifesaving obligations assumed by the Portuguese State, over more than 6 million square kilometres in the Atlantic Ocean Area of Responsibility (Lisboa and Santa Maria SAR Regions).

With modernised, more capable and more efficient platforms, combined with qualified, well trained and motivated personnel, the PRTAF is prepared to face the upcoming challenges with serenity and confidence, certain it can give an important contribution to the Alliance and the international community.

Portugal, as a founding member of NATO, participated in several operations. How do you interpret the Portuguese Air Force contribution to these operations and the importance of the Alliance's synergy?

Besides the core mission of Portuguese airspace defence and the obligation to provide collective integrity of NATO's airspace, the PRTAF committed forces to several NATO operations as well as to the NATO Response Force (NRF).

In my view, there was an excellent level of performance in those missions and I believe we proved the quality of our training, the value of our personnel and our capability to provide multiple options for national contributions to global security.

Although I recognise the actual asymmetric and hybrid threats place new challenges to any force, including the most powerful and capable, recent conflicts have shown the importance of resilience in order to defeat any given threat. This is true even when there is unquestionable superiority in strength.

Joint and combined synergies have to come along, so that required assets become available in time, are sustainable and effective. Additionally, fratricide risks have to be mitigated by improved efficiency, interoperability and networking information and control. This should be achieved through training and information sharing amongst Alliance partners during peace. That's why participation in multinational exercises is essential to prepare the forces for combined and joint operations. The PRTAF is well aware of this requirement, and in spite of budgetary constraints, maintains regular participation in several international exercises and training courses abroad.

To offer a more comprehensive joint training program for the Portuguese expeditionary forces, along with our allies, the PRTAF has been planning and executing a tactical level exercise, REAL THAW since 2009. Using lessons learned, this LIVEX became more complex

Portugese EH-101 executes a real world rescue mission over the Atlantic Ocean, 350 NM from the coast.

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and tailored to the air, land and naval force's training needs, providing an important and cost effective joint training opportunity.

Some of these exercises were performed within the European Participating Air Forces (EPAF) Expeditionary Air Wing (EEAW) framework, where we try to pool and share maximum resources, encompassing up to 30 F-16 MLU aircraft from the five EPAF Nations (Belgium, Denmark, the Netherlands, Norway and Portugal). This concept allows an affordable and relevant combat force that's completely interoperable, sharing identical platforms, tactics and mind-set. This is a good example on how to develop synergies throughout alliances.

Portugal is facing a financial crisis. How does this affect the Portuguese Air Force?

Portugal, along with many other nations, has been hampered by a financial crisis which imposes severe budget constrains on the Armed Forces and the Air Force in particular. In addition to motivated and well trained personnel, air forces rely significantly on sophisticated equipment that's expensive to acquire and maintain at a high level of readiness. So, reorganisation and prioritisation became mandatory, in order to accomplish the assigned mission with less resources.

Prioritisation implies personnel cutbacks along with changes in work methodologies. Planning must be more precise, avoiding the waste of resources. This will lead us to a more effective and efficient management of what is available. At the maintenance level, we've applied 'Lean Techniques', reducing time for maintenance repairs (scheduled and non-scheduled). This is a slow process that requires bottom-up acceptance and top-down involvement to work. This methodology complies with the operational requirements using less maintenance and support personnel, while saving relevant financial resources. Over the last several years, the concept has been implemented in all Air Bases, with an identical outcome.

But I must say this is not enough and 'business as usual' is simply not an option. For the short term, we have to accommodate the impact of the crisis, and manage to maintain our current core capabilities and missions. It will be a major effort for all of us, Airmen and Civilians, serving in the Portuguese Air Force. We will prevail and come out not only changed, but better.

Threats and world scenario security have changed significantly during the last decade. What are your concerns on challenges of Air and Space Power in a future security environment?

Core missions such as Air Defence and Air Support Operations are still the foundation for our Air Force. Therefore, we ensure the defence of national airspace as the foremost mission and we contribute to national and international security. Never-the-less, threats are changing in nature, lasting longer and varying in intensity. Setting apart terrorists from the civilian population became one of the most difficult challenges for any force, while collateral damage is no longer politically acceptable.

Joint and combined seamless operations become the only possible approach to modern military operations, to counterbalance the financial cut-backs and to allow flexibility and the long-term commitment required for a successful campaign. Armed forces have to become more flexible and expeditionary, providing different and credible options for employment, standing ready to respond when called upon, as seen during Operation UNIFIED PROTECTOR (OUP) in Libya where the prompt response of the international community was critical. The quick response, the wide range of intervention and the effectiveness that characterises Air Power, allows the air component, by itself, to systematically play a key role in all operations.

Within this scope, joint interoperability training assumes the utmost relevance. This year, under the umbrella of the European Defence Agency's Helicopter Training Program, Portugal will host the world's largest multinational helicopter exercise, Hot Blade 2012, which will be coordinated by the PRTAF with support from Luxembourg. Austria, Belgium, the Czech Republic, Finland, Germany, the Netherlands and Spain will be the other participating nations in the exercise, which is specifically designed to allow crews to practice operations in a hot, high and dusty environment.

Unmanned Aerial System have been playing a decisive role in all recent conflicts. Does the PRTAF plan to integrate this capability?

The PRTAF recognises the critical role of UAS in modern warfare. The procurement of a Medium Altitude Long Endurance (MALE) UAS system, remains one of our goals. Unfortunately, we are currently unfunded in this capability. Though we don't have an operational system as of yet, we are gaining experience by participating in several international programs and initiatives, and using our Air Force Academy as a vehicle to acquire knowledge and some expertise. Several research projects are being developed at the Academy level, in partnership with national and international Universities and industrial companies. These projects range from the construction of small platforms made out of composite materials to software development for flying profiles and sensor control. Relevant progress has been achieved and partnership with off-the-shelf platform constructors for systems integration and exploration is planned as the step ahead. The primary areas of interest foreseen with UAS are mainly in support of national agencies, such as coastal surveillance, maritime pollution control and fire fighting observation.

The PRTAF will celebrate its 60th anniversary this year. How do you see the Portuguese Air Force of today?

As the youngest Service of the Portuguese Armed Forces, the Air Force has been progressing with stability and continuity over the last sixty years. Today I see the PRTAF as a small, capable and competent force that provides Portugal with different options to contribute to global security, within NATO and the EU. Building on the capability of our assets and the competence and motivation of our people, we are able to assume a key role within the national defence, the military support to other national agencies and be ready to intervene as necessary.

I must also mention and praise the Portuguese Air Force men and women currently involved in operations, and those that operate and sustain a robust and permanent air capacity in support of the Portuguese and International Community. I am a proud commander of a great team made of remarkable people.

Transformation and reorganisation is undergoing to make us more efficient. The modernisation process required for interoperability and sustainability drives us into a joint and combined environment, where the human factor takes prevalence. Education, ethics, discipline, military training and perseverance must be the driving force.

The Portuguese Air Force main goal is to reduce in size while increasing competence.

I know we will succeed.

Sir, thank you for your time and your comments.

General José Pinheiro

Portuguese Air Chief of Staff joined the Air Force in 1973 and holds a degree from the Portuguese Military Academy. In addition, he graduated from the Air War College and completed various national and international courses. As a fighter pilot, he logged more than 3,000 flight hours. In that specialty at Monte Real Air Base, he fulfilled duties as Squadron Commander, Wing Ops Commander and Base Commander. While a staff officer assigned to NATO/SHAPE for Reaction Forces Planning, and after the Senior Warfare Course, he was posted to the Cabinet of the Deputy Chief of Staff. As Major General, he assumed Command of the Air Force Academy. After two years, General Pinheiro was promoted to Lieutenant General and became the Deputy Commander of the NATO Joint Force Command, Lisbon, until 2010. Before his current position, he was appointed as Commander of Portuguese Air Force Education and Training before being promoted to General.

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NATO warship boarding a suspect pirate skiff for inspection.

Piracy off the Horn of Africa

Bringing Air and Space Power to the Fight

By Commander Roberto Petruzzi, ITA N, JAPCC

Introduction

Piracy off the Horn of Africa (HoA) is still alive and kicking. Being the only growth industry in a region of failed states and shattered economies, this form of criminal activity is expected to undermine the rule of law at sea and freedom of navigation for a long time if the international community does not change its operational thinking. Initiatives and efforts to tackle the problem are finally providing encouraging results. Between 2010 and 2011 there was nearly a 43 % decrease in successful hijackings. This was due to the effort and action of military naval forces (with a more assertive posture both in disrupting attacks and in freeing hijacked vessels) and preventive/responsive measures used by the merchant vessels. Nevertheless, the number of attempted attacks is still growing (189 in 2011 compared to152 in 2010) and Somali pirates are becoming more violent (8 seafarers were killed in 2011 and 8 in 2010, while no killings have been reported in other parts of the world)[1].

The Long Arm of Somali Pirates

The increase in number of attacks and violence is not the only concern for seafarers. In the past years Somali pirates have shifted tactics to counter military intervention, proving to be motivated, highly responsive, agile and dynamic. Today, Somali pirates use hijacked fishing vessels, dhows and other vessels to conduct pirate operations. Skiffs launched from 'mother ships' intercept and attack innocent vessels often resulting in a successful hijacking. This *modus*

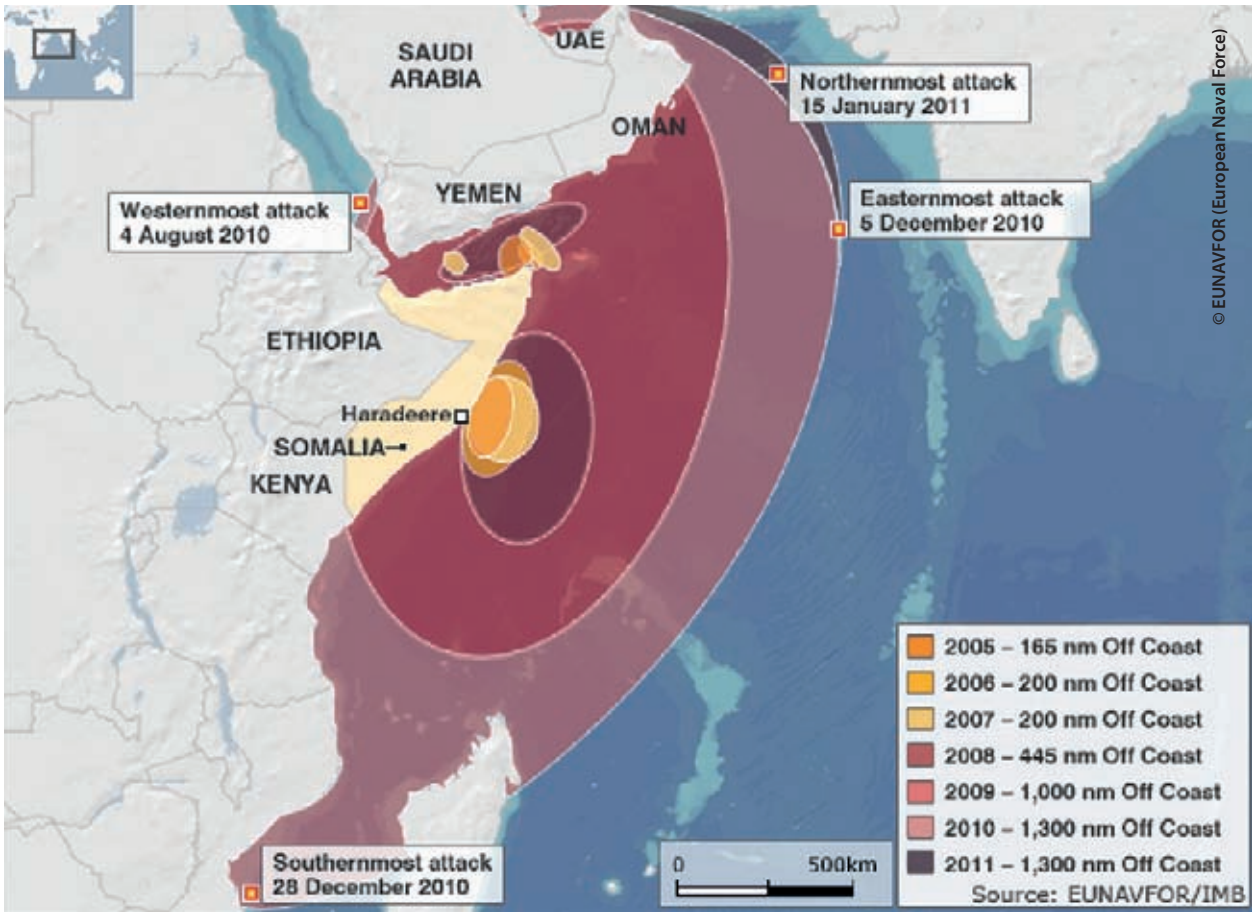


Figure 1: Expansion of pirate operations.

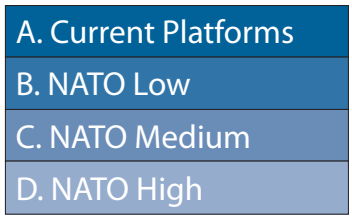
operandi not only allows an attack on unsuspecting vessels but also extends their operational capability, in time (during the monsoon seasons) and space, as far as 1,300 nautical miles (NM) off the coast of Somalia (see Figure 1).

In March 2011, given continuing pirate attacks on merchant ships despite the presence of a number of international Naval Forces, the Piracy High Risk Area was extended and now stretches to approximately 2.6 million square NM.

In 2010, Admiral Mark Fitzgerald, Commander of U.S. Naval Forces Europe and Africa, stated "We could put a World War Two fleet of ships out there and we still wouldn't be able to cover the whole ocean"[2]. In 2011, Major General Buster Howes, Operational Commander of EUNAVFOR, stated: "If you wanted to have a one-hour response time in that huge stretch of ocean, you would need 83 helicopter-equipped destroyers or frigates"[3]. Due to the involved costs and the current situation of the world economy, it is very unlikely that such a force would be generated to fight piracy off the HoA. If no change in the status quo is foreseen, the only way to assist and support surface assets in patrolling the counter-piracy area is to implement Air and Space (A&S) Power. Only A&S can provide the persistence and Intelligence, Surveillance, and Reconnaissance (ISR) capability to discriminate the 'abnormal behaviours' at sea, raise Maritime Situational Awareness (MSA) and build a Common Operating Picture (COP). In this way a timely alert system for merchant vessels could be developed and Commanders at sea would have a tool to better employ warships. The question is: what is the best mix of A&S assets to efficiently support Commanders at sea in the fight against piracy?

A&S Support to Counter-Piracy: An Analytical Approach

JAPCC Involvement in Counter-Piracy. The JAPCC has closely monitored Somali Piracy since the beginning of Operation Ocean Shield (OOS) in September 2009. In an article that appeared in the JAPCC Journal,



	A	B	C	D
AIS Satellite	24 Hr	24 Hr	24 Hr	24 Hr
SAR Satellite	0	2	4	9
Optical Satellite	1	2	4	7
HALE	0	1	2	4
AWACS	0	1	2	4
MPRA	1	4	10	20
T-UAV	1	4	8	16

- MPRA/AWACS/ High Altitude/Long Endurance (HALE) based in Dijbouti & Thumrait, Oman
- ScanEagles (Tactical UAV) based on notional commercially operated marine launch platforms

Figure 2: Summary of sorties/passes per day, by platform, across all treatments.

Edition 11[4], Group Captain Bennington, Chief of Staff to Commander Maritime Air Northwood, identified A&S Power's possible contribution in the fight against piracy. His conclusions and the Alliance's chronic inability to contribute with A&S assets for Counter Piracy (CP), triggered JAPCC Maritime Air subject matter experts interest in addressing the issue.

The first step consisted of conducting a theoretical study to determine the number of Maritime Patrol and Reconnaissance Aircraft (MPRA) needed to maintain different percentages of surveillance in the CP area by using the experimentation capability provided by The Boeing Portal (based in Fleet, UK). The results of this initial experiment designated Ocean Shield 1(OS1) were published in the JAPCC Journal Edition 12[5] in an article entitled "Strategy versus Capability: The Non-Contribution of NATO Air and Space Power to Counter-Piracy". Although purely hypothetical, the experiment showed the potential offered by the Boeing Portal and paved the way for a more broad and detailed study. The conclusion clearly demonstrated that piling up MPRAs (not available to NATO) to patrol the CP area was not appropriate.

This led to a new JAPCC project on A&S contribution to CP off the HoA. The aim was to determine the optimum use of A&S assets in the CP mission, and to extract best-practices for the application of A&S Power in other Maritime Domain operations. With the signature of a 180 day Cooperative Guidelines Agreement (CGA) in May 2011, a JAPCC and Boeing Portal joint team began work on Ocean Shield 2 (OS2)[6]. This is a stand-alone discovery experimentation aimed at gaining insights into potential commitment levels of A&S ISR platforms available to NATO for attainment of Maritime Domain Awareness (MDA) in the CP Region off the HoA.

"The way ahead might be an integrated system experiment with a 'human in the loop' factor, focused on a specific geographical area with a reviewed CONOPS for air assets and integration of surface assets …"

Context. The experiment was conducted using a faster-than-real-time, computer generated, constructive simulation to model a 'System of Systems' approach to the development of MDA. The model consisted of a variety of A&S ISR capabilities (available to NATO) providing data for a notional integrated COP which was used to economically task Detection, Identification and Tracking assets in order of priority. All data used was Not Protectively Marked (NPM)/UNCLASSIFIED. It was proposed that Detection, Identification and Tracking of Suspect Pirates for MDA was key to advising NATO on potential force trades of existing and future A&S surveillance assets. This would not include physical interdiction.

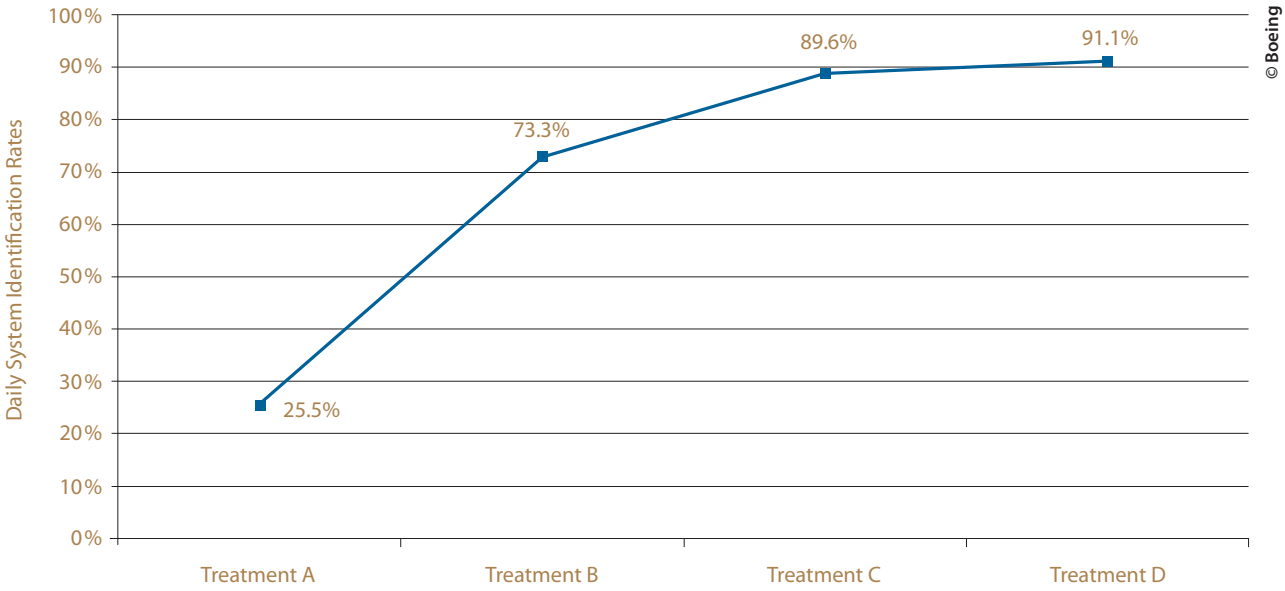


Figure 3: Plot of average daily System identification rates of suspect pirates by treatment.

Scenario. The region specified for the experiment is broadly related to the Op OCEAN SHIELD Area of Operations (AO). Its eastern boundary closely runs parallel to the Somali coastline, out to 500 NM offshore, and extends as far south as Tanzania. To the north, the entire Gulf of Aden is modelled, as well as an area of the southern Red Sea containing the Bab Al Mendeb Straits. The total enclosed region amounts to approximately one million square NM (3.3 million square kilometres), or nearly 1% of the Earth's sea surface. In order to provide a representative operating environment capable of taxing the system, a composite 'Pattern of Life' was created for high seas merchant shipping, local traffic, fishing vessels, and pirate activity.

The experiment was base-lined on A&S ISR asset commitment to current CP operations. From this baseline differing levels of commitment (defined as treatments A through D) were examined. These increasing levels of NATO force contributions were examined to determine the system effectiveness in the Detection, Identification and Tracking of suspect pirates in the waters surrounding the HoA. The commitment levels were developed and described as Low, Medium and High and are depicted in Figure 2 (see previous page). The Concept of Operations (CONOPS) of A&S assets was deliberately simplified to match resource constraints on the conduct of the experiment. As the constructive simulation would not allow real-time human manipulation or decision making, it was important logical 'decisions' could be made by the model with regard to asset tasking. The model did not contain a comprehensive Command & Control element, but followed a simplified logic.

Insights. The key insights identified during the experiment were:

1. Synthetic Aperture RADAR (SAR) satellites appear to contribute little to overall system detections.
2. MPRA on alert provide 23% of COP detections in the course of their reactive tasking.
3. A plot of average identifications of suspect Pirate Action Groups per day, by treatment, suggests a 'Law of Diminishing Returns' with only a modest increase in daily identifications with more assets beyond Treatment B (see Figure 3).
4. Detection and identification asset requirements appear proportional to the size of the area to be surveilled, whereas tracking asset requirements appear proportional to the number of targets within that area.

Conclusion

Piracy off the HoA is a local problem with regional reach and global impact. The overall response by the international community is, to a certain extent, successful but not decisive. Many agree the final solution to piracy rests ashore but efforts at sea are still required. Warships with organic air capabilities are still to be considered the 'end game' assets but a persistent tool is needed to fill the gap to combat pirates' successful tactics. To address this issue, the JAPCC entered for the first time the realm of modelling and simulation and closely cooperated with industry, resulting in a new way of addressing A&S Power related issues in current NATO Operations. The way ahead might be an integrated system experiment with a 'human in the loop' factor, focused on a specific geographical area with a reviewed CONOPS for air assets and integration of surface assets (warships, organic helicopters and ground stations). Such an experiment could also be an instrument to conduct operational planning, simulated exercises, and mission rehearsals or for the genesis of a Concept of Employment for A&S assets in the maritime domain. The OS2 experiment is one of the numerous steps in the comprehensive approach to combat piracy. The international community, especially the EU, is exploring the possibility of extending military operations ashore, launching attacks aimed at destroying pirate boats at bases. The JAPCC strongly believes experiments like OS2 are important for the development of new capabilities to cope with present and future challenges. It is possible that piracy could become something more daring or even something different than we know of today. What if the piracy of tomorrow spreads to other parts of Africa? What would happen if the future version of piracy were to cut our standard lines of communication and make the waters off the HoA a virtual no-go for shipping? And what if the pirates of tomorrow are jihadists? What would happen if pirate skiffs were employed as sea-based Improvised Explosive Devices? Would NATO (and the world) be ready to face these threats?

Note

The full report of the JAPCC project "Air and Space Power support to Counter-Piracy operations off the Horn of Africa" (including the complete results of the OS2 experiment) will be published and distributed to NATO, non-NATO and national Headquarters and agencies in the spring of 2012. An e-copy of the document will also be available on the JAPCC website[7]. ●

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   "Piracy and Armed robbery against ships, Report for the period 1 January – 31 December 2010", ICC International Maritime Bureau, January 2011.
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7. www.japcc.org.

Commander Roberto Petruzzi

joined the Italian Navy in 1991 and completed flight training as a Navy pilot in 1998. In his career he has embarked on most units of the Italian Naval Fleet and was deployed to STANAVFORMED, DINAK, Operation ACTIVE ENDEAVOUR, Operation ENDURING FREEDOM and the United Nation Mission in Ethiopia and Eritrea. From 2005–2006 he commanded the auxiliary ship 'Procida'. Following his command he served as a staff officer in the Aviation Department of the Italian Navy General Staff from 2006–2009. He is currently stationed at the JAPCC in Kalkar, Germany as Maritime Air Operations Subject Matter Expert.

Special thanks to Aaron Brown and the Boeing Portal team of Boeing Defence UK Ltd for their enthusiasm and professionalism shown in the development of the Ocean Shield 2 experiment.

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The VMAQ-4 Seahawks: Writing the Next Chapter

USMC Airborne Electronic Warfare

By Major Dean 'Sugar' Driskill, USA Marine Corps, VMAQ-4, Ops Officer

Introduction

The U.S. Marine Corps has always taken a leading role in helping to incorporate new and improved technology on the battlefield. Whether it was new equipment, and tactics during the amphibious 'island hopping campaign' in the Pacific during World War II, or developing the integrated Marine Air/Ground Task Force (MAGTF), Marines have set the mark for combined arms synchronisation to achieve the highest standards in combat. Marine Tactical Electronic Warfare Squadron 4 (VMAQ-4), the 'Seahawks,' have a distinguished history and are proud to carry that tradition forward while writing the next chapter in the history of Marine Corps airborne Electronic Warfare (EW) excellence. As the first U.S. Marine Corps squadron to transition and deploy into combat with the latest version of the EA-6B Prowler, the Improved Capability (ICAP) III, VMAQ-4 is carrying Marine Corps airborne EW capability to the next level and remains at the very cutting edge of EW while deployed to Afghanistan.

EW is Always Changing

Electronic Warfare, perhaps more than any other major field of military capability, evolves and develops very quickly. From its origins in the late 1930s, EW has developed and progressed at a rate that matches or

exceeds 'Moore's Law'[1]. The technology is fielded and the enemy immediately attempts to develop a counter. This, in turn, drives the implementation of a counter to this counter, etc. Thankfully, organisational dedication to maintain the technological advantage in EW has helped keep pace with these threats.

The New EA-6B ICAP III Prowler

Since 1971 the EA-6B has been the world's premiere Electronic Attack (EA) platform. Since then, the EA-6B has experienced a series of dramatic overhauls and upgrades which have extended its service life and continually improved its capabilities. Since 1991, the history of the 'Seahawks' has centred on the EA-6B Prowler when the squadron was commissioned as an active duty squadron. Now, as the first USMC squadron to transition to the newest ICAP III version of the Prowler, VMAQ-4 employs the most sophisticated and capable Prowler ever. The ICAP III Prowler constitutes the first complete overhaul of the Integrated Weapon Systems in the EA-6B since the aircraft transitioned from the EA-6A in the early 1980s. This improved weapon system is a truly impressive step up in capability and connectivity.

There are several improved features the ICAP III has over the older ICAP II version. At the heart of this change is the improved ALQ-218 Electronic Warfare Suite. This improved EW suite involves hardware changes throughout the entire airframe to dramatically improve the EW capability of the Prowler. The ALQ-218 improves the Electronic Warfare Support (ES) capability, EA capability, and includes dramatic improvements to the connectivity of the Prowler. The ICAP III has improved the night vision goggle (NVG) integration. The entire colour displays available to the Electronic Counter-Measures Officer (ECMO) and Pilot incorporate improved NVG compatible light settings enhancing the Prowlers night combat capability. The improved capability to use NVGs allows the Prowler to support operations around the clock.

Other important ICAP III improvements help the Prowler connect with other players around the entire theatre. The ICAP III systems include several upgrades that significantly improve aircrew situational awareness. This includes being an active participant in Link 16. Link 16 is an informational distribution system used by a growing number of U.S. and Allied platforms that digitally connects the battlespace giving position updates to all participants, in the air, on land, and at sea.

In addition to Link 16, the ICAP III has dramatically enhanced the interface and thus the effectiveness of the Multi-mission Advanced Tactical Terminal (MATT). This is the Prowler conduit into a global information system

"The fight in Afghanistan continues to highlight the adaptability of the EA-6B to support combat missions across the range of military operations."

accessible via satellites and terrestrial stations that provides near real-time electronic intelligence and system information.

VMAQ-4 is truly breaking ground and building the strong foundation for ICAP III integration into these systems. In fact, VMAQ-4 is not only developing the Tactics, Techniques and Procedures (TTPs) for USMC Prowlers, but is also working to pass these tested TTPs along to the U.S. Navy Prowlers and EA-18 Growlers. The enhanced coordination and safety gained through improved connectivity with other assets around the battlespace is just one example of how ICAP III improves the counter-insurgency fight.

One of the most important improvements the ALQ-218 brings to the EA-6B is upgraded ES capability. At the basic level this includes upgrading from a super heterodyne receiver system (analysing incoming frequencies by creating and then comparing them to known intermediate frequencies) using 1980s computer processors, into an interferometry receiver system (precisely measuring incoming signals based on time offsets of the signal arriving at different parts of the aircraft) with modern computer processors. This equates to a very impressive and noticeable improvement in the accuracy and speed of detecting and localising threat emitters. The tactical difference over the modern battlefield is very apparent. The ALQ-218 ES capabilities dramatically strengthen the Prowler's airborne EW.

© U.S. Navy, Kelly Schindler

Along with the marked improvements in ES capability, the ALQ-218 has definite enhancements to the EA capability. Principally this involves mirroring the EA with the ES capability resulting in more effective jamming techniques assigned more precisely and quickly. The improved processing power of the ALQ-218 allows the ECMO to oversee the system as it quickly makes reactive and responsive jamming assignments. Additionally, improved jamming techniques allow the ECMOs to plan and execute more complex jamming 'packages' that better cover air and ground forces.

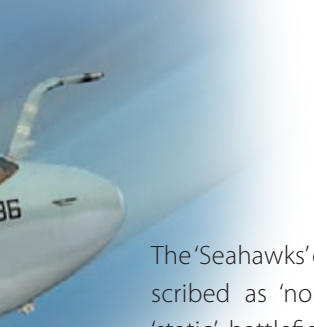
Additionally, the USMC ICAP III Prowlers have been upgraded to perform Non-Traditional Intelligence, Surveillance, and Reconnaissance (NTISR). Marine Prowlers can carry the LITENING imaging pod on one of the external wing stations. This provides full-motion video to the aircrew and can be relayed to the friendly Ground Forces via ROVER data link. This greatly expands the available coverage provided by EA-6Bs. This is a great example of how the Prowler's role has dramatically expanded beyond just jamming the 'traditional' Integrated Air Defence System (IADS).

The ICAP III also retains the strength of its other inherent EA weapon systems. The High Speed Anti-Radiation Missile (HARM) continues to undergo improvements with refined capability to suppress enemy threat systems. Additionally, the ALE-43 Bulk Chaff pod is now almost exclusively carried by the ICAP III Prowler within the Marine Air/Ground Task Force Air Component Element and gives the Commander additional EW options and flexibility. Since World War II, bulk chaff has been an integral part of delaying, confusing, or cluttering enemy radar systems and IADS. Bulk chaff is another tool the Commander can use to help Allied air, ground, and naval forces survive in the increasingly congested and probably hostile Electromagnetic spectrum.

Fighting the new ICAP III also involves a good deal of training for the aircrew to maximize the system. VMAQ-4 helped develop, refine, and implement a thorough transition and a robust training regime before the deployment. That training is paying off in successful combat flights directly supporting the Marines, Soldiers, and Coalition forces on the ground all over Afghanistan.

ICAP III Prowlers in Afghanistan

The fight in Afghanistan continues to highlight the adaptability of the EA-6B to support combat missions across the range of military operations. Historically, the EA-6B was designed, funded, and developed to primarily support and protect airborne platforms from enemy radar threats. However, ever since the traditional IADS in Afghanistan ceased to exist very quickly after Operation ENDURING FREEDOM commenced, the Prowler has successfully supported combat operations not originally envisioned for the aircraft. For almost 11 years in Afghanistan the Prowler has flown combat sorties directly supporting the ground forces. VMAQ-4 is doing this better with the ICAP III.



The 'Seahawks' currently fly what can primarily be described as 'non-traditional' EA missions. With the 'static' battlefield indicative of counter-insurgency and stability operations, the Prowler is primarily focusing on conducting EW to support ground forces, rather than to protect strike aircraft from surface to air missiles and anti-aircraft artillery (AAA). This has necessarily brought about changes in TTPs. Many of these TTPs revolve around improving the detection, tracking, and dissemination of information about insurgent activity between a host of Coalition systems. This directly assists the Ground Component Commander by improving situational awareness around friendly forces. Rapid, effective identification and analysis of insurgent activity has often helped provide critical indications and warnings of impending insurgent activities.

Having dedicated EA assets helps compliment the overall EW support for Coalition ground forces. It gives the Ground Component Commander additional options and flexibility to develop an effective scheme of manoeuvre. Planning for, and having dedicated EA overhead helps contribute to giving the Ground Component Commander assets he can use to help control the electronic dimension of warfare in a manner similar to how he can rapidly gain control of a fire fight using kinetic ground and airborne weapons. Additionally, the improved NTISR capability with the LITENING pod provides additional options for the Ground Component Commander to help understand his battlespace.

Conclusion

The ICAP III version of the EA-6B Prowler provides improved EW in both the counter-insurgency fight in Afghanistan and wherever the Marines and Coalition forces may be called to deploy in the future. As the first ICAP III squadron in the Marine Corps to deploy to combat, VMAQ-4 helped break new ground developing improved EW TTPs to support the Ground Component Commander. Training, and now fighting with the improved situational awareness that the ICAP III provides, allows the aircrew to adjust electronic fires faster than ever before. This proved valuable during the recent Afghanistan deployment with the dynamic nature of the Counter-insurgency fight. The significant improvement to the EW suite in the ICAP III Prowler helps ensure the MAGTF, the United States Department of Defence, and our Allied and Coalition partners around the world can fight effectively across the range of military operations. VMAQ-4 is building upon the history of USMC EW excellence as it writes a new combat chapter for ICAP III Prowler employment.

"For almost 11 years in Afghanistan the Prowler has flown combat sorties directly supporting the ground forces. VMAQ-4 is doing this better with the ICAP III."

1. Moore's Law – an axiom of microprocessor development usually holding that processing power doubles about every 24 months especially relative to cost or size generally attributed to Mr. Gordon Moore.

Major Dean 'Sugar' Driskill

is currently the Operations Officer for VMAQ-4. He graduated from the U.S. Naval Academy in 1997 with a degree in History. After earning his Naval Flight Officer Wings, he attended the Aviation EW School at Corry Station, Florida and was then trained as an EA-6B Electronic Counter-measures Officer at NAS Whidbey Island. He has served as an instructor at VAQ-129, and a Weapons and Tactics Instructor with VMAQ-2, and VMAQ-4. He has made several deployments to the Far East and to both Iraq and Afghanistan. He served at the Joint UAS Center of Excellence and has attended the USMC Command & Staff College where he earned a Masters degree in Military Studies at MCB Quantico, Virginia.

Indirect Fire – Understanding the Threat (Part 2)

By Wing Commander Jez Parkinson, GBR AF, JAPCC

Introduction

Part One of this article appeared in the JAPCC Journal, Edition 14 (available at www.japcc.org) and considered the Indirect Fire (IDF) threat to deployed air assets. In Part Two, we will consider specific factors and considerations relating to Counter-Rocket, Artillery and Mortar (C-RAM) capability within the broader IDF context.

C-Ram System Components and Capabilities

An effective C-RAM capability requires a system of systems approach, and has three basic components:

1. A 'sense' capability which will detect the launch and/or presence in flight of a rocket, artillery or mortar round.
2. A 'warn' capability that the system, having detected a projectile in flight, will provide an output that will provide a warning that a round is inbound.
3. An 'intercept' capability where the system, having detected a projectile in flight, engages the projectile with a weapon system designed to destroy the incoming projectile in flight.

It could be argued that both '1' and '2' above could be further sub-divided into 'simple' and 'complex', with the complex element in each case only being required if, having sensed and warned, the intention is to then intercept or engage.

Many different types of sensor systems are available with the ability to detect the launch of a projectile and/or detect and track a projectile in flight. The mix of sensors must be tailored to the operating environment, threat and potential further activity to be taken once a launch has been detected. An incoming round may simply be detected which would be sufficient to provide an output to initiate a warning, or a more complex system may be required that provides

The NBS C-RAM.

a warning of a launch, tracks a projectile, predicts both Point of Origin (POO) and Point of Impact (POI). Complex systems can also provide for multiple other activities such as counter battery fire against the POO, warning of a launch to allow personnel to employ the correct drills, forensic exploitation of the POI or clearance of the POI in order to allow operations to continue.

In most scenarios it is likely that multiple sensors will be required. This could be for a variety of reasons to include: redundancy to ensure continuous system function should some sensors fail, and saturation to provide complete coverage over the threat parameters where the defended area is large or multiple and/or, widely dispersed POO are possible. However, irrespective of the scenario, software and an interface will be required that allows data from multiple sensors to be fused into an output or multiple outputs that facilitate fast, effective follow-on activity.

There would be little point in sensing a launch if there is subsequently no mechanism to warn of it. The nature of the warning needed will again be dependent on what subsequent action is required. Where multiple follow-up activities are required the output from sensors may drive a number of activities where the output required in each case is different. The rapid identification of a POO is required for counter battery fire and complex track data is required if the projectile in flight needs to be engaged. A far less complex output would be needed if there is neither the ability nor intention to either engage the POO or rounds in flight and all that is wanted is the initiation of a siren that warns personnel that a round is in flight and they need to take appropriate action.

The 'intercept' element of any system with existing technology is likely to be some sort of gun system with an ability to project a 'cloud' of bullets towards an incoming round. This concept increases the chances of destroying a relatively small, fast moving target by raising the probability that the incoming round will actually make contact with an object (bullet) travelling in the opposite direction.

Understanding Effects

The range of possible effects of intercepting an incoming round should be considered in detail, not only before deploying an intercept capability but also, after having decided to deploy, what that intercept capability must deliver. The question to be explored here is what happens to an incoming round when it is hit by an outgoing one? The range of possible answers is considerable. If the incoming round is detonated in mid-air, debris will still hit the ground. If the round is hit and breaks apart, an intact warhead may still hit the ground and function as intended. As a variation on these alternatives, a round is hit but is only deflected, and in the worst case scenario, as a result of being deflected a round lands in an area where it does more damage than had it not been deflected. The difficulty with this last scenario is that to have reached a situation where this has happened, the data will be subsequently available to determine what would have actually happened had the incoming round not been engaged, therefore the legal implications of such data being available needs to be carefully considered.

"It has to be accepted that with current levels of technology and a resourceful, adaptable enemy, situations may exist where it will be difficult to provide adequate warning of an IDF attack and impossible to create a system that will be able to engage and destroy an incoming round before it impacts."

A development of the discussion above is the issue of where outgoing rounds that do not hit the intended target fall? In an ideal situation the rounds would land harmlessly in an unpopulated area, but if there is any risk that rounds will fall and cause injury either to civilians or friendly forces, consideration will need to be given to the use of rounds that self-destruct. As far as the basic construction of any round is concerned, notwithstanding the possible need for it to self-destruct, in simple terms the bigger, faster and more dense the round used, the more kinetic energy it will posses when it hits a target and the more likely it is that the target will be destroyed.

Operating Procedures

In an ideal C-RAM operating environment, the only thing flying would be an incoming round. Unfortunately, this is an unrealistic scenario and where a full C-RAM capability (to include an intercept component) is deployed; the issue of airspace control needs very careful consideration. It must be understood that no defensive system should inhibit friendly force freedom of manoeuvre, there should be no possibility of fratricide and with C-RAM the time available for decision making may, in reality, be too short for a human to react. A combination of airspace control measures together with weapon control orders and robust C-RAM operating procedures will need to be implemented if a complete C-RAM system is to function effectively in an environment where aircraft or other airborne assets are operating.

A paper which discussed C-RAM operating procedures in detail would be a document of considerable size, but perhaps the key element of any operating procedure would be to define the safeguarding of an intercept element by ensuring a persistent human presence is established. It can be seen from the timelines discussed elsewhere in this paper that the time from detection to impact of an incoming round can be a matter of only a few seconds. In these few seconds a huge amount of data will be flowing around any C-RAM system and if the system is to have the best chance of hitting and destroying a projectile in flight, the operator will have to be highly trained, alert, and capable of making the correct decision in the shortest time possible. It is suggested that any C-RAM system with an intercept capability should have the intercept element permanently inhibited so that no gun can fire unless a person physically removes the firing inhibits on the system.

Sighting Considerations

The components of any C-RAM system must be correctly sighted if they are to perform at the required level of precision. With warning and/or engagement windows being only a matter of seconds, placing elements of the system in anything other than the optimum location for their function makes no sense. Ideally, a C-RAM system deployment should be considered during the set-up phase of any base if there is an IDF threat present, or, if it is perceived that one may develop. Even if a C-RAM or Sense and Warn (S&W) system is not initially deployed, identifying where elements of the system would go, should it be required, will avoid infrastructure issues at a later stage.

Consider also that infrastructure will be required to accommodate personnel operating the system as well as workshop facilities for repair and storage for ammunition and spares. Whilst beyond the scope of this paper, the general point should be made that a C-RAM detachment is a sizeable unit with considerable support requirements.

NATO C-RAM Minimum Military Requirement

There has been considerable discussion over recent months about defining the NATO Minimum Military Requirement (MMR) for a C-RAM capability. The straightforward fact is that the MMR will be different for each location because of the huge number of variables which have to be considered before C-RAM system parameters can be defined. The starting point in defining any capability is to decide how long it will take personnel to take cover upon hearing an IDF attack warning; the currently accepted estimate is between 3 and 5 seconds, remembering that any warning has either to be heard instantaneously across an entire base location. Otherwise, additional time needs to be built-in to allow the initiating signal that initiates the warning siren to travel to the extremities of a base.

The next figure to be identified is the average flight time of the type (or types) of projectile(s) being fired at the location. Small, fast moving projectiles that have a relatively flat trajectory and are fired from close range will be difficult to detect in sufficient time to allow an effective warning to be given. Additionally, the time required by a C-RAM system to detect, track and engage an incoming round may be longer than the time of flight of the type of threat described. It has to be accepted that with current levels of technology and a resourceful, adaptable enemy, situations may exist where it will be difficult to provide

107 mm rocket on an improvised firing rail.

adequate warning of an IDF attack and impossible to create a system that will be able to engage and destroy an incoming round before it impacts.

Whilst C-RAM system capabilities continue to develop, it is unlikely that any system will be able to provide the optimum level of defence on initial deployment. The individual components within the system will require calibration and the system as a whole will have to be 'tuned' to the environment it is operating in and the specific IDF threat it is deployed to counter. Depending on the frequency and complexity of IDF attacks, this process of optimising a system for a particular location may take a period of many months.

Summary

This paper has attempted to draw together at the most basic level all of those factors considered essential in creating an effective and resource efficient NATO C-IDF capability. C-IDF is a broad and complex subject that involves a variety of specialist disciplines from intelligence specialists to system operators and technicians through soldiers, sailors and airmen to civil engineers. It is hoped that this paper has sufficiently highlighted not only the complexities of developing a C-IDF capability for the Alliance, but also the importance of specialist input throughout the entire process. ●

Wing Commander Jeremy Parkinson

is a RAF Regiment Officer who joined the RAF in 1986 and is currently serving in his second NATO appointment working at the Joint Air Power Competence Centre (JAPCC) at Kalkar in Germany where he is the Force Protection and Defence Against Terrorism Subject Matter Expert. He has a broad background in Force Protection and has completed operational tours in the Middle East, the Balkans and Northern Ireland as well as speaking on Force Protection and related issues to many nation's militaries and NGOs. His current projects include NATO Doctrine for the Force Protection of Air Operations, Countering Air Orientated Terrorism and NATO Air Force Protection Capability Development.

Special Operations provide an inherrently agile instrument idealy suited to the current and future security environment.

Special Air Warfare: A Coherent Framework for NATO SOF Aviation

By Lieutenant General Frank J. Kisner USA AF, Commander, NATO Special Operations Headquarters, SHAPE, Belgium

Lieutenant General Frank J. Kisner, Commander of the NATO Special Operations Headquarters (NSHQ), delivered the keynote address at the 21st KINDELAN Seminar where he described a building block approach to help mitigate chronic NATO Special Operations Forces (SOF) aviation shortfalls. The following is adapted from those remarks.

Introduction

There is a common view among a variety of defence and security establishments around the world that the nature of the current and future security environment we face presents complex and irregular challenges that are not readily apparent and are difficult to anticipate. Governments are faced with 'unusual' or 'unconventional' threats that dominate the attention of their political and defence leaders. This diverse set of threats are interconnected and have the potential to undermine wider international stability by creating a condition of low level, persistent conflict for the foreseeable future. SOF provide an inherently agile instrument ideally suited to this ambiguous and dynamic irregular environment. SOF allow national and collective defence establishments to retain freedom of action by employing a force which traditionally has a smaller footprint than their conventional counterparts, and therefore one which

may be more politically acceptable to both the providing Nation(s), and to the Nation in which operations are conducted.

SOF can be formed into versatile, self-contained teams that provide an extremely flexible force capable of operating in swiftly changing scenarios. SOF operates outside the realm of conventional operations or beyond the standard capabilities of conventional forces, thus providing a solution to extraordinary circumstances of political interest when no other option is available. However, the ubiquitous nature of Air Power and that flexibility we all know also creates the potential for a synergy of action between SOF and all elements of Air Power. But unless that synergy exists and is exploited, a Nation unable to employ SOF may be faced with conventional alternatives that may not possess the geographical reach, the required rapidity of response, the ability to apply force discriminately, or the appropriate level of discreetness. With regard to SOF operations, in most cases successful missions require the orchestration of special operations air, maritime, and ground elements operating collaboratively under extremely non-standard conditions.

Historically, ad-hoc temporary arrangements cobbled together to perform SOF operations proved incapable of fulfilling the challenges inherent to special operations and resulted in disastrous consequences.[1] One of the key lessons identified is that the operational packaging of SOF requires organic, dedicated, or habitually associated air assets and capabilities specifically tailored and embedded in the force structure to perform or support special air operations. In order to meet the intense demands of special operations mission sets, aircrews have to train regularly with ground and maritime forces as a unified team. Ad-hoc attachment of air assets and capabilities simply fails to create the habitual relationships and 'no-fail' proficiency required by SOF.

NATO thinking about SOF aviation is anchored in the fundamentals of Special Air Warfare. Special Air Warfare is a broad concept defined as activities conducted by air/aviation forces using Tactics, Techniques, and Procedures and modes of employment not standard to conventional forces. Special Air Warfare balances the tenets of Air Power with the principles of special operations employment.

NATO SOF Mission Sets

Given the strategic relevance of SOF to the emerging global security environment and the general characteristics of special air warfare in the NATO context, specific characteristics and capabilities are required of special air warfare forces in support of the NATO SOF core mission set. MC-437/2 assigns three core missions to NATO SOF: Special Reconnaissance (SR), Direct Action (DA), and Military Assistance (MA). While these mission sets are not the sole purview of SOF, they do effectively define a broad range of special air warfare requirements. Special air warfare forces must be able to conduct special air operations in support of SOF SR, DA, and MA missions across the entire spectrum of conflict and across the entire spectrum of alternate operating environments.

"In order to meet the intense demands of special operations mission sets, aircrews have to train regularly with ground and maritime forces as a unified team."

NATO SOF Requirements

NATO has robust standing requirements for special air warfare capability that are articulated in several documents. The first is NATO's new Strategic Concept of 'Active Engagement, Modern Defence' launched at the Lisbon Summit in November 2010. This guidance reaffirmed NATO's three core tasks of Collective Defence, Crisis Management and Cooperative Security, but also emphasized the need to further develop expeditionary capabilities for the purpose of employing military and political forces before and after conflicts as well as during them. Because "instability or conflict beyond NATO's borders can directly threaten Alliance security by fostering extremism, terrorism, and transnational illegal activities such as trafficking in arms, narcotics and people"[2], the Secretary General has embraced an 'away game' mentality in this new

Significant shortfalls in special air warfare capability are prevalent.

Strategic Concept that has particular relevance to SOF. Specifically, the concept calls for NATO to further develop expeditionary capabilities to detect and defend against international terrorism, as well as to develop "the capability to train and develop local forces in crisis zones so that local authorities are able … to maintain security without international assistance."[3] These lines of effort translate directly into SR, DA, and MA tasks at the core of NATO SOF's primary mission set.

The second major document that articulates stan ding NATO requirements for SOF special air warfare capability is the '2+6' construct expressed in the Political Guidance that defines NATO's baseline level of ambition regarding required Alliance military capacity.

"These current efforts are just the beginning of a larger comprehensive approach the NSHQ is pursuing to help address NATO's chronic shortfall in SOF aviation."

This guidance drives the NATO Defence Planning Process (NDPP) to work with Nations to generate sufficient forces to simultaneously conduct 2 Major Joint Operations and 6 Small Joint Operations. As part of Capability Requirements Review 2012 (CRR 12), the NDPP will conduct a new analysis of the minimum capability requirements to meet NATO's standing '2+6' level of ambition. CRR 12 will for the first time include clearly articulated definitions of SOF aviation requirements in the form of fixed and rotary wing Special Operations Aviation Task Units and the required Command and Control capacity of Special Operations Aviation Task Groups and Combined Joint Special Operations Air Components (CJSOACs).

The Role of the NSHQ

Despite NATO's robust operational requirements for special air warfare capability, NATO SOF has historically struggled to access the aviation support required for its missions. The NATO NSHQ was established to address the expanding role of SOF in NATO missions and provide a deliberate synchronising capability for all NATO SOF.

A major part of the headquarters' synchronising effort is expended to identify and fill specific capability gaps of the force. In this role it conducted a series of dedicated studies and efforts over the past four years to specifically document NATO SOF air shortfalls. This work has verified that significant shortfalls in special air warfare capability are prevalent and continue to hamper NATO SOF's ability to tackle current missions in Afghanistan and future missions under NATO's externally focused Strategic Concept. Relying on the few special air-capable NATO Nations to fill collective SOF aviation needs has not proven feasible, and does not posture NATO well for future missions. Also, scarcity of resources, lack of habitual training relationships, and unfamiliarity with the SOF mission sets are the three

main reasons that NATO SOF reliance on non-dedicated air support fails to meet the level of readiness required in traditionally complex SOF missions. So the question becomes "what is being done for NATO SOF aviation and what more is needed?"

Training and Education

As the primary point of direction and coordination for NATO SOF, the NSHQ has made good progress in integrating aviation issues into its NATO SOF Training and Education Program. The NSHQ J-7 currently runs an 8-day NATO CJSOAC course that includes classroom preparation on NATO and Air Power competencies followed by CONOPS development and three full days of battle-tracking in full synchronisation with a student Joint Operations Centre, running in parallel in support of the Special Operations Staff Officer Course. Additionally, specific topics regarding Air Power are presented and discussed during the Special Operations Component Command Staff Course and the ISAF SOF Pre-deployment Course. There are also multiple seminars on the use of Intelligence, Surveillance and Reconnaissance in a SOF environment using curriculum and updated best practices provided by the US Joint Special Operations Command.

Framework for NATO SOF Aviation

These current efforts are just the beginning of a larger comprehensive approach the NSHQ is pursuing to help address NATO's chronic shortfall in SOF aviation. The overarching strategy envisioned from the NSHQ perspective involves a coherent framework for NATO SOF aviation development that facilitates an end state of synchronised, integrated, and mutually supporting SOF aviation capacity across the Alliance. This coherent framework will be developed through a 'building block' approach that progressively expands the headquarters' capacity to facilitate SOF aviation development across the Alliance. The intent is to help accelerate individual National efforts to field special air warfare capability while also pursuing a modest NSHQ-led multi-national operational SOF air capability for training, tactics validation, and SACEUR's immediate, ensured use in crisis response operations.

Air Warfare Centre

The foundation of the overall building block approach envisioned for helping to address the NATO SOF air shortfall is the creation of a NATO SOF Air Warfare Centre. Once established, the Air Warfare Centre will initially focus on developing doctrine, tactics, and Standard Operating Procedures specific to NATO SOF Aviation. This line of development will support individual Nations' efforts to build SOF Air capabilities that are standardised and interoperable in NATO. As staff capacity builds at the Air Warfare Centre, additional curricula will be developed to conduct appropriate training and education for building and employing SOF aircrews, mission commanders, leaders, and aviation Military Assistance advisors. Future multinational flying training venues may also be developed and leveraged to continue these lessons in the air, as well as to validate NATO SOF aviation tactics. This doctrine/training/education component is intended to address the long-term systemic interoperability and standardisation deficiencies which must be overcome in order for Nations to develop persistent, effective, and interoperable special air warfare forces.

Interim SOF Capability

A further element being investigated to help address the NATO SOF air shortfall is the possible development of an interim NATO SOF operational flying capability. Even though SOF aviation requirements will be fully articulated in CRR 12, actions to address those requirements will take considerable time. Because of intense competition for funding and other resources, Nations may take 6 years or more to even begin to fill SOF aviation capability requirements. Therefore, the purpose of this NATO SOF-dedicated flying unit would be to provide SACEUR an ensured special air operations capability until Nations develop sufficient special air warfare capacity to support NATO immediate crisis response options.

Conclusion

Overall, the unique capabilities and strategic freedom of action and freedom of manoeuvre that SOF, complemented by Air Power, provide a Nation are ideally suited to address the irregular security challenges prevalent today and those anticipated in the future. National Air Forces should recognise that special air warfare is indeed a unique discipline that requires specific emphasis and advocacy within respective defence establishments and rests on the core ethos of airmen striving to exploit Air Power for the benefit of Nations, Treaty Alliances, and to maximise Mission Success.

1. Consequences such as the Desert One catastrophe in 1980. An excellent description of this event can be found at: http://www.theatlantic.com/magazine/archive/2006/05/the-desert-one-debacle/4803.
2. NATO, Active Engagement, Modern Defense: Strategic Concept for the Defense and Security of the Members of NATO, Lisbon Summit 19-20 Nov 2010, para 11.
3. Ibid, para 25.

Lieutenant General Frank J. Kisner

is the Commander of the NATO Special Operations Headquarters, co-located with Supreme Headquarters Allied Powers Europe in Casteau, Belgium. He leads a multinational staff representing 25 NATO and 3 non-NATO nations, serving as the primary point of direction and coordination for all NATO special operations-related activities. He is a Command Pilot with over 5,000 flight hours in C-130E/H and MC-130E/H aircraft, and has significant experience in combat and leadership in major joint contingency operations. He is a graduate of the U.S. Air Force Academy, U.S. Army Command and General Staff College, and the U.S. Naval War College.

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AWACS Rising – Joint C2ISR

Force Multiplier for the 21st Century

By John 'Hobbit' Mahaffey, Senior Scientist, Production Directorate, NATO C3 Agency

Introduction

The 21st century battlespace is a dynamic spectrum of conflict characterised by operations from low intensity insurgency, to nation building to traditional 'force-on-force' warfare. Adversaries range from well trained and equipped forces to poorly organised insurgents. The 21st century battlespace is also global and immediate, crossing traditional boundaries and international alliances with reaction times measured in hours and days, not weeks and months. Trigger events will be varied, including national aggression, insurgency, political instability and natural disasters.

The complexity and reach of the 21st century battlespace will demand a multi – level, joint response to the mission requirement. Land, Maritime, Air, and Special Operations Forces (SOF) will play significant roles, requiring speed, access and accuracy from a dynamic and flexible architecture of Command and Control (C2) and intelligence. This will require the passing of intelligence and information to and from commanders, and their forces at all levels.

The traditional distinctions between operations and intelligence will blur. The new battlespace will require immediate direction, intelligence and information at the operational and tactical level. Commanders will require almost immediate feedback for planning, execution and assessment.

Rapid, reliable and accurate command, intelligence and assessment will become the lifeblood of the operation. Within this battlespace a new set of information warriors will emerge; pushing and pulling information to and from commanders in the field and at headquarters. These weapons, represented by emerging C2 and

Joint Intelligence, Surveillance and Reconnaissance (JISR) capabilities must be flexible in time, space and function; able to move rapidly to and from the battlespace, adapting to the environment, the adversary and the mission.

The Airborne Joint C2ISR System

Characteristics of these emerging weapons systems include mobility, flexibility, access to data both raw and exploited, and robust communications, all executed by highly trained operators. Within the joint battlespace the requirement for an 'Airborne Joint C2ISR System' has emerged. These highly flexible weapons systems will be required to support the full range of C2 and JISR functions for strategic, operational and tactical operations within the battlespace. Proposed responsibilities include:[1]

- Provide rapid and mobile access to and dissemination of C2 and JISR products and information;
- Provide organic and collected C2 and JISR data and information;
- Extend battle management authority for the joint, component and tactical commanders.

To date, few systems can support both the C2 and JISR mission concurrently. In most cases, C2 and JISR systems are designed specifically for their tasks. Systems supporting both C2 and JISR are characterised by organic sensor capabilities, on-board analysis, communications capabilities robust enough to provide reach- back to multiple networks and trained operators capable of supporting both mission roles.

The E-3 Sentry as an Airborne Joint C2ISR System

The E-3 Sentry weapons system is one of few capable of providing the operational and technical capabilities required to support C2 and JISR missions simultaneously. The E-3 Sentry weapons system already combines organic air and surface surveillance radar and electronic emission sensors coupled with a robust communications suite, crewed by operators trained in sensor analysis and tactical battle management.

Full participation as an Airborne Joint C2ISR system will require additional capabilities, both technical and operational. The following paragraphs detail a proposal for the enhancement of the E-3 Sentry as a currently operational weapons system in support to the Joint Force.

E-3 Support to the Joint Force Commander

The E-3 Sentry provides the Joint Force Commander (JFC) with robust communications between the operational headquarters and commanders in the field.

The E-3 can relay direction to and results from forces deployed in the field. When authorised, the E-3 Sentry acts as an extension of the JFC or the component commander. These options are especially valuable when the operations are immediate; the battlespace is distant from the headquarters element or is poorly equipped for reach-back.

E-3 Support to Component Commanders

Traditionally, the E-3A has not supported land operations directly and provided limited support to maritime operations. Within the new battlespace the E-3 will need to provide tactical battle management of air assets supporting troops in contact, close air support, air land operations, amphibious operations, surface surveillance, littoral operations and counter–piracy operations. Intelligence derived from on–board sensor systems coupled with disassociated traditional and Non–Traditional ISR (NTISR) systems provides intelligence on the disposition of adversary and friendly forces within the battlespace.

When suitably equipped and manned, the E-3 Sentry may collect, exploit and disseminate data, imagery and information from disassociated ISR systems and databases to ground commanders prior to and during engagements supporting Indications and Warning (I&W) and combat operations. As an extension of higher headquarters, the E-3 Sentry may provide direction to component and tactical commanders in the absence of a direct real–time link between the land and maritime battlespace and the headquarters element.

E-3 Support to Special Operations

Within the battlespace, the E-3 Sentry can expect to support SOF with data, information and intelligence derived from organic and disassociated sensors and systems for Intelligence Preparation of the Battlespace (IPB) and I&W for planners and forces in the field. The E-3 Sentry support to tactical operations includes: tactical battle management of air forces supporting troops in contact, personnel recovery, aerial resupply and direct action targeting. Moreover, the E-3 Sentry may act as a lifeguard, providing communications and battle management support for forces should they come under direct attack or be threatened by adversary forces.

E-3 Support to Civil Military Cooperation (CIMIC)

CIMIC has become a fixture in the 21st century battlespace. Support and protection of the civilian population within the area of operations is often more important than the prosecution of adversary forces. E-3 support to CIMIC includes integration of data and information from organic and dissociated sensors in support of disaster relief, force protection, counter – terrorism, environmental surveillance and border enforcement among others. For example, immediately after hurricane Katrina in 2005, the USAF E-3 provided air traffic control for more than 1,000 helicopters whilst flying 11 sorties in support of national disaster preparedness.[2] As an airborne communications node the E-3 can provide a link between crisis control centres and deployed relief assets to assist in the coordination of operations.

E-3 Support to the Joint C2 Mission

As an airborne C2 platform the E-3 can provide an extension of the operational command passing direction to the tactical level until a deployable C2 unit becomes available.[3] Support to these operations requires the addition of manpower and systems capable of accomplishing these tasks. Training of current E-3 operators in C2 procedures related to mission roles (e.g. amphibious operations) will be required. Alternately, the E-3 can host command designated personnel in support of these roles (e.g. Air Command Element [ACE]).[4] Technically, robust communications must be capable of integrating into Alliance and national C2 systems for access to relevant databases, C2 applications such as Time Sensitive Targeting (TST) coordination tools and access to emerging capabilities though internet protocol (IP) based applications such as Voice over IP (VoIP).

E-3 Support to the Joint ISR Mission

While the E-3 weapons system was not designed with a JISR capability, the system may provide support to the JISR mission through employment of its organic sensors (Air/Surface Surveillance Radar and Electronic System Measures (ESM)) or as a JISR coordinator providing direction, management and protection for JISR systems within the battlespace.

Manpower requirements include the training of current personnel in JISR functions such as JISR management, participation in various intelligence related networks and an understanding of JISR system operations and capabilities. If connected to the JISR network via IP based communications, E-3 operators could provide analysis and direct management of JISR assets. Like C2 above, system requirements must focuson the need for robust communications capable of integrating into the required networks.

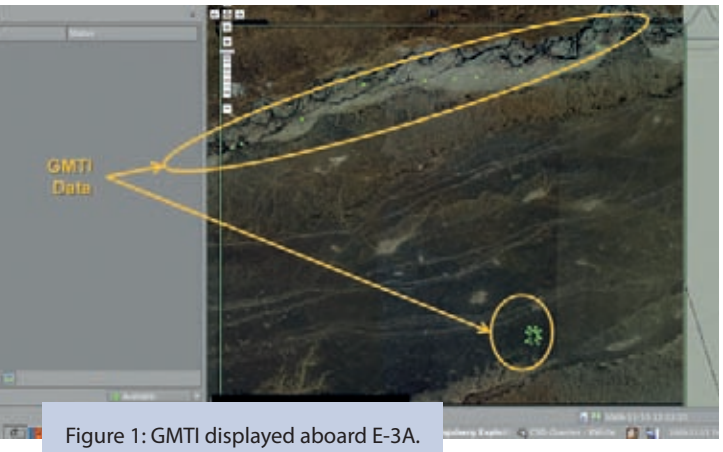

Figure 1: GMTI displayed aboard E-3A.

Figure 2: EO Video screen capture of surface-to-air missiles.

E-3 Systems Development – IP Based Communications

The advent of the internet and its ability to rapidly transmit data between multiple end-users makes the medium ideal for the employment of Joint Forces within the battlespace. In future operations, access to various C2 and JISR networks will be a minimum requirement; as evidenced by the emergence of chat as the primary medium for command direction and information requests.

Within the C2 and JISR community the emergence of web enabled applications is driving more commands towards network centric operations. Web enabled applications provide the capabilities of more complex and expensive systems using common hardware and networks. Figure 1 depicts a screen capture of a Ground Moving Target Indicator (GMTI) from a disassociated sensor to a laptop aboard an airborne E-3A. With this information, E-3 operators could provide direction and warning to Joint Forces operating in the area.

E-3 Systems Development – Disassociated Sensors

Disassociated sensors are those sensors not organic to the E-3 Sentry and may include Electro Optical/Infrared (EO/IR) imagery, GMTI and Electronic Intelligence (ELINT) products. Disassociated sensors provide the E-3 Sentry with enhanced intelligence supporting both C2 and JISR operations. Using these products E-3 operators can detect emerging threats, provide targeting and assessment of combat operations.

During exercise BOLD QUEST 2011, at Camp Atterbury, near Edinburgh, Indiana, imagery was provided to the NATO Airborne Early Warning (NAEW) Deployable Ground Entry Point (DGEP) and an airborne workstation to E-3 operators detailing land operations and potential

threats within the battlespace. Figure 2 is a screen capture from on-board laptops configured to receive and display imagery. The image details potential threats (such as surface–to–air missiles). Using this information, the E-3 operators support IPB, I&W and threat warning at the joint, component and tactical level.

The E-3 Sentry – Airborne Joint C2ISR Capability for the 21st Century Battlespace

The E-3 Sentry weapons system is among the very few systems that have the potential to support the Joint C2 and JISR mission simultaneously at all levels. In order to do this, the E-3 must develop its technical and operational capabilities in support of the battlespace as a whole.

This is not an insignificant requirement. For the NATO E-3 to accomplish this they must update their Concept of Operations (CONOPS) to support new and emerging mission roles. From the new CONOPS, operational and technical requirements can be derived for upgrade of the system and training of its operators in support of these new roles.

The plan should focus on short and long term initiatives to improve and integrate new operational and technical concepts and capabilities. For example, current low bandwidth IP based communications may be used to support limited C2 and JISR operations as long as capabilities and limitations are fully understood by the supported commander and the E-3 operators. Operational procedures can mitigate limitations while low cost enhancements may be made to improve capabilities (e.g. IP data over UHF SATCOM). These procedures will allow the E-3 Sentry to begin support of emerging operational roles before permanent modifications can be integrated.

Long term development of on-board communications, enhancement of organic sensors and receipt, analysis and exploitation of disassociated sensors will provide extended capabilities for NATO Joint Commanders both within and outside of NATO area of operations. Capabilities such as access to Ku band SATCOM provide expanded access to C2 and JISR capabilities that elevate the current capability from tactical air surveillance and battle management to operational level command and control.

Conclusion

The E-3 Sentry is one of the few weapons systems capable of filling the Airborne Joint C2ISR role. In order to be successful, the E-3 must expand its capabilities technically and operationally, linking C2 and JISR elements throughout the battlespace. This requires acceptance of these new mission roles and direction, guidance and vision on the part of the owning and operating nations. ●

1 Mahaffey, John L., Draft Airborne Joint C2ISR Capability White Paper, Requirement Tasked by E-MACC 2010, Rome ITA, Sep 2010
2 Haulman Daniel L., The U.S. Air Force response to Hurricane Katrina, Air Power History, Fall 2007
3 Air Force Doctrine Directive 3-60 Targeting, 28 July 2011
4 Air Force Doctrine Directive 3-1 Air Warfare, 28 July 2011

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The EATF is a flexible and inclusive partnership between national and multinational military air transport fleets and organisations in Europe.

The European Air Transport Fleet

Increasing Airlift Provision within the European Union

By Lieutenant Colonel Laurent Donnet, BEL AF, EDA

The mission of the European Defence Agency (EDA) is to support the European Council and the Member States in their effort to improve the European Union's (EU) defence capabilities in the field of crisis management and to sustain the CSDP as it stands now and develops in the future.[1] Within that framework the EDA identifies operational requirements, promotes measures to satisfy those requirements and participates in defining and evaluating the improvement of European military capabilities in general.

The European Air Transport Fleet (EATF)

The exorbitant cost of military transport aircraft stimulates innovative solutions that are not focused on traditional or classical projects. The EDA's work over the last three years on filling the existing air transport capability gap has yielded a number of promising solutions amongst which the creation of the EATF is certainly the most innovative one. This 'Fleet' is however not to be understood in the pure military sense of the word that would suggest a large amount of aircraft under the command of a General supported by a robust headquarters. For the time being, this EATF is more comparable to a partnership like the ones existing in commercial aviation like Star Alliance or OneWorld; where preferred arrangements with selected partners lead to a more cost-efficient use of assets and personnel.

The EATF is a flexible and inclusive partnership between national and multinational military air transport fleets and organisations in Europe, aimed at the enhancement of standardised air transport services.

This underlines the intended open relationship to be created between partners characterised by mutual cooperation and responsibility to achieve specific goals in the airlift area. The straight forward objective of the EATF is to improve the airlift provision within the EU and to develop concrete solutions to better use existing and future military airlift assets to meet national, EU, NATO and other frameworks operational requirements. When a shortfall exists, one can choose to acquire more assets or to use the existing ones in a more efficient way. The prohibitive cost of air transport assets mentioned before combined with the current financial situation makes the first option very unlikely, except for planned acquisitions. Hence, the EATF is concentrating on the second option. In May 2011 during an EDA Steering Board, eighteen Ministers of Defence signed the Programme Arrangement (PA) to formalize the EATF partnership.[2] In July, Norway officially requested to become the 19th member of the EATF; and was endorsed by all partnership signatories in September. Hungary will sign the PA in 2012 and become the 20th EATF member.

EATF Working Groups

An overarching Management Committee is steering the EATF for strategic guidance and several ad hoc working groups (AHWG) are addressing different issues that the Member States identified as necessary to tackle in order to make their airlift, and hereby EU's airlift, more efficient. For the time being three AHWG's are addressing specific air transport issues. The AHWG Strategy and Development is drafting the EATF project management plan, fine-tuning the governance model to ensure proper guidance for the EATF partnership as well as developing the legal framework for implementing it. The second group, the AHWG Diplomatic Clearances (DIC) examines how to harmonise, or at least simplify, the use and the delivery process of DIC for military transport aircraft within the EU, eventually expanding that harmonised mechanism to non-EU Member States. It is also working on establishing a single (permanent) DIC arrangement amongst Member States, creating one European procedure and document usable for EU operations and missions. In addition, the AHWG

DIC is clarifying and harmonising the treatment and the mechanism of civil clearances, commercial rights and/or DIC for commercial aircraft on military missions. Finally, the third working group, the AHWG Tactical Air Transport (TAT), is looking at improving operations and training issues at the operator's level. To attain this, participants are identifying common issues and problems encountered as well as lessons identified in recent operations and training missions and looking for solutions to solve them. The aim of this working group is to achieve a far reaching level of harmonisation and interoperability in the area of operations and training between airlift users as well as to elaborate short, medium and long term deliverables useful to the air transport community.

Airlift Training

While the fighter community has been trained extensively for years to operate together (e.g. Tactical Leadership Programme (TLP), Flag exercises, large NATO exercises in European airspace, etc.), the same cannot be said for air transport. In Europe today, airlift training is very much a national issue and since operating together becomes more the rule than the exception, the need to train together becomes bigger every day. Although a major step towards more combined training as well as harmonisation of airlift procedures and processes in Europe was the creation of the European Air Transport Command (EATC) in Eindhoven, all participants in the AHWG TAT are welcoming the initiatives developed by the working group to increase the opportunities to train together and to exchange best practices.[3] The current work strands of the AHWG TAT, described in more detail below, are a yearly European Air Transport Symposium and two flying events: European Air Transport Training (EATT), scheduled in 2012 and 2013, with the goal of creating a European Advanced Airlift Tactics Training Centre (EAATTC) in 2014.

The European Air Transport Symposium

The first European Air Transport Symposium was held in December 2010 at the EDA premises in Brussels while the second was held at the EATC facilities in Eindhoven in October 2011. The 2012 symposium

The EATF goal is to create a European Advanced Airlift Tactics Training Centre (EAATTC) in 2014.

is planned for October 24th and 25th in Prague. The aim of the symposium is to gather air and ground crews around the table to provide topical briefings on specific airlift issues, exchange views, lessons and experiences from operations and training as well as to brainstorm on possible solutions for identified problems. This symposium also provides opportunities for crews and other air transport specialists to network amongst the airlift community. One of the aims is also to speed up concrete solutions beneficial to all through the AHWG TAT. The latter can be illustrated by an issue identified at the 2010 symposium, the lack of air transport intelligence specialists. During discussions, one of the problems highlighted was the need to have more experts with specific air transport intelligence knowledge at squadron level to (de)brief the crews. To alleviate the shortfall it appeared that one of the only air transport intelligence courses was given at the Advanced Airlift Tactics Training Center (AATTC) hosted by the 139th Airlift Wing based in St Joseph, Missouri. However, this course was for US personnel only. Thanks to both the presence of AATTC instructors at the symposium and exchanges between EDA and AATTC an allied intelligence course was launched in November 2011.

Advanced Airlift Tactics Training Centre in Europe?

Created in 1984, the US AATTC has developed a variety of air transport courses, ranging from basic aircrew tactics and night-vision operations training to specialised classes for intelligence and electronic combat personnel. The overall objective is to increase the tactical awareness and proficiency of air transport crews in a combat environment. The demand for slots at the AATTC is very high and the number of allocated slots for non-US nations remains limited. Hence, after initial contact with AATTC and first brainstorm sessions within the AHWG TAT the idea of creating a European AATTC (EAATTC) quickly grew and, in fact, is close to becoming reality.

Initial investigation concerning potential US support for such a tactics course in Europe has been conducted by the EDA and showed a clear willingness of the AATTC to support. Two 'warm up' sessions for the EAATTC will be organised in 2012 and 2013 and will consist of a two week flying event. The first multinational air transport tactics training event is scheduled in Zaragoza, Spain from 4 to 15 June 2012. Six nations will participate. Belgium with a C130, the Czech Republic with a CN295, France with a C130, Germany with two C160s, the Netherlands with a C130 and finally Spain, as host nation, with a C130 and a CN295. Austria has already indicated its intention to send observers to EATT 2012 and will probably be followed by other Member States. In addition, the AATTC will send one or two instructors to provide support and advice.

The concept of operations of the future EAATTC has not yet been specified and issues like permanent or non-permanent location and staff, academic and flying course at the same location or not, legal framework, etc. will need to be agreed on as soon as possible between interested Member States. Moreover, some sensitive areas have already been identified: airlift experts being a scarce resource creating a new entity with permanent staff will probably have no big support from Member States. Therefore human resources working in existing agencies and organisations dealing with air transport (EDA, EATC, EAG) should be (initially) used to build up the EAATTC.[4] From an infrastructure point of view potential locations to host this EAATTC should be investigated as soon as possible and the appetite of the Member States to host exercises/courses will be looked at in parallel with existing possibilities (EATC, TLP). To convince the Member States to invest in this EAATTC, besides operational benefits, good business cases will have to be established to clearly demonstrate the extent of the financial effort to be made. Finally, due to weather and airspace constraints creating a flying course in Central Europe is very unlikely.

Summary

By launching the European Air Transport Fleet Member States have clearly expressed their political will to increase the airlift provision within the EU. The aim is to have the optimal use of available and future capacity, assured through wide ranging coordination and exchange mechanisms, including exchange of flight hours, air-to-air refuelling and support services. However, the road ahead is still a long one and lots of challenges need to be overcome. Hence the military willingness to tackle them and to continue to harmonise tactics, techniques, procedures and processes will have to be kept high in order to reach the end goal of this lengthy, but necessary evolution. ●

1. Common Security and Defence Policy.
2. Austria, Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Greece, Italy, Lithuania, Luxembourg, the Netherlands, Poland, Portugal, Romania, Slovakia, Spain and Sweden.
3. The EATC is a multinational headquarter created by Belgium, France, Germany and the Netherlands exercising an operational command on their airlift assets.
4. European Air Group (EAG): international organisation comprising the Air Forces of seven European nations (Belgium, France, Germany, Italy, the Netherlands, Spain and the United Kingdom) looking at identifying realistic ways to improve the operational capability of its members.

Lieutenant Colonel Laurent Donnet

is in the Belgian Air Force working in the European Defence Agency (EDA). His duties include dealing with strategic air and sea lift. He joined the Royal Military Academy in 1985 and graduated as a military pilot in 1990. Afterwards, he flew as a fighter pilot in the F-16 recording over 2,100 flight hours. Throughout his career he served in several positions, including squadron commander. He participated in operation ALLIED FORCE in 1999 and was commander of the first Belgian F-16 detachment in Kabul, Afghanistan in 2005. Before joining the EDA he worked at the Strategy Department of the Belgian Joint HQ as a subject matter expert.

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Monument dedicated to the Heroic Airmen of the Deblin 'School of Eaglets,' Deblin, Poland.

The Polish Air Force Academy (PAFA): Then and Now

Interview with Brigadier General Jan Rajchel, Commandant Polish Air Force Academy

Would you please give us a historical overview of the Polish Air Force with some of its traditions and a brief history of the 'School of Eaglets' in Dęblin?

First of all, I would like to say that the history of the Polish Air Force is very long and goes back to the end of World War I. It is full of tradition, significant dates and challenges depicting difficulties of the situation of Poland desperately trying to regain its independence after being torn apart by European powers for more than 100 years. Recently we celebrated 90 years of Polish military aviation. The first organisational efforts regarding military aviation formation were made in 1918. Initially, the Technical

Department of the Ministry of Military Affairs took over military aviation and the official sign of the Polish Air Force was accepted by the Chief of General Staff of the Polish Military. By the end of WWI, attention was put on creating a modern military aviation organisational structure.

It should be noted that the creation and development of the new military service at that time was strongly supported by France who provided technology and personnel to the newly born Polish Military. Under the umbrella of all military aviation development processes, the establishment of the Lower School of Aviation in Dęblin occurred in 1920. At first, the school was designed to prepare flight and technical personnel for military aviation duties. Unfortunately, this educational institution did not expand due to the Bolshevik offensive that threatened Dęblin and its vicinities. The foundation of the pilot training in Dęblin, however, had already been laid. Finally, on the basis of the decision taken by the Ministry of Military Affairs in November 1925, the Officers School of Aviation was established. Originally based in Grudziadz, it moved to Dęblin in April 1927, making the Polish Air Force Academy one of the oldest military aviation schools in Europe. The school provided training and expertise for pilots and aviation 'spotters/observers'. Today, these specialists are known as communication and navigation officers. Between the two world wars, the school contributed vastly to the process of aviator preparation. From 1925-1939 almost 1,000 specialists graduated from the school. During the first days of WWII, the infrastructure of the school was totally destroyed by Luftwaffe aircraft. Its graduates were immediately deployed and went into combat operations world-wide taking part in heavy fighting over Poland, Great Britain, Africa and the Middle East. In many instances they became heroes known the world over. On April 26, 1945 the Eaglets returned to their nest and the 'School of Eaglets' started its operations quickly.

In 1968 the 'School of Eaglets' was awarded the status of a higher education institution and has since been operating/functioning in accordance with the Higher Military Education Act. In 2005, adhering to new regulations, and based on the decision rendered by the Polish Parliament, the Polish Air Force Academy started its operations; meaning it became one of the Polish higher vocational schools subordinated to the Ministry of Defence. The new legal basis and the new regulations allowed civilian students the opportunity to study at the Academy.

Specifically, looking at the Polish Air Force education and training system, what is the role and importance of the Polish Air Force Academy in preparing personnel for service in the military?

In answering this question it has to be emphasised that the Polish Air Force Academy plays a key role in preparation of personnel not only for the Air Force but for other services of the Polish Military as well. Today, we have implemented a mixed, academic/vocational education system for pilots, navigators etc. With over 5 years of studies our graduates are awarded the title of Master of Science (MSc) with the aviation education on the level of the 3rd class AF pilot (depending on the specialisation). In accordance with recent changes to Polish Law, we also offer our students a four-year program of studies. These graduates are awarded a Bachelor of Arts (BA) degree with emphasis on vocational training.

As mentioned earlier, the PAFA is the only higher military education institution in Poland providing training and education to all flight and navigation personnel of all services in the Polish military. This includes Air Traffic Control (ATC). Additionally, we provide development training for all functional areas of Polish military aviation with various vocational courses. Four or five years of studies at the Academy (one or two years of courses) provides not only military education for the candidates of different services but also serves as a timeframe within which our cadets are given a solid portion of academic (technical) education in line with similar institutions worldwide. This is also when the soldiers' core values and airmanship are developed. The PAFA is also an organisation that provides training and expertise to personnel already deployed in different operational units within the country. We host up to 2,000 participants with our developmental courses each year.

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The PAFA developed a modern ATC Training Centre utilising simulators like this one.

The Academy is a specialised organisation within the Polish military providing not only professional military training but civilian (regular academic) education as well. In its structure, as mentioned, the Academy has four functional organisations certified by Polish and European authorities such as EUROCONTROL, International Civil Aviation Organization (ICAO) or Polish Air Navigation Services Agency (PANSA). The ATC Training Centre graduates are awarded civilian certificates recognised throughout Europe.

In summary, the PAFA offers full-time and part-time undergraduate and graduate study courses in Aviation and Aeronautics for military pilots, avionics specialists and ATC personnel as well as full-time and part-time undergraduate courses in National Security. The PAFA conducts courses for civilian university graduates who wish to become members of the Air Force. Students can qualify as military pilots, navigators, aircraft maintenance specialists, air traffic controllers, meteorologists, communications or air defence specialists. Having graduated from a course, cadets are commissioned as 2nd Lieutenants. The PAFA offers full-time undergraduate studies in Aviation and Aeronautics for military pilots, navigators and air traffic controllers. Military studies are administered for candidates seeking a permanent military career. The PAFA still undergoes structural and functional changes to meet growing demand for the contemporary military education. For instance, the PAFA offers internationally recognised educational programmes and syllabuses; common English language based modules and is open to all international co-operation initiatives.

We actively participate in many international and domestic aviation focused conferences, symposia and forums. We co-operate with EUROCONTROL, PANSA, the Institute of Navigation (ION), the Oxford Intensive School of English (OISE) in Bristol, UK and a number of other academic institutions providing pilots and aviation ground personnel training and education. On November 15th 2011, we hosted the conference

'Pilot Training and Education – Challenges and Risks,' gathering top decision makers, Commanders from the Polish Air Force and guests from abroad who represent Military Academies and Universities.

What is the future of the Polish Air Force Academy and what changes do you see in future training requirements?

The present structure of the military higher education system in Poland is under review. According to some experts the system consists of too many educational institutions and should be limited to one or two military academies at the most. Never-the-less, I hope the idea of closing the Academy or downgrading its accreditation is not accepted by leaders making decisions on the future of the Polish Military Education system; especially when the role of the Air Force in contemporary conflicts is growing in importance. It is all about politics, but from our perspective we are continuing to develop and share best practices with the future of the Polish military in mind. We recently submitted a new concept of aviation training and education to the Ministry of Defence. Our proposal consists of two modules, the first one is exclusively academic education and the second is aviation training and education for a specific type of aircraft or helicopter. Moreover, within the theoretical part of training we decided and proposed to include the award of certain civilian certificates related to the future profession of our graduates. After 7 semesters of studies, our graduates shall obtain a degree in engineering, the Private Pilot License (PPL) for a fixed wing aircraft or helicopter and an Instrument Flight Rules (IFR) certificate. The most significant change will be introduced in the scope of military transport aviation. Pilots who are to operate transport aircraft will be obliged to complete the Airline Transport Pilot License (ATPL) training certifying their ability to fly this type of aircraft. As a result of these changes, we expect our graduates will be awarded civilian certificates and be provided with more than 300 flight hours.

Poland is a member of both NATO and the EU. With respect to Air Force training and education, what does the Academy contribute to the international community? What advantages and disadvantages do you see with community involvement?

Since joining NATO and the EU numerous military educational institutions in Poland started to search for opportunities to get involved in a partnership with other organisations responsible for educating and training different groups of cadets. The PAFA joined the European Air Force Academy (EUAFA) Commanders Conference in 2005. This was not a conference, as such, but a forum with a defined Framework of Work. The basic document focusing all member states Air Force Academies cooperative efforts on the provision of mutual aid in the field of cadets and instructor exchange. The idea is to share expertise and training programmes as well as development of common educational modules. In 2009, the PAFA held the conference chairmanship and organised annual meetings and the final Commanders Conference with the aim

to develop new ideas and commonly agreed initiatives related to the enhancement of educational processes and preparation of educational modules for the exchange of cadets and instructors between Academies. All academy partners within EUAFA intensified their efforts and each year we can profit from new developments of the forum. Developments include a new web-based platform, used as a common tool for information exchange, and a number of catalogues published electronically to make students/cadets familiar with new exchange opportunities. Other initiatives include research projects and English language based vocational training modules organised for foreign cadets by EUAFA members.

How did the Academy prepare itself to be a partner to other European Air Force educational institutions? Would you walk us down the path to accreditation?

The Polish Air Force Academy is a higher military education institution that continuously prepares itself to partner with other European Air Force Academies. A number of structural changes, development of new English based training modules, creating new functional areas and training centres will allow our Academy to receive foreign cadets for years to come. Recently, we created a state of the art Aviation Training Centre furnished with modern simulators of various types used in the screening phase of training. We also purchased a number of new training aircraft (Diamond 20). For training ATC personnel, the PAFA developed a modern ATC Training Centre offering training and expertise to cadets or civilian personnel in the field of Air Traffic Management. The Centre is certified by EUROCONTROL, the European control institution, so training activities and certificates are well recognised throughout Europe.

The Academy is also prepared to provide training for Forward Air Controllers (FAC). The FAC Training Centre has been in place for four years. A number of vocational course participants from abroad have already accomplished specialised training at the Academy in Dęblin. The PAFA received EUROCONTROL certification for 'Aviation English' courses and for English Language Proficiency for Aeronautical Communication (ELPAC) standard courses/examinations as well.

Clearly, the number of initiatives and different efforts to attract foreign students to the Academy are significant. In establishing our academy, we envisioned alignment with the Bologna Treaty[1]. We implemented the European Credit Transfer System and are looking forward to new initiatives such as the European initiative for the exchange of young officers inspired by EuRopean Community Action Scheme for the Mobility of University Students (ERASMUS). Military personnel and civilian educational staff actively participate in these forums trying to walk the path defined by all EUAFA members. Not only are they exchanging ideas, but trying to implement best practices.

Sir, thank you for your time and your comments.

1. The Bologna Treaty, signed in 1999 by the Ministers of Education of European countries, aims for easier understanding and access to European education systems by students and researchers.

Brigadier General Jan Rajchel

graduated from the Polish Air Force Academy in 1988 specialising in the MiG-21. Upon completion, he performed duties as a fighter pilot with the 41st and 2nd Air Force Fighter Regiment. In 1994 he completed studies at the National Defense University in Warsaw. From there General Rajchel moved to Malbork signing into the 41st Tactical Air Force Squadron. He then served at the 23rd Air Base in Mińsk Mazowiecki flying the MiG-29. At the completion of his dissertation in 1998, he was awarded a PhD in military science and tactics. After numerous commander and post graduate courses in Warsaw, General Rajchel was given the duties as Commander of The Polish Air Force Academy in 2007.


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Mass Migration and Financial War

New Challenges for Air Power?

By Lieutenant Colonel Francesco Turrisi, ITA AF, JAPCC

The U.N. report, "2010 Revision of World Population Prospects," projected there would be 10 billion people on the planet by 2100[1].

At the same time we can foresee a number of problems, such as lack of essential resources or climate changes that are bound to increase a phenomenon associated with humans: migration. We need to distinguish between 'controlled' and 'uncontrolled' migration. The first is positive, as it tends to balance a demographic discrepancy of the Earth's North–South divide[2]. The second is negative due to various reasons (magnitude, integration, sustainability etc.).

Today we are facing the problem of the uncontrolled migration in a context different from the past due to the worldwide economic globalisation that could transform a small scale crises (Greece for instance) into a global economic crises. We live in a world, from a social-economic perspective, unstable where financial problems could impact severely on social problems such as migration.

The aim of this article is to highlight the potential implications and risks that a 'financial war' could have on uncontrolled mass migration and Air Power. It is no exaggeration to state that we are already in a period of perpetual 'financial war' waged not just by governments but also by global corporations and private citizens. NATO needs to be more aware of this financial war and its possible implications. The response to economic crises is often to seek self-protection through a degree of isolationism and limiting the exposure of financial capital in the nations most affected. This can

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have disastrous consequences, particularly in weaker economies that are heavily reliant on foreign investment and can lead to total economic collapse and effective failure of the state. Mitigating this risk normally relies on diversification, whether at the level of the state or the individual. This is a luxury affordable only to large players such as the US, Europe and Asia. Africa, by contrast, often finds itself in both a marginalised and highly vulnerable position due to the fact that its economy is designed around the needs of the global north.

The question is: What challenges might NATO face as a consequence?

Presently, the Horn of Africa is going through a period of dramatic challenges caused by a serious lack of essential resources such as food and water. A worsening of the situation could trigger a phenomenon difficult to control such as mass migration, in the magnitude of hundreds of thousand or even millions of people. In such a context, it isn't too difficult to imagine NATO in a role alongside the UN, due to its ability to operate in such difficult conditions. At the same time it is necessary to investigate the skills/capacities required to face this potential migration properly. At this point it is useful to step back and try to understand who the actors are in this 'financial war' and why the outcome will mainly occur on the African continent.

The Main Players

The current financial crisis is challenging the existing world order. First of all it is necessary to point out that today the leading roles, in contrast to the recent past, are held by nations which have economic superiority rather than military superiority. This is incredible as for the first time since World War II the world is questioning the United States' role as a global-leader. The worldwide financial flow runs through an imaginary line that starts in the United States, goes through Europe and ends in East Asia, highlighting a US-China key economic relationship. It is important to note the current relationship between these two giants is of deep economic interdependence. China has an economy (at least presently) completely focused on outside needs and owns, thanks to the enormous income obtained using aggressive exchange rate policies, a significant portion of US public debt[3]. China, therefore, cannot abandon the dollar without drastically impacting its own economy. This is a condition that binds the two giants together for better or worse. In other words, if the US gets into a crisis, so does China. On the evidence that the US has been facing an economic crisis since 2008, is China heading for a similar fate?

The Third Wheel

The financial war, as already stated, is fought between the US, Europe and Asia, and apparently does not affect the global south of the world. I say apparently because in reality the 'outcome' in some areas of the world is not easily identified. Gross Domestic Product (GDP) is a concept not applicable to people not taking part in the global financial mechanisms, for example people or ethnic groups of Sub-Saharan Africa, etc. The underdevelopment of a large part of Africa has a

variety of reasons (geographic, health, history) but certainly the complete dependence of the economy on the needs of the global north is an essential element for understanding the effects of a global crisis. In general, the African continent produces raw materials for the foreign market; the intermediate processes of transformation do not exist. Similarly there is a lack of agricultural diversification (production is limited to a few goods like coffee, bananas, tea, cotton, cocoa and so on). In summary, the market does not exist, neither does any industrial capability. Therefore a drop in global demand for diamonds, cotton, coffee, etc., translates into fewer resources, which in Africa means less food and drinking water.

The Domino Effect

The human being has always shown a propensity for migration, directly linked to the conquest of new territories and social improvement. Particularly interesting is the case of the barbarian invasions that contributed to the fall of the Roman Empire. One of the triggering causes of the barbarian invasion must be sought in the phenomena of instability born in the Central Asian steppes, which effectively created a 'domino effect' that, pushed neighbouring populations, usually peaceful and integrated into the Roman world, to invade the empire. The potential phenomenon of mass migration may thus have the potential to trigger such a domino effect once again. Currently the bulk of migration occurs within the African continent, from the Sub-Saharan area to the periphery, but in the coming years we can foresee an increase in flows that could trigger social tensions in the states of the Maghreb and the Middle East. This mixture could be explosive.

NATO: To Be or Not to Be

In the last fifteen years events have clearly highlighted a new role for NATO that goes well beyond that which was originally conceived. The most recent example is the Libya campaign. In the near future, given the growing instability, we can imagine further examples of the novel employment of NATO forces. But what would be the use of NATO forces in a context of 'mass migration'? Much will depend on the choices made by the international community and on pre-emptive political actions.

If we analyse what has happened in Europe in the last decade, we see the problem of immigration handled on the spur of the moment, ranging from positions of extreme tolerance to strict restrictions. Considering internal problems the EU is facing (currency crisis, internal political division etc.), it will be very difficult (if not impossible) for Europe to implement preventative strategies. Instead it is likely to adopt reactive policies on a case-by-case basis. However, taking into account the assumptions and geo-political analysis made so far, the most likely employment of NATO forces will be the control of border crossings, hosting protected population groups (refugees) and countering irregular (clandestine) operations. At the same time we will have to implement those activities aimed at limiting phenomena associated with migration, such as illegal trafficking, human trafficking, terrorism, etc. It is clear that such a complex situation can be addressed only within a 'comprehensive approach', planned well in advance. The Armed Forces must be examined from a balanced perspective and not just a military one. Areas such as personnel and technology need to be considered. Also, focus should be given to infrastructure along borders and working with agencies already established for border security. The ability to deploy to critical 'hot spots' will need improving. Legal boundaries need to be well defined. The use of intelligence assets at the tactical and strategic level will have a leading role. Adequate logistics to move personnel and equipment rapidly to inaccessible areas is essential.

Airpower: What is Next?

At this point let's investigate the role of Air Power as mentioned above. Air Power is "The capacity and ability to project Air and Space Power to influence the behaviour of people or the course of events."[4] This UK definition, accepted by many countries, allows us to understand the importance of controlling the third dimension in the context of 'mass migration'. The element most relevant is the capacity to influence the course of events. If we want to be effective, we must anticipate situational development. In other words, we must shape future Air Power by directing it to the desired effect.

The industrial process that leads to the creation of a weapon system, such as with the Typhoon and Joint

Strike Fighter, is terribly long. This should be reviewed in light of current and future crises. In a perfect world Air Transport, both fixed wing and rotary, should be increased in numbers. If economic reasons prohibit an increase, there should be serious thought of initiating the concept of mixed fleet (tactical and strategic). Currently, at the European level, the importance given to this sector is not appropriate to face future needs. This condition is evident in the lack of integration (fixed and rotary wing assets typically respond to different commands) and joint training. We are observing the total number of platforms decreasing day-by-day due to policies of having fewer but more advanced assets. If we continue to favour quality versus quantity we could, potentially, lose the ability to operate simultaneously in several areas. This unfavourable condition is noteworthy in the context of 'mass migration' due to the potential large areas of intervention.

Intelligence, Surveillance, Target Acquisition, and Reconnaissance (ISTAR) will surely play a key role (platforms, sensors and satellites) with 'mass migration'. The challenges of the future are more and more focused on preventing, rather than fixing situations that have already developed[5]. We are limited by the economic crisis which plagues many national defence budgets. We need to find cheaper solutions in addition to high-tech war fighting. Some less costly alternatives are safe and adequate in permissive environments (for example some areas of the third world).

ISTAR investments should focus more on sensors than on specific platforms. Specific abilities with strategic relevance are:

- Language Recognition
- Human Detection: Cluttered Environment
- Facial Recognition
- Change Detection: Man-Made

Maintaining adequate aerospace superiority/supremacy will be a necessary condition to guarantee an appropriate military response necessary to prevent phenomena potentially associated with uncontrolled migration such as terrorism, illegal trafficking, etc. The ability to accomplish a mission precisely and quickly, will guarantee pre-emptive control in situations of instability linked to the crisis scenario. To

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have national technological supremacy directly bonded to the concept of Air Power, however, is probably too expensive. Only close cooperation between the Alliance partners will reduce that economic burden. We should move from a state of interoperability to one of interdependence, avoiding redundant repetitions.[6]

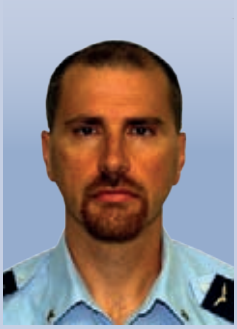
Conclusion

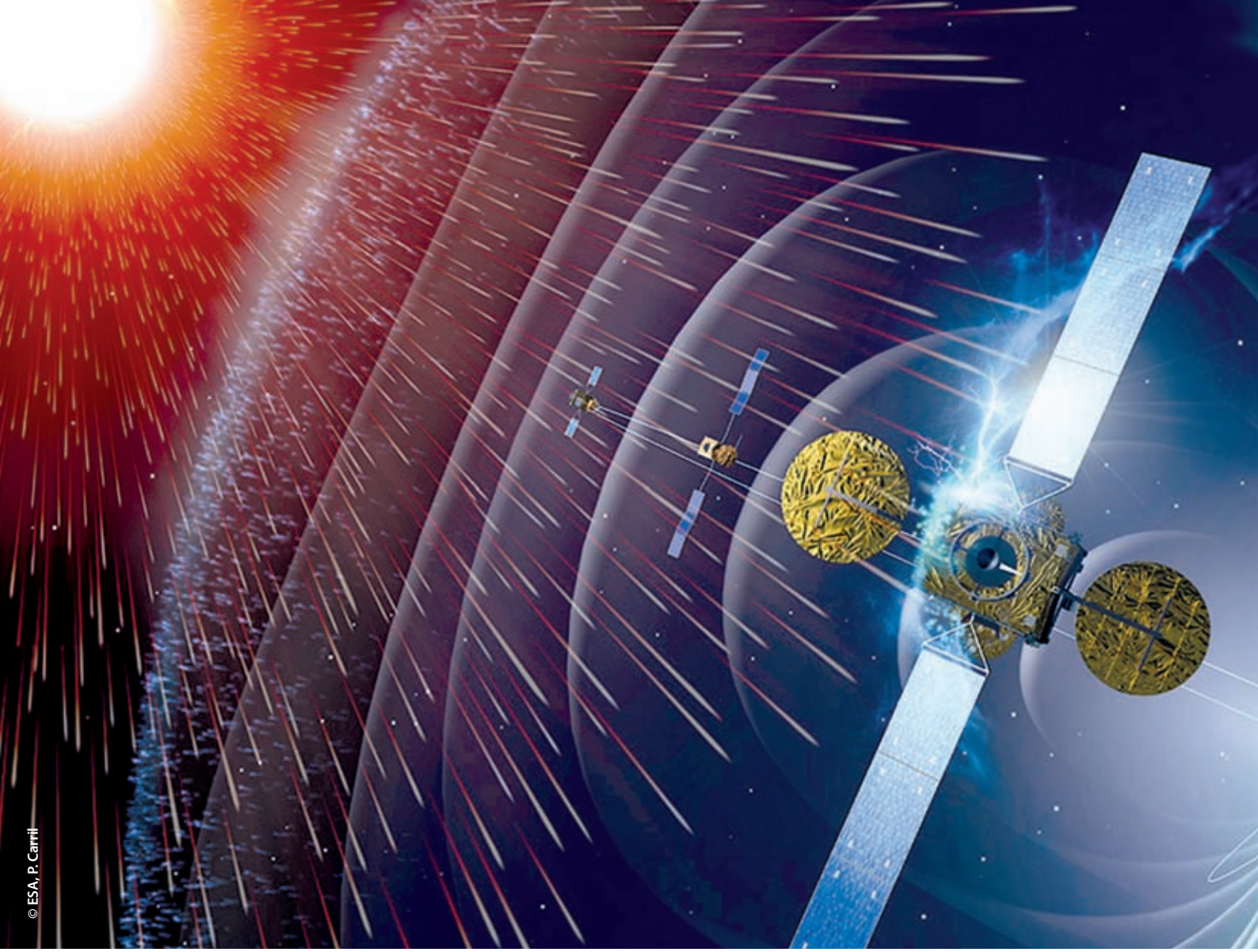
With financial warfare we have witnessed, recently, a new kind of war. In some ways this is more subtle than conventional wars of the past. The most vulnerable, with the biggest potential of loss is Africa. In reality, financial warfare could trigger a series of geo-political scenarios, amongst which could be the escalation of immigration to the European continent. In this context, NATO, being probably the only entity having the resources to support the UN, will play a vital role in the stability of the region. Employing NATO forces, however, is a complex task involving a review of strategic choices, interdependent management and combined training. There are also legal implications. In times of economic hardship and global instability it's important to highlight how the choices of today will affect the results of tomorrow. ●

1. www.un.org
2. "Economists talk about the North–South divide when referring to the economic growth and development of nations. The developed, or industrialized, countries, most of which are in the northern hemisphere, are referred to as the North. The developing countries, which are economically underdeveloped to varying degrees, are referred to as the South." http://www.pollutionissues.com/Pl-Re/Poverty.html
3. www.usgovinfo.com, www.wikipedia.com
4. UK MoD AP3000 Ed.4.
5. JAPCC conference report 2011.
6. IBID.

Lieutenant Colonel Francesco Turrisi

joined the Italian Air Force Academy in 1988 and holds a degree in Aeronautical Science. He operated the Tornado Interdiction-Strike for almost 13 years covering various responsibilities up to the level of package leader and tactical instructor. As a WSO he participated in several operations including Joint Endeavour in Bosnia (1996) and Allied Force in Kosovo (1999). He also deployed to Bosnia as an Air Force Liaison and Afghanistan as Coordination Officer at ISAF HQ in Kabul. In October 2002 he moved to Florida as a navigator instructor on the T-39. In 2008 was assigned to the Air Training Command in Bari, working with the new T 346 MASTER advanced trainer. He has been a member of the JAPCC since August 2011.





A Fool too Late

Recognising Space Dependency

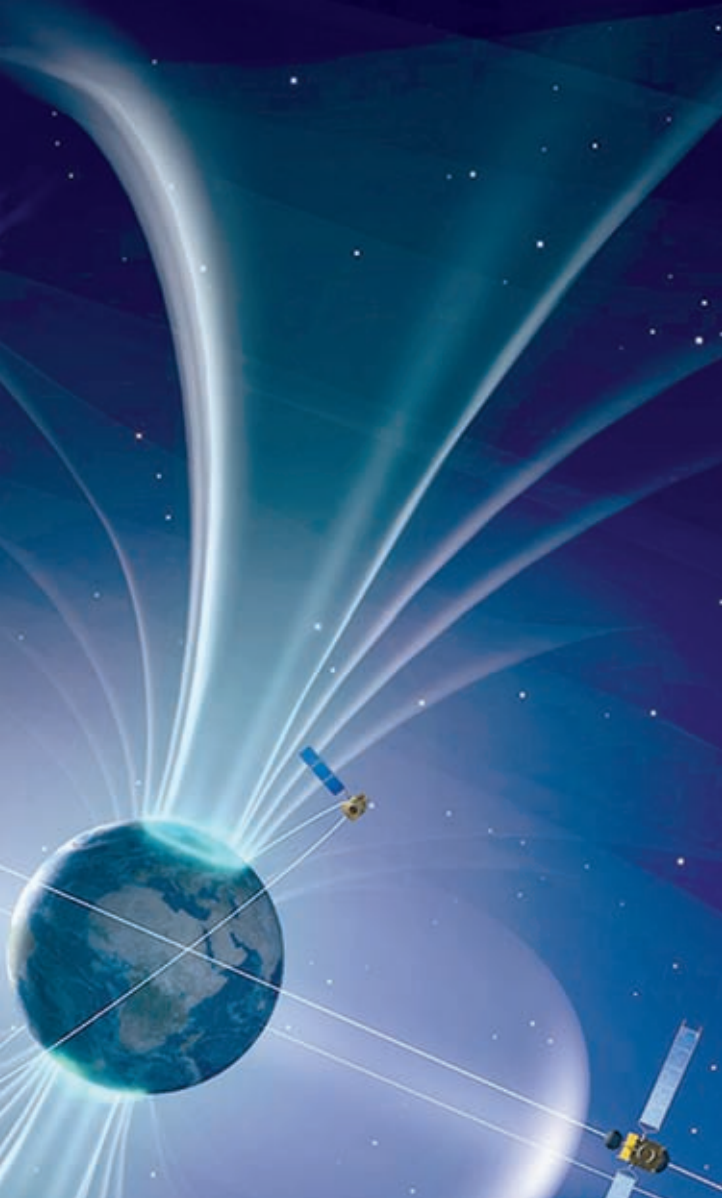
By Lieutenant Colonel Edoardo Meacci, ITA AF, JAPCC

Consider the following scenario: Flying over Libya, in my fast jet close to Mach speed: watching outside and consulting my NAV aids, everything is so fast. My brain after so many years is used to this compressed view and I feel good and safe thanks to my aircraft's instruments. Over me a blue sky, the cold 'unknown' environment of Outer Space, so far from daily life where everything is moving far faster than my jet.

But now back to my task, Time On Target (ToT) fixed, recovery point and route established, transponder rotational codes as fragged, Link-16 synchronised, Have Quick properly working, Situational Awareness (SA) from AWACS clear and stable – no bogeys, no bandits around! It's amazing how much useful hardware and software I have and I need.

Mission accomplished! Now back to my KC-135 tanker, and then inbound to Trapani. But, the rendezvous should have been around here, my MIDS lost the time synchronisation and the position information looks to be incorrect! I need my refuelling boom … ASAP!

Time sync and/or GPS signal lost? How did this happen?



Space Dependency?

Do we realise the critical role played by Space in our lives? Do we have a 'Space dependency'? What would happen if support of Space assets were lost for a day, a week or longer? Are we prepared for this kind of event and how would it impact the conduct of our daily activities? Will this 'degradation' affect only the military world or the civilian one as well? Is this an unrealistic scenario?

Many scientific discoveries and technical developments have occurred since the first man-made object was launched into Space. Now, over 50 years later, vast numbers of man-made objects populate Space immediately surrounding the Earth, and this 'unconquered territory' is relevant and constraining to many human activities. Space-based assets provide us with Position – Navigation – Timing (PNT) capabilities, communications and data transfer (clear & encrypted) and imagery products (visible & invisible spectrum) for both military and civilian purposes.

In solving some of the technological challenges of the 20th century, we have also made our military operations absolutely dependent on enabling capabilities like integrated Command and Control and telecommunications (voice, media and data). Would it be possible to achieve our objectives in modern day missions like Operation UNIFIED PROTECTOR (OUP) with only the capabilities of our grandparents? Consider the following:

- Would our pilots be able to fly over the ocean, or to meet a tanker to get 'oxygen' and push forward to the target without a GPS signal?
- Would our controllers be ready to work without time synchronisation for their encrypted radios?
- Would our pilots be able to use a LORAN (Long Range Navigation) system if they could find an operational one?
- Would it be possible to locate troops in contact or a lost pilot, identify and communicate with them without enemy knowledge or interference, over long distances?

We need the latest satellite picture to know exactly where the troops and/or pilots are and to evaluate all possible threats (both physical and electromagnetic). Today it is important to know the weather forecast in the operational area, and accurate Space Weather (SW) predictions are essential in order to get support from our assets to achieve mission success. Is it possible to replace all essential assets in a short time? The handling of such a catastrophic event will be dramatic. If the Space environment became unworkable and uncontrolled, the financial burden to recover from the disaster could be unaffordable. The Space environment and Space capabilities are vital for our military & civil ground based technologies and for our modern way of life.

Can It Happen?

The scenario above is not unrealistic. Unfortunately, the degradation of a satellite or the loss of a Space asset with service disruptions have already occurred in

NOAA Space Weather Scales

Category		Effect	Physical measure	Average Frequency (1 cycle = 11 years)
Scale	Descriptor	Duration of event will influence severity of effects		
Geomagnetic Storms			Kp values* determined every 3 hours	Number of storm events when Kp level was met; (number of storm days)
G 5	Extreme	**Power systems:** widespread voltage control problems and protective system problems can occur, some grid systems may experience complete collapse or blackouts. Transformers may experience damage. **Spacecraft operations:** may experience extensive surface charging, problems with orientation, uplink/downlink and tracking satellites. **Other systems:** pipeline currents can reach hundreds of amps, HF (high frequency) radio propagation may be impossible in many areas for one to two days, satellite navigation may be degraded for days, low-frequency radio navigation can be out for hours, and aurora has been seen as low as Florida and southern Texas (typically 40° geomagnetic lat.).**	Kp=9	4 per cycle (4 days per cycle)
G 4	Severe	**Power systems:** possible widespread voltage control problems and some protective systems will mistakenly trip out key assets from the grid. **Spacecraft operations:** may experience surface charging and tracking problems, corrections may be needed for orientation problems. **Other systems:** induced pipeline currents affect preventive measures, HF radio propagation sporadic, satellite navigation degraded for hours, low-frequency radio navigation disrupted, and aurora has been seen as low as Alabama and northern California (typically 45° geomagnetic lat.).**	Kp=8	100 per cycle (60 days per cycle)
G 3	Strong	**Power systems:** voltage corrections may be required, false alarms triggered on some protection devices. **Spacecraft operations:** surface charging may occur on satellite components, drag may increase on low-Earth-orbit satellites, and corrections may be needed for orientation problems. **Other systems:** intermittent satellite navigation and low-frequency radio navigation problems may occur, HF radio may be intermittent, and aurora has been seen as low as Illinois and Oregon (typically 50° geomagnetic lat.).**	Kp=7	200 per cycle (130 days per cycle)
G 2	Moderate	**Power systems:** high-latitude power systems may experience voltage alarms, long-duration storms may cause transformer damage. **Spacecraft operations:** corrective actions to orientation may be required by ground control; possible changes in drag affect orbit predictions. **Other systems:** HF radio propagation can fade at higher latitudes, and aurora has been seen as low as New York and Idaho (typically 55° geomagnetic lat.).**	Kp=6	600 per cycle (360 days per cycle)
G 1	Minor	**Power systems:** weak power grid fluctuations can occur. **Spacecraft operations:** minor impact on satellite operations possible. **Other systems:** migratory animals are affected at this and higher levels; aurora is commonly visible at high latitudes (northern Michigan and Maine).**	Kp=5	1700 per cycle (900 days per cycle)

* Based on this measure, but other physical measures are also considered.
** For specific locations around the globe, use geomagnetic latitude to determine likely sightings (see www.swpc.noaa.gov

Solar Radiation Storms			Flux level of ≥ 10 MeV particles (ions)*	Number of events when flux level was met**
S 5	Extreme	**Biological:** unavoidable high radiation hazard to astronauts on EVA (extra-vehicular activity); passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk. *** **Satellite operations:** satellites may be rendered useless, memory impacts can cause loss of control, may cause serious noise in image data, star-trackers may be unable to locate sources; permanent damage to solar panels possible. **Other systems:** complete blackout of HF (high frequency) communications possible through the polar regions, and position errors make navigation operations extremely difficult.	10^5	
S 4	Severe	**Biological:** unavoidable radiation hazard to astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk.*** **Satellite operations:** may experience memory device problems and noise on imaging systems; star-tracker problems may cause orientation problems, and solar panel efficiency can be degraded. **Other systems** over several days are likely.	10^4	3 per cycle
S 3	Strong	**Biological:** radiation hazard avoidance recommended for astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk.*** **Satellite operations:** single-event upsets, noise in imaging systems, and slight reduction of efficiency in solar panel are likely. **Other systems:** degraded HF radio propagation through the polar regions and navigation position errors likely.	10^3	10 per cycle
S 2	Moderate	**Biological:** passengers and crew in high-flying aircraft at high latitudes may be exposed to elevated radiation risk.*** **Satellite operations:** infrequent single-event upsets possible. **Other systems:** effects on HF propagation through the polar regions, and navigation at polar cap locations possibly affected.	10^2	25 per cycle
S1	Minor	**Biological**: none. **Satellite operations**: none. **Other systems:** minor impacts on HF radio in the polar regions.	10	50 per cycle

* Flux levels are 5 minute averages. Flux in particles$\cdot s^{-1} \cdot ster^{-1} \cdot cm^{-2}$ Based on this measure, but other physical measures are also considered.
** These events can last more than one day.
*** High energy particle (>100 MeV) are a better indicator of radiation risk to passenger and crews. Pregnant women are particularly susceptible.

Radio Blackouts			GOES X-ray peak brightness by class and by flux*	Number of events when flux level was met; (number of storm days)
R 5	Extreme	**HF Radio:** Complete HF (high frequency**) radio blackout on the entire sunlit side of the Earth lasting for a number of hours. This results in no HF radio contact with mariners and en route aviators in this sector. **Navigation:** Low-frequency navigation signals used by maritimeand general aviation systems experience outages on the sunlit side of the Earth for many hours, causing loss in positioning. Increased satellite navigation errors in positioning for several hours on the sunlit side of Earth, which may spread into the night side.	X20 ($2x10^{-3}$)	Fewer than 1 per cycle
R 4	Severe	**HF Radio:** HF radio communication blackout on most of the sunlit side of Earth for one to two hours. HF radio contact lost during this time. **Navigation:** Outages of low-frequency navigation signals cause increased error in positioning for one to two hours. Minor disruptions of satellite navigation possible on the sunlit side of Earth.	X10 (10^{-3})	8 per cycle (8 days per cycle)
R 3	Strong	**HF Radio:** Wide area blackout of HF radio communication, loss of radio contact for about an hour on sunlit side of Earth. **Navigation:** Low-frequency navigation signals degraded for about an hour.	X1 (10^{-4})	175 per cycle (140 days per cycle)
R 2	Moderate	**HF Radio:** Limited blackout of HF radio communication on sunlit side of the Earth, loss of radio contact for tens of minutes. **Navigation:** Degradation of low-frequency navigation signals for tens of minutes.	M5 ($5x10^{-5}$)	350 per cycle (300 days per cycle)
R 1	Minor	**HF Radio:** Weak or minor degradation of HF radio communication on sunlit side of the Earth, occasional loss of radio contact. **Navigation:** Low-frequency navigation signals degraded for brief intervals.	M1 (10^{-5})	2000 per cycle (950 days per cycle)

* Flux, measured in the 0.1-0.8 nm range, in $W \cdot m^{-2}$. Based on this measure, but other physical measures are also considered.
** Other frequencies may also be affected by these conditions.

URL: www.swpc.noaa.gov/NOAAscales

April 7, 2011

the past and the consequences were not marginal. There is no reason to suspect it will not happen in the future. Loss of Space assets occur for three different reasons: *natural, accidental, or intentional.*

Natural events typically refer to those that occur in the harsh environment of Outer Space. Satellites could be hit by a Near Earth Object (NEO) or small asteroid, or could be affected by solar activity. Our Sun continuously emits an immense amount of energy across the entire electromagnetic spectrum (including alpha, beta particles and gamma ray radiation) with ionising effects on both the magnetic and electric fields surrounding the Earth. Physical damage is also possible due to the intense heat from the Sun, geomagnetic storms originated by a solar coronal mass ejection (CME) or a high speed stream of solar wind. Such natural events happen more often than people realise but, fortunately, the most severe consequences are experienced on a relatively infrequent basis (The solar activity cycle normally takes 11–12 years). In our recent history, remarkable Space weather effects were observed in 1859, 1972, 1989 and 2003, with strong ground HF radio systems disruptions, difficulties in conducting routine control operations for many satellites, degradation and temporary shutdown of other assets[1].

Accidental events occur when our satellites are hit by Space debris, are involved in an accidental collision with another live satellite or through technical failures. Space debris is increasing and the problem represents a serious and demanding challenge. Like the environment on the Earth itself, the Space environment is becoming more and more cluttered. With the increase in Space junk and number of satellites (operational and not) occupying the limited orbital locations, the risk of accidental collisions will increase. In a worst case scenario, a major collision between satellites (such as the Iridium 33 and Cosmos 2251 impact on Feb. 2009) or between a satellite and a piece of debris could set off a 'chain reaction' as debris from the impact creates additional impacts, and hence more debris.

Intentional events may be linked to military operations or terrorist activities and could involve the use of:

· Ground/air-based weapons against targets in Space; and
· Orbiting weapons against other Space assets or ground-based facilities.

The mechanisms for interference and destruction of Space assets due to intentional events include:

· Orbital intercept;
· Signal disruption (via jamming and/or spoofing – Electronic Warfare);
· Destruction by conventional explosives;
· Destruction by nuclear explosives;
· Destruction by 'hit-to-kill' (kinetic-energy) weapons; and
· Destruction by directed-energy weapons (lasers, microwaves, etc.).

While the ability to conduct each type of attack already exists today, an expected increase in the percentage of so-called 'dual use' Space–based systems, (i.e. risk to economic interests) the high costs of assets and political consequences may actually reduce the probability of such an event in the future.[2] The most likely scenario in a future conflict would involve non-permanent interference (Signal Disruption) applied to deny or degrade services provided by a single or a few Space assets. While the intentional 'kill' of a single satellite would not interfere much with our life, it could have a critical impact on a military operation that may rely on that particular Space asset, due to its position, orbit and/or on-board capabilities.

The Consequences

Currently, many military activities are, in some way, linked to cyber and Space capabilities. For Command & Control, tactical voice and data links, we use time synchronisation and satellite repeaters. UAVs use satellites for data transfer and remote piloting of the vehicle itself. Without satellite imagery we could not get precise weather predictions. During mission planning, knowing the weather forecast in order to foresee and manage all phases of the mission is a must. A lack of communications and data-transfer, as we well know, will severely hamper our military operations.

The military and civil search & rescue communities depend on GPS. So do our mobile phone networks, SAT-TV connections, and computer networks which

depend on timing synchronisation provided by Space-based assets. The majority of our economic, social and military activities are linked together and the disruption of some Space assets' services could have a major impact.

We have already highlighted some technical consequences but what could be the effect on our daily life? Have you ever tried to get through the day at home without the TV remote control? What about managing your business without an internet connection or mobile phone network? Are we still capable of flying with a mechanical (gyro-based) inertial navigation system (INS)? What about our ability to use precision weapons? Many of us do not fully understand the extent to which modern society depends on Space-based capabilities.

We are not sufficiently trained to face Space related emergencies. We don't have emergency plans and we no longer invest in mechanical back-up systems. We often miss the correct comprehensive approach, waiting to react until after consequences occur. To be prepared for the future emergencies we need to instil a level of Space-Mindedness in all our personnel, which can be achieved only by increasing our knowledge, by training people and including Space events in all exercises.

We should increase international cooperation in order to share capabilities and synergies. We should build a NATO Space Situational Awareness (SSA) capability to augment our confidence and consciousness about what is 'flying' above us. We should strengthen our Space weather knowledge and predictions, in order to better monitor this environment and, finally, we must prepare back-up plans and systems. Thinking about Space as an operational domain is mandatory.

Today, Space is still relatively 'unconquered' territory, without rules and Standard Operating Procedures (SOPs), without borders and trenches. Unfortunately, we cannot afford to only hope that it remains uncontested. We are missing a NATO Space policy and strategy. Cooperation among Space faring nations is required.

Military operations, Commanders, military organisations, educational structure and policy makers need to focus on the importance of Outer Space. Our capabilities will continue to increase in sophistication, enabled by the Cyber & Space domains which are crucial for our future success. We cannot wait!

"A fool too late bewares when all the peril is past."
Queen Elizabeth I

1. For more information about Space weather, visit the NOAA website, where details about the sun cycle in progress are available (http://www.swpc.noaa.gov/index.html).
2. Space-based dual use system: a Space based asset with a set of technologies and applications that can be exploited for both civil and military purposes.

Lieutenant Colonel Edoardo Meacci

joined the ITA AF in 1987. He has a background in Air Defence where he served till 1999 as an AD Controller, AD Instructor and Mobile Radar Squadron Commander. Between 1999 and 2002 he was assigned to the Tactical Leadership Programme (TLP) in Belgium where he contributed as AD Specialist inside the Flying Branch. Prior to coming to the JAPCC, he spent his last 7 years in the 3rd Division of the Italian Air Staff where he dealt with Air Defense, Air to Air and Air to Ground training, Current Ops and Air Space Management and where he was, for the last 3 years, the Chief of Special Forces section. He is the Space SME of the Concepts and Development Branch.

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A Royal Air Force Euro Fighter Typhoon takes off in afterburner from RAF Fairford.

Air Power's Second Century: Growing Dominance or Faded Glory?

By Professor Philip Sabin, King's College London

In October 2011, we entered the second century of non-balloon air power. Fittingly enough, the first air power century ended as it began – with military aircraft operating over the wide expanses of the Libyan desert. Geographical coincidence apart, however, the two Libyan episodes offer a stark illustration of how far air power has come. In 1911, the handful of primitive aircraft had to be transported from Naples by ship, and their role was distinctly subordinate to that of the tens of thousands of Italian troops who bore the brunt of the conflict with the Ottoman forces. In 2011, by contrast, NATO's intervention was conducted almost entirely from the air and sea, radically changing the course of the civil war and leading to the downfall of the Gaddafi regime.

Many air power enthusiasts see such contrasts as indicating a growing dominance of aerospace power in warfare as technology develops. Twenty years ago in the wake of the 1991 Gulf War, US Air Force Colonel John Warden proclaimed that, 'The world has just witnessed a new kind of warfare – hyperwar. It has seen air power become dominant. It has seen unequivocally how defenseless a state becomes when it loses control of the air over its territories and forces. It has seen the awesome

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power of the air offensive – and the near impossibility of defending against it… We have moved from the age of the horse and the sail through the age of the battleship and the tank to the age of the airplane'.[1]

There is, however, another very different view of where air power stands as it enters its second century. According to this view, the best days of air power are actually behind it, notably in the total war of 1939-45. British General Sir David Richards said shortly before becoming Chief of the Defence Staff in 2010 that, "Conflict has moved on from the era of the tank and aircraft", and US General McChrystal in Afghanistan famously warned the previous year that, "Air power contains the seeds of our own destruction if we do not use it responsibly".[2] The clearest articulation of this pessimistic view is in Israeli historian Martin van Creveld's recent book *The Age of Airpower*. Van Creveld writes that, "Though the process did not unfold in the same way at all places, and though it has certainly had its ups and downs, seen in retrospect airpower has now been in decline for six decades and more".[3]

How can we decide which (if either) of these radically different interpretations holds the greatest truth? In these remarks, I will focus on four aspects of military strategy which I think can help us to resolve the controversy and develop a more balanced view. These four aspects are *predictability, flexibility, rapidity* and *survivability*. I will say a little about each of them in turn.

Predictability

Strategists routinely acknowledge how difficult it is to predict future crises, but this initial *caveat* is all too easily forgotten as they press on regardless to develop planning assumptions and force structures for the decades to come. We need a much deeper and more visceral understanding of how pathetically inadequate our predictive abilities really are, and there is no better way of developing this than to look back at how catastrophically flawed our past predictions have often turned out to be.

In 1988, I edited a book on *The Future of UK Air Power*, and the only real reason to consult this volume today is as a case study of exactly such failures of foresight.

My favourite example is General (now Lord) Charles Guthrie's chapter on battlefield air support, which began by asserting that, "After the year 2000, much on the Central Front will be similar to today. The conventional threat facing the Allied ground forces will be from mass: superior numbers of tanks and helicopters, supported by guns, rockets and aircraft, whose aim would be to roll over NATO forces and their reserves as quickly as they could".[4] As these remarks show, we completely failed to foresee the imminent collapse of the eastern bloc, just as we subsequently failed to predict Iraq's invasion of Kuwait, renewed ethnic strife in the Balkans, the September 11th attacks, the continuing insurgencies in Iraq and Afghanistan, and the current financial collapse.

It was this sheer unpredictability of future strategic events which led me to criticise General Richards' confident assurances in 2010 that high tech weapons platforms were obsolete because even state-on-state wars now involved irregular means such as economic, cyber and proxy actions instead of conventional conflict.[5] I also challenged assurances at a conference early in 2011 that public opinion in the wake of our bloody embroilments in Iraq and Afghanistan would not allow us to intervene abroad again even if we could afford to maintain the capabilities to do so. NATO's recent campaign in Libya has obviously cast both these predictions in a very different light.

We must resist the temptation to see the most recent conflict as the template for the future, and Libya is just as flawed as Afghanistan in this regard. The proper response to the sheer unpredictability of future crises is to study the past century of air power history much more broadly, so as to get a sense of the enormous variability of possible contingencies (including deterrent roles as well as those which led to actual armed hostilities). The best antidote to unwarranted confidence about the future is a broad awareness of the mistakes, complexities and reversals of the past.

Flexibility

If future crises really are so unpredictable, this places an even greater premium on flexibility as a core attribute of military forces maintained to address them. Air power proponents have long proclaimed such flexibility as a key strength of aerospace power. Although such claims contain a great deal of truth, we need to deconstruct the various component aspects of flexibility to get a more balanced sense of how uniquely flexible air power really is.

In terms of geographical flexibility, aerospace power does of course have enormous advantages, because its speed and reach allow it to switch its point of application and focus quickly at unpredictable crisis points without being tied down to a specific location as land forces tend to be. Operational flexibility across the various levels of conflict is another aspect where air power shines, because the impermanence of its presence over the conflict zone makes it politically easier to commit air platforms in ambiguous circumstances like those seen recently in Libya and Pakistan while also making it militarily safer to launch sporadic air raids than to risk a ground invasion of a more capable adversary (the classic case being the use of strategic air power as the leading edge of the Western counteroffensive against Germany and Japan in World War Two).

"The vaunted flexibility of air power is hence a rather more complex and double-edged affair than aerospace enthusiasts sometimes acknowledge."

When it comes to flexibility of effect, air power does not compare so favourably with surface forces. Here, the detachment of air platforms from the surface environment becomes a weakness rather than a strength, since it prevents air power from conducting more subtle and discriminate interactions such as searching inside woods, buildings, caves or boats, conversing with people, taking prisoners, training allies, and so on. Although recent developments in Intelligence, Surveillance, Target Acquisition, and Reconnaissance (ISTAR) capabilities and in precision munitions have radically improved air power's ability to observe wide areas and discriminately engage specific targets, there is little else that air power can

do to engage *with* the surface environment except through the inherently joint activity of transporting and inserting ground forces themselves.

Air planners also face very difficult trade-offs between flexibility and cost, especially in the current dire financial situation. Although the ideal solution in terms of the three dimensions of flexibility I have identified may be a manned fast jet equipped with the latest sensors and precision munitions, it is very hard to afford these in the numbers required. Putting them on aircraft carriers brings real benefits in geographical and operational flexibility but inflates costs still further, as seen in the UK's controversial decision to accept a gap in its own carrier capability. The lead times for major aerospace programmes are also now so long that the need for adaptability to face wholly uncertain strategic challenges becomes a vicious circle driving up costs even more – the jets used recently in Libya and Afghanistan were all designed decades ago in the very different context of the Cold War.

The vaunted flexibility of air power is hence a rather more complex and double-edged affair than aerospace enthusiasts sometimes acknowledge. Air power is in some ways much more flexible than surface forces, but in other ways it is less so. I will now discuss the implications of this further in terms of two more specific strategic attributes – rapidity and survivability.

Rapidity

One of the most distinctive characteristics of aerospace vehicles is their sheer speed – at least an order of magnitude faster than surface forces thanks to the lower frictional resistance of the air and space environments. At the tactical level, air operations are measured in seconds and minutes instead of the hours, days and weeks typical of surface clashes. However, this tactical rapidity can produce unrealistic expectations of rapid strategic effect, when in fact one of the most important attributes of aerospace power is how *different* its dynamics are at different levels of analysis. In ground warfare, principles such as using part of one's forces to pin the enemy, part to outflank them, and part as a reserve in case of contingencies apply whether one is commanding a platoon or an army group, but in air warfare the tactical skills of flying individual craft are fundamentally different from the overall application of air power at the strategic level.

Since air power (like sea power) usually depends on coercive or attritional mechanisms for its strategic effect, and since adversaries tend to be stubbornly resistant to giving in despite suffering considerable losses from air attack, it often takes longer than initially expected for air campaigns to prevail. World War Two, Korea and Vietnam provide classic instances of such disappointed expectations, and more recently in the Kosovo and Libya conflicts there was considerable

frustration as the days stretched into weeks and months without visible signs of progress from the air offensives. Ground forces, by contrast, can *sometimes* secure victory more speedily and conclusively through physical occupation of the crucial territory, especially when enemy resistance has been weakened by aerial bombardment. The defeat of Germany in 1945, the Six Day War in 1967, the Falklands War in 1982 and the Gulf War in 1991 are all obvious instances of fairly rapid ground force triumphs facilitated by the exploitation of air superiority.

The other side of the coin is, of course, that even rapid occupation of a country does not preclude the development of insurgent resistance which can bog ground forces down for years on end. This has been true throughout the air power era (as shown by the continued fighting in Libya long after 1912), but since 1945 it has tended to become the norm, as experience in Vietnam, the Middle East and Afghanistan clearly demonstrates. Iraq offers a classic illustration of the resulting dilemma – the no-fly zones and sporadic bombing raids in the decade after 1991 did not bring down Saddam Hussein's regime, but the 2003 ground invasion, despite its rapid 'conventional' success, triggered a prolonged insurgency which imposed vastly higher costs in blood and treasure. It is important for airmen not to raise false hopes that the tactical rapidity and military dominance of Western air power will produce rapid strategic effects, but recent experience clearly shows that ground force intervention may prove equally inconclusive as well as far more costly and entangling. This leads me to the final strategic issue I wish to discuss, namely survivability.

Survivability

Air power used to be anything but immune from the attritional losses suffered by armies and navies in the industrial era. Casualty rates for aircrew during the two World Wars were even higher than for their surface counterparts, and even in the Vietnam War, the USA lost 3,700 fixed wing aircraft and 4,900 helicopters across the course of the conflict.[6] One of the most striking strategic changes of the past few decades is the way in which superior air powers like the US and Israel have been able to avoid such losses even while engaging in intense or prolonged air campaigns. For a variety of reasons including technological change (especially the growing prominence of electronic warfare), air warfare has become increasingly asymmetric and one-sided, to the point where the victors in conflicts like Lebanon in 1982, Kosovo in 1999 and Libya in 2011 suffer almost no aerial losses whatsoever.[7] Much has been made recently of how unmanned air vehicles are 'revolutionising' air warfare by removing operators entirely from harm's way, but this is in fact only one component of the apparent invulnerability of Western fixed wing aircrew in recent conflicts.[8]

It might be thought that this very welcome development would be nothing but good news for Western air power, but in fact it has been something of a double-edged sword. It has bolstered what was already a very potent contrast in twentieth century images of military power, namely that, 'Aircraft observe and kill, while soldiers fight and die'. The new-found survivability of Western air power makes it seem rather unheroic and unfair, while the blood price paid by soldiers on both sides gives them greater political kudos thanks to the sacrifices and 'martyrdom' which they suffer. It is very telling that the recent conflicts in Iraq and Afghanistan are commonly perceived as 'ground wars' rather than as the quintessentially joint campaigns which they actually are.

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An A-10A Thunderbolt II aircraft flies over a target area during Operation Desert Storm.

British historian Max Hastings shares van Creveld's scepticism about the contribution of air power, and during the bitter inter-service debates preceding the UK's recent defence review, he wrote a newspaper article which captures perfectly this jaundiced and unheroic image of modern air power. In his words, "The nonsense of assuming parity between the three services must stop. The army's role is today overwhelmingly paramount. The other services perform important support functions, but they are not fighting forces in the same way… Admirals and air marshals, today bureaucrats in uniform rather than warriors, lack the perspective, knowledge and experience credibly to preside over the armed forces".[9]

The downside of the 'real fighting' which makes ground forces so politically prominent is, of course, that ground force losses have historically been the main motor causing nations to rethink their interventions and withdraw, as happened to the US in Vietnam, Lebanon and Somalia, the Israelis in Lebanon and the Occupied Territories, and the USSR in Afghanistan. Air power is not only much less vulnerable in its own right to such casualty-driven demoralisation, but it can markedly reduce the vulnerability of ground forces themselves during joint campaigns by providing intelligence, firepower and transport (including aeromedical evacuation). Tragically high though the losses in Iraq and Afghanistan have been in recent years, they are markedly lower than in previous such intense and prolonged conflicts, and unprecedentedly capable air support deserves significant credit for this improvement.

Conclusion

So is the second century of air power likely to be marked more by growing dominance or by faded glory? My conclusion on the basis of the four strategic aspects which I have explored is that there is truth on both sides of the debate. The technical capabilities of air power are indeed unprecedented, but costs are rising unsustainably and the face of conflict is changing in a way which makes the kind of military

triumph achieved in 1945 much less politically decisive. Dominant air power is no guarantee of victory in tangled politico-military conflicts like those in Vietnam, Lebanon and Afghanistan, and there are real debates over whether 'death from above' in the form of the targeted killings carried out recently by Israel and the US makes replacement leaders less effective or merely even more ruthless and intransigent. On the other hand, air power is an increasingly indispensable element of Western military operations as we seek to limit our liabilities and reduce our exposure to losses in what is still a vicious, dangerous and highly unpredictable world.

Asymmetric warfare is a challenge but also an opportunity for air power, since aerospace capabilities provide our own major asymmetric advantage. Sometimes, air power can play the leading role in defeating opponents without exposing our own surface forces to the perils of a 'fair fight', as in Kuwait in 1991, Kosovo in 1999, Afghanistan in 2001 and Libya in 2011. However, air power is just as important when we do find ourselves committed on the ground, since its contributions in the field of ISTAR and air transport as well as strike and counter-air operations are indispensable elements of the joint effort. The choice between air and surface power is entirely false, since there is no way we would risk putting 'boots on the ground' in the first place without the aerospace capabilities needed to sustain and protect them and to provide the crucial edge over their local adversaries.

The age of air power is not just beginning, as technological zealots sometimes suggest, but nor is it already over as van Creveld and similar sceptics tend to argue. Instead, air power is entering its second century as a mature and integral component of military power as a whole. We now have a hundred years of experience of how air power has performed across a wide variety of conflicts, from symmetrical military duels to tangled asymmetric clashes dominated by political sensitivities. Instead of being blinded by our latest searing but unrepresentative experience, we need to build on air power history more broadly if we are to respond effectively to whatever unpredictable challenges the next air power century may hold. ●

1. John Warden, 'Employing Air Power in the Twenty-First Century', in Richard Shultz & Robert Pfaltzgraff (eds.), The Future of Air Power in the Aftermath of the Gulf War, (Maxwell AL: Air University Press, 1992), pp.81-2.
2. 'US commander in Afghanistan to order limits on air strikes', The Guardian, June 22nd, 2009; 'New chief faces fight to win the trust of RAF and Navy', The Times, July 15th, 2010.
3. Martin van Creveld, The Age of Airpower, (New York: Public Affairs, 2011), p.171.
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6. René Francillon, Vietnam Air Wars, (London: Hamlyn, 1987), p.208.
7. I explore this shift further in my chapter on 'The Counter-Air Contest', in Andrew Lambert & Arthur Williamson (eds.), The Dynamics of Air Power, (Bracknell: RAF Staff College, 1996), pp.18-39.
8. See my chapter on 'The Strategic Impact of Unmanned Air Vehicles', in Owen Barnes (ed.), Air Power: UAVs: The Wider Context, (Swindon: RAF Directorate of Defence Studies, 2009), pp.97-115.
9. The Guardian, April 30th, 2007, quoted in John Alexander, 'The End of Air Power History and the Last Airman?: Air Power, Liberal Democracy and the British Way of War', RAF Air Power Review, 14/2, Summer 2011, pp.55-74.

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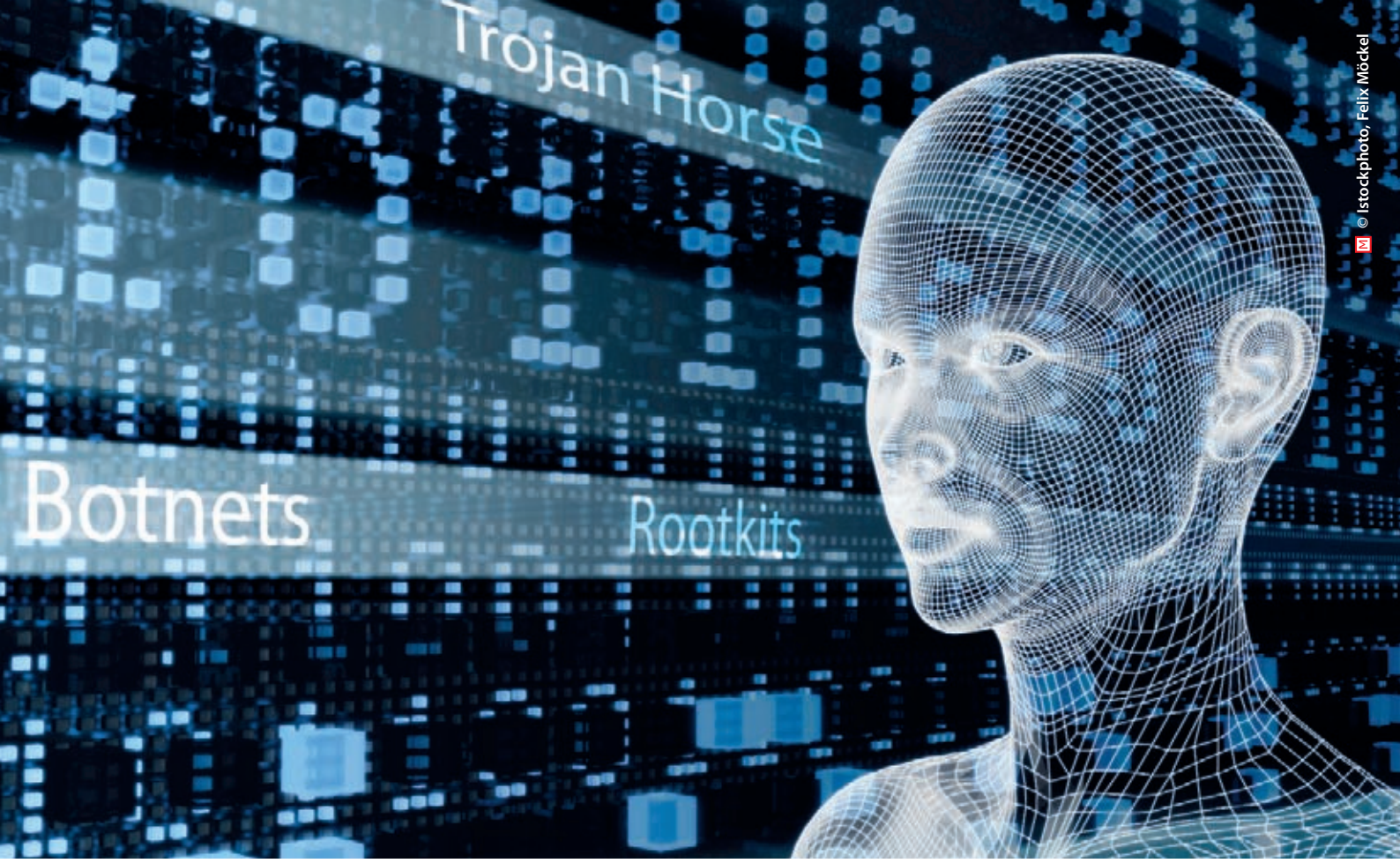


The Evolving Cyberspace Threat

By Mr. Gregory C. Radabaugh, USA AF, ISR Agency

The threats evolving today will have a direct impact on the ability of militaries to function effectively.

"If you know the enemy and know yourself, you need not fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know neither the enemy nor yourself, you will succumb in every battle."
Sun Tzu

Information and Warfare

Knowledge of the battlespace has been critical throughout history, and while information is key to both kinetic and non-kinetic warfare, what differentiates the current operating environment from that of Sun Tzu is that today military operations move at the speed of ones and zeros. Modern communications and the Internet have become significant force multipliers in air, land, sea, space and cyberspace, enabling both decision making and force application. This same information environment, however, provides our adversaries with an opportunity to affect our operations clandestinely and without entering our physical battlespace.

"Airmen's need for information anywhere, anytime to conduct military operations provides multiple opportunities for an adversary to access the information environment and shape it to their advantage."

Our information environment is a unique and dynamic combat theatre. The US Department of Defence (DoD) is responsible for approximately 7 million computers worldwide, connected via 120,000 commercial tele-

communication circuits and operating thousands of warfighting and support applications. Our networks range from fixed locations to deployed forces in 88 different countries. Due to the nature of our work, we are under reconnaissance and attack 24 hours a day, 7 days a week. The DoD receives about 360 million probes or scans a day, and some DoD systems are scanned within 7 seconds of coming online.

"The amount of traffic observed on the world-wide web is staggering: One estimate of the number of e-mails sent per day in 2010 is around 294 billion. This would equate to more than 2.8 million e-mails sent every second, thus around 90 trillion e-mails sent per year. The sad part is that an estimated 90% of these are spam and viruses."

The other aspect of our operational environment is that it is shared with the rest of the world. There are an estimated 1.9 billion Internet users, and growing. The amount of traffic observed on the worldwide web is staggering: One estimate of the number of e-mails sent per day in 2010 is around 294 billion. This would equate to more than 2.8 million e-mails sent every second, thus around 90 trillion e-mails sent per year. The sad part is that an estimated 90% of these are spam and viruses.[1]

The U.S. Air Force now operates as a series of interconnected networks. In essence, our modern weapon systems have become flying networks able to exchange information on the fly, so to speak. The resulting implication is that modern weapon systems will likely have network vulnerabilities which can be exploited by an adversary. In addition, Air Force operations require interconnectivity between military and civilian networks in a number of support areas, including Communications, Logistics, Transportation, Utilities, and Personnel. This interconnectivity provides additional opportunities for adversary exploitation, and if you consider the impact of our increasingly connected personnel (Skype, Facebook, Twitter, etc.) it is clear our adversaries have a much wider range of vulnerabilities to target and exploit than traditional military communications.

How Adversaries Take Advantage of the Operational Environment

Given the worldwide, 24 hours a day, 7 days a week information environment we now inhabit, how does an adversary take advantage of our dependence? Multiple intrusion vectors have been observed by the Air Force against our networks:[2]

Malware, or malevolent software, is a term used to collectively describe several categories of malicious programs, including Worms, Trojan Horses, Botnets, etc. Originally used mostly for pranks and vandalism, malware is now mostly used for financial gain and stealing company and government proprietary information, and is estimated to cost billions of dollars annually.

Zero day exploits employ malware that exploits a software vulnerability that is not yet known to the software developer and is used regularly in popular software programs from Adobe (Adobe Acrobat, Reader and Flash Player) as well as Microsoft. Both companies regularly distribute patches for software vulnerabilities; however, the lag time between vulnerability discovery and patching creates a window of opportunity for an attacker. The battle between developer and attacker is continuous, with vulnerabilities constantly being found.

A *Distributed Denial of Service* (DDOS) attack is an attempt to make computer resources unavailable to the user and can originate from a single computer or a botnet. Often the attacker will deploy malware to a large number of computers which then work in concert to attack a critical network node, flooding it with traffic and denying access to users. One of the better known examples occurred in 2008 when Georgian government sites were targeted prior to the South Ossetia war.

Phishing and spamming are e-mails made to look like they originated from legitimate individuals or organizations, but only contain malicious files or links to harmful websites. This form of attack has become very sophisticated, targeting specific individuals (known as Spear Phishing) or groups in the hopes of getting access to a network.

Peer-to-Peer (P2P) communications are used by both military and civilians alike. Examples of common P2P programs are Skype, Voice over IP (VoIP), and instant messaging. The danger in P2P applications is that unsecure and unsigned codes may allow remote access to files on a victim's computer or even compromise the entire network. From a network perspective, P2P can use high amounts of bandwidth, thus limiting other, more important information transmission.

Thumb Drives and Removable Media enable our forces to move and store large amounts of data in small, mobile devices. However, with convenience comes a vulnerability to infection by malware, resulting in some very high profile intrusions of Western military systems as reported in open sources.

Today it has become second nature to go online and search for information. Our adversaries use this to their advantage through *Google Bombing and Browser Hijacking*. For example, searches on Google with certain search terms, especially after a major event, will return websites with malware. Index poisoning pushes malicious websites to the top search results.

WiFi and Bluetooth have the potential to be one of our most dangerous vulnerabilities. The ubiquity of hands-free devices, including headsets and mobile phones; wireless keyboards, mice and printers, means a faster, more mobile and cheaper information environment. Many of our communication devices make use of Bluetooth, freeing us from cables and hard connections. However, this freedom engenders vulnerability. If set to discoverable mode, an attacker can connect to your device without your knowledge and then hack in to steal information, send unsolicited text messages, access mobile phone commands or install a virus.

Which Adversaries Take Advantage of the Operational Environment?

Now that we have seen the wide variety of attack methods available today, let us now take a look at who is using them against Air Forces. The US Air Force has observed a wide variety of threat actors attempting to intrude into Air Force networks, with skills ranging from amateur 'script kiddie' to professional. Some of the more prevalent actors are described below.

Kevin Mitnick[3] is perhaps one of the most famous of the early *Individual and Activist* hackers. Today we see individuals using their hacking skills for a number of purposes, from website defacement for political purposes to criminal activities. An example of an individual effort is the US and China 'Hacker War' in 2001.[4]

State-sponsored activity by government or non-government entities is the most dangerous adversary; the most skilled and most voracious. It is extremely difficult to attribute activity to *nation states*. In America, we have observed many terabytes of data stolen from both government and cleared defence contractors. A recent example of a compromised military target was with the $300 billion Joint Strike Fighter program.

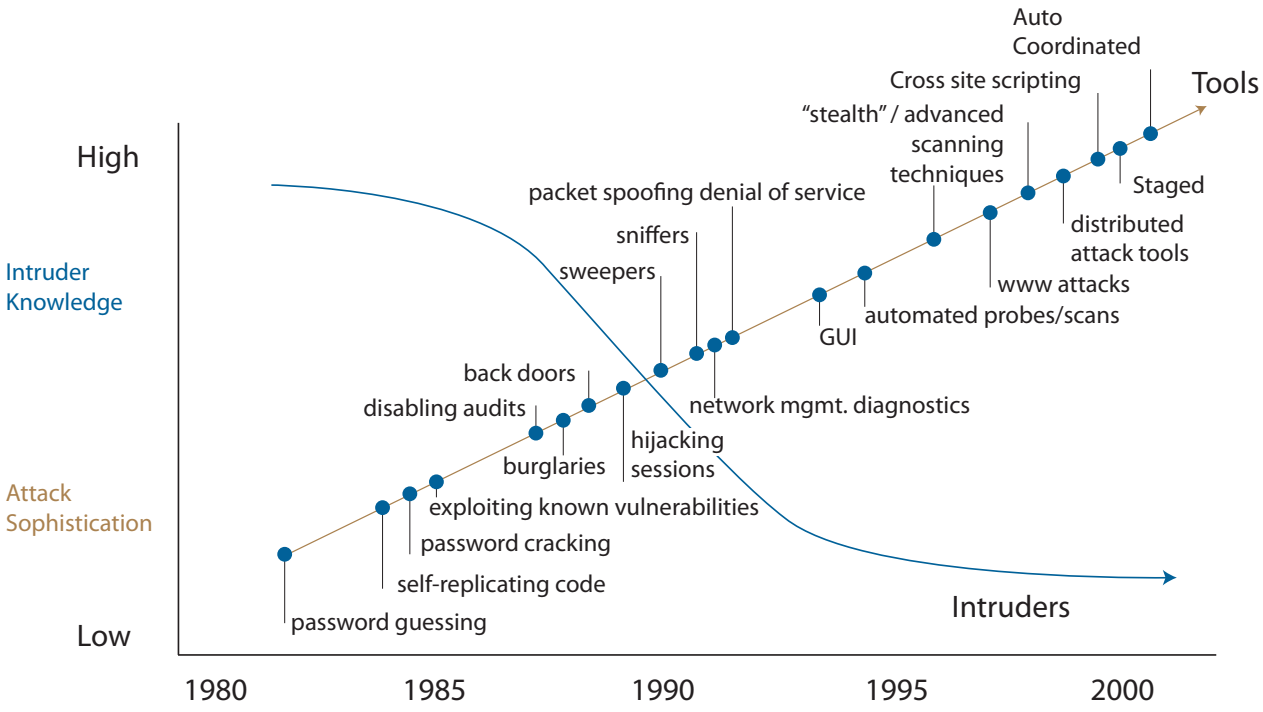
"… be prepared to conduct operations when networks are unavailable; the war will not stop when the laptop goes dead."

Terrorist Groups have the potential for significant disruptive activities, but to date most demonstrate only limited technical capabilities and typically use networks for operational support activity such as propaganda, planning, recruitment, funding and communications.

Cybercrime is a worldwide phenomenon with cybercriminals engaged in any illegal activity with the potential to make money. According to a report from antivirus software manufacturer Norton, global cybercrime resulted in over $114 billion in direct financial losses in 2010 alone. That figure jumps to $388 billion when you factor in the value that victims place on the time they spent recouping the losses.[5] There's nothing stopping cybercriminals from conducting offensive operations against a military network–except money of course.

The *Insider Threat* can be the most dangerous threat of all. Modern warfare requires information to be available to the greatest number of participants; however, modern technology also makes it easy for disgruntled employees to take advantage. Think 'Wikileaks'[6] .

Attack Sophistication vs. Intruder Technical Knowledge



Cyber Considerations for the Future Operational Environment

Current trends are not favourable for the Cyber defender. The technical knowledge required to attack a network is dropping due to a continued increase in the number and sophistication of automated attack tools. Network intrusions into government networks are rising exponentially with the U.S. DoD alone spending more than $100 million in the last six months of 2010 responding to and repairing damage from outside cyber-attacks. Data exfiltrated by our adversaries can never truly be recovered and can be used to gain technological superiority against us in a future conflict.

Threat Consequences

Adversary intrusions into military networks belonging to both the United States and our allies are occurring now and, given future technological trends, will continue to occur. Experience with the cyber threat suggests specific consequences:

- *From a military perspective, your adversaries are currently shaping your future actions and decisions right now.* Assume your adversaries are in your networks now. This access enables them to preposition capabilities for future conflicts, have situational awareness of your capabilities and responses, and potentially influence your perceptions of adversary capabilities and intent.
- *In attempting to assess the cyber threat, analysis must move from the reactive to the predictive.* Our prior methodologies relied on forensic analysis for results; identifying that an intrusion was occurring or had taken place, providing attribution to the intruder and subsequent damage assessment. Operators require indications and warning to mitigate the threat – real-time situational awareness of global cyber activities. This requires collaboration with outside agencies, e.g., allies, other services.
- *An increase in network defences does not equate to a decrease in the threat danger.* As you increase the efficiency of your defences, you push out the 'noise and chaff' of amateurs. Consequently, only

the truly dangerous threats are left in your networks. The good news is that you now have fewer to search out; the bad news is that they are very hard to find.

"Cybercrime is a worldwide phenomenon with cybercriminals engaged in any illegal activity with the potential to make money. According to a report from antivirus software manufacturer Norton, global cybercrime resulted in over $114 billion in direct financial losses in 2010 alone."

- *The threat evolves to counteract the defences put in place.* Changes in network defence will drive the attacker to find new vulnerabilities or new approaches to exploit old ones. Thus, it is a continuous process improvement for both the attacker and defender.
- *You can't defend everything.* You will have to define what information is important and critical to your operations, i.e., concentrate on defending what's important.
- *Perimeter defence is not enough; what you do defend must be done in depth.* The implication is that you have to know what is on your networks and where it is physically located. Of equal, if not greater, importance, you have to know who is on your networks and where. This was the driving force behind the establishment of the 624th Operations Centre.

Summary

Airmen's need for information anywhere, anytime to conduct military operations provides multiple opportunities for an adversary to access the information environment and shape it to their advantage. Certain adversaries have demonstrated the ability to gain access to networks and have obvious incentives to maintain that access. Countering those adversaries requires everyone to be proactive and predictive in identifying the threat, as well as defining what is important and defending it in depth. Finally, be prepared to conduct operations when networks are unavailable; the war will not stop when the laptop goes dead. ●

1. http://email.about.com/od/emailtrivia/f/emails_per_day.htm
2. For more information on malware and hacking techniques, numerous books are available such as 'Hacking: The Art of Exploitation 2nd Edition' by Jon Erickson (http://www.amazon.com/Hacking-Art-Exploitation-Jon-Erickson/dp/1593271441/ref=sr_1_1?s=books&ie=UTF8&qid=1325706171&sr=1-1). (This does not constitute a DoD endorsement of the cited work it is presented as one example out of many available.)
3. See 'Ghost In The Wires: My Adventures As The World's Most Wanted Hacker' by Kevin Mitnick (http://www.amazon.com/Ghost-Wires-Adventures-Worlds-Wanted/dp/0316037702/ref=sr_1_1?s=books&ie=UTF8&qid=1325706318&sr=1-1)
4. http://www.nytimes.com/2001/05/13/weekinreview/may-6-12-the-first-world-hacker-war.html
5. http://money.msn.com/saving-money-tips/post.aspx?post=6730f6ce-5203-4b59-bd46-f65a7a3545c2
6. http://www.washingtonpost.com/world/national-security/bradley-manning-case-investigators-show-evidence-of-wikileaks-link-assange-chats/2011/12/19/gIQAcDoS5O_story.html

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entered the U.S. Air Force as an enlisted linguist in 1974, earned a commission in 1979, and left active duty and joined the civil service in 1989. He remained part of the Air Force Reserve until his retirement in 2004. He has served in numerous intelligence, cyber and information operations positions. He has worked at the tactical, operational, theatre, national and international level. Mr. Radabaugh is currently the Chief of ISR Policy, Doctrine, Studies & Analysis, Lessons Learned, and Cyber Issues for the Air Force Intelligence, Surveillance and Reconnaissance (ISR) Agency, at Lackland Air Force Base in Texas. The Air Force ISR Agency is a field operating agency reporting to the Air Force deputy chief of staff for ISR.

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NATO Secretary General Anders Fogh Rasmussen meeting Mustafa Abdul Jalil, the Chairman of the National Transitional Council.

One Swallow Maketh Not a Summer

What Success in Libya Means for NATO

By Wing Commander R A C Wells, GBR AF, JAPCC

Am I alone in feeling somewhat uncomfortable when a politician declares '*success*' in any armed conflict? After seven months of operations NATO concluded its '*successful*' mission in Libya with everyman from the NATO Secretary General to the French President and the British Prime Minister parading around Tripoli like conquering heroes (not actually conquering territory you understand …). One can only assume that their respective aides had not learned from the unfortunate George W Bush when pronouncing 'Mission Accomplished' aboard the USS Abraham Lincoln whilst casualties continued to mount in Iraq. Whilst NATO military operations may have concluded, Libya and the Maghreb are still far from secure and nor is Europe's Southern border. NATO's *comprehensive approach* surely demands more than simply military muscle when declaring '*success*'.

The purpose of this piece is twofold. First, a broad critique of NATO's performance in response to the Libyan situation and, secondly, to place the success of this singular mission in the context of NATO's strategic direction. I must however, as a public employee, be cognisant of the recent advice from the British Prime Minister to his military chiefs and leave the (political) talking to him and concentrate on the fighting.

With respect to NATO's working practices, let us start on a positive note. The relative speed at which NATO acted on the Libyan question should actually be viewed in a positive light. From the passing of United Nations Security Council Resolutions 1970 (26 February 2011) and 1973 (17 March 2011) to offensive military action (01 April 2011) took just 33 days. Compare this to the NATO-ISAF mission in Afghanistan (born in November 2001 at the Bonn Conference but assuming command only in August 2003) then perhaps NATO is not quite the bureaucratic dinosaur its critics often suggest.

However what the Libyan campaign failed to change within NATO was the political willingness of all nations to contribute collectively to the military effort. This could be viewed in certain quarters as downright hypocrisy with nations sitting comfortably at the North Atlantic Council table agreeing that something must be done but, when asked to actually contribute warfighting capability, suddenly discover a compelling argument not to do so. The same argument, this lack of willingness, could be rolled out with respect to nations contributing 2% of GDP to NATO, however I digress. The fact is that NATO remains over reliant upon the vast (but decreasing) resources of the United States; an issue which must be addressed by a more solid commitment from the European Alliance members. NATO is essentially a political organisation and, whilst politicians answer to their respective electorates, European leaders should be very clear where US[1] (and Canada's) interests increasingly lie – North America, the North (Arctic) and their West (toward the Asia-Pacific region). The inference being that the commitment and cost of protecting Europe must be increasingly met by Europe.

One then has a certain sympathy with the outgoing US Secretary of Defense Robert Gates who parted with a broadside at NATO with specific criticism of European governments for failing to reform their armed forces and to prepare them more effectively for operations. However (and most humbly) I believe Gates was mistaken on 3 counts: the club rules have not changed since NATO's inception, NATO is not an extension of US Foreign Policy and Europe is not run along federal lines in the same way as the US. To some European nations NATO was not founded to commit armed forces to expeditionary operations beyond NATO's physical domain but to counter the threat of the Warsaw Pact. With the Red threat all but gone, economies could be found in national defence inventories, albeit along lines of national interest. However, unlike the fifty federated united states, Europe does not have a common defence and procurement strategy but a loose amalgam of national programmes, some of which are collaborative and some in direct competition. Thus, in a time of crisis, whilst there may appear general agreement to consider military action, *the parties agree … each of them … will assist … by taking … such action as it deems necessary, including the use of armed force*[2]. There exists a mandate to only consider rather than to commit forces! This resolution to unite efforts for collective defence and for the preservation of peace and security has not altered since 1949.

Let us change tack to military matters and let me be quite clear from the outset. With the exception of the air campaign over Kosovo, I cannot immediately recall a single major campaign in which NATO has intervened militarily from the outset. Operation Unified Protector (OUP) was no exception having been hurriedly inherited from the US-led Operation Odyssey Dawn. This shift being a clear indication of the change in US policy from leadership to facilitation and, again, the less-than-inferred demand that European Nations contribute more to what is essentially European Security.

Libya was somewhat similar to the Kosovo air campaign in that, in accordance with its UN mandate, the Alliance did not (officially) put boots on the ground. However, in pursuing its mission to protect the Libyan civil populace using all necessary measures, NATO effectively formed the Air Component to the revolutionary forces. The negative effect of this land campaign by proxy will be discussed later in this article.

Statistics though do not lie and cannot hide the very small nature of the air contribution to OUP when compared (whether fairly or not) to other recent campaigns. OUP averaged 120-odd missions per day (26,000[3] over 214 days). This contribution however pales into insignificance when compared against Operation Desert Storm (109,870 sorties, 45 days, average 2,441 sorties per day), Operation Allied Force (38,004 sorties, 78 days averaging 487 per day) and Operation Iraqi Freedom (37,000 sorties, 26 days averaging 1,423 per day).

Add to the small scale, the internal frictions (phrased as Lessons Identified) within NATO military circles. The shortages

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A captured Colonel Gaddafi clearly still alive.

in key capability areas (Air-to-Air Refuelling, persistent ISR and exploitation, Air Logistics, weapon stockpiles) are widely acknowledged and documented in addition to the politically-restricted target lists (potentially lengthening the campaign) and the difficulties faced in identifying dynamic targets without eyes on the ground. Also add to this list: the two month wait, after the air campaign had commenced, for a coherent air strategy to emerge; the temporary costs of accommodating personnel in Italian hotels (yes hotels!); and the lack of available personnel due to the forthcoming NATO Summer holiday period, then one starts to envy the decentralised command structure of Al Qaeda!

But does any of this matter? The shortage of equipment and personnel, the reluctance of certain nations to participate and the lack of cohesion amongst 28 nations is frankly to be expected and are rather tactical concerns. A more thorough examination of the Libyan campaign would question the failure of foreign policy and intelligence to predict the Arab Spring and the lessons encountered when allied air power operates in support of irregular land forces.

The Arab Spring of 2011 caught the vast majority of foreign observers off guard. The successive revolutions in Tunisia, Egypt and Libya were seemingly borne from internal dissatisfaction amongst Arab populations but notably without external initiation or assistance. Although NATO does have a forum for Mediterranean Dialogue this again seems to have no actual bearing with the reality on the streets of Tunis, Cairo or Benghazi. This apparent failure of foreign policy has been exacerbated by further inaction. If NATO intervened in Libya, at the behest of the United Nations, to protect the civilian populace then the inaction over Syria does not reflect well on either of these august institutions. But once again one must remember that both the UN and NATO are political structures and both paralysed by the lack of consensus. However if NATO wishes to remain a credible military/security force, unlike the militarily-impotent UN, then change is surely required. Perhaps NATO should consider leading in the absence of UN action or does NATO require the legitimacy of UN approval to act?

Perhaps more pressing to the advocates of Air Power is the stagnation in its employment. Libya again saw the lack of an opposition air force or integrated air defence systems of any great substance and, without this effective opposition, Air Power got lazy as the number of self-imposed constraints gave the initiative to the forces and events on the ground rather than to an aggressive air strategy. What Libya highlighted is that air-forces cannot yet operate in isolation and without assistance from a Land (and to a certain extent a Maritime) component. Allied Air Power does not currently have the technical capability to positively discriminate between all friendly and opposing forces in a timely manner and to the degree required by current Rules of Engagement. In the particular case of Libya, NATO lost its degree of neutrality by effectively comprising the air wing of the National Transition Council (NTC) land component. There is little doubt that human rights abuses have been committed by both Gaddafi supporters and regime opponents[4] so aligning to one side (or at least appearing to) can damage the credibility of one's mission. Whilst allied personnel are bound by the laws of armed conflict, the belligerents in Libya were not, as graphically depicted in the execution (there is no other word for it) of Gaddafi himself.

Thus Air Power enthusiasts need to address the employment of Air in support of irregular land forces whilst NATO needs to address the need to somehow

control these irregular forces when in direct or indirect support. The latter requirement questions NATO's theoretical neutrality but also demonstrates how international law has lagged behind the shift from conventional warfare between states to asymmetric conflicts involving irregular participants.

On a broader canvas, Air Power faces another challenge. Critics and taxpayers will point to the increased cost and sophistication of aerial platforms which, to the layman, have achieved such great '*success*' in Libya. But what of Iraq, Afghanistan and the Horn of Africa? Air has indeed played a vital part in these operations but the question lingers whether Air has played a decisive part. The massive technical advantage of allied air forces did not prevent the humiliating withdrawal from Iraq, a country now beset with internal division and external influence from its east. The piracy off the coast of east Africa is a minor financial irritant but one with strategic media impact and is yet another example of high-tech, expensive capabilities being frustrated by a low-tech enemy.

But perhaps the biggest test for NATO will soon be upon us and will demonstrate that Libya's swallow maketh not a NATO summer. The Alliance should prepare to accept that their mission in Afghanistan will prove as futile as the previous Soviet mission[5] and indeed previous British and Russian attempts at securing that medieval fiefdom. I have little doubt that the politicians will wrap the Afghan mission up in *'success'* and yes, militarily, NATO was never in danger. However, NATO's future existence appears increasingly less reliant upon purely military success but, under a more comprehensive approach, is increasingly reliant on securing its interests and resources in addition to the continued physical security of its territory and populations.

In the rush for the door, the West fatigued by a decade of conflict in Afghanistan and with upcoming US Presidential elections, the Afghan President will be abandoned to the same fate as Najibullah and indeed Gaddafi. The Afghan Army and Police will quietly abandon their posts leaving the Taliban to reverse most of what has been built or achieved over the past decade. Under a process of transformation (i.e. nothing will change but we will rebrand everything) NATO will build a new expensive Headquarters, shuffle its military command structure and will, in the absence of any similar security organisation, survive to fight another day. But simply being the only organisation of its type neither justifies nor guarantees NATO's continued existence, in its current form. Unfortunately the current crop of European political leaders (read Eurozone countries) has demonstrated, during the current economic recession, their collective inability for decisive action with policy being dictated by the financial markets rather than in Brussels. Without the requisite financial and military commitment from its member states, NATO may end up, similar to the European Union, as yet another sacred cow – "a beast one lacks both the means to nourish and the will to put down."[6]

1. United States Department of Defense – Sustaining U.S. Global Leadership: Priorities for 21st Century Defense dated 05 Jan12.
2. Article 5 of the Washington Treaty.
3. NATO webpage: www.nato.int
4. MDE 19/036/2011 Amnesty International October 2011 – Detention abuses staining the new Libya.
5. I thoroughly recommend to the reader **Afghantsy** by Roderick Braithwaite, to date the definitive account of the Soviet/Russian experience in Afghanistan 1979–89.
6. Sacred cow as defined by Enoch Powell and blatantly plagiarised from Lord Tebbit's article on the EU. The Daily Telegraph dated 04 Jan 12.

Wing Commander Richard Wells

is a C130 Navigator with 4,000 flying hours – mostly in the tactical role. He has completed operational tours in Sierra Leone, Afghanistan, Iraq and the Middle East as an aviator, air advisor and as the commander of an Expeditionary Air Wing. Wells currently works in the Combat Support branch at the Joint Air Power Competence Centre in Kalkar, Germany, and, in his dual roles as Chairman of the NATO AAR Panel and as Custodian of ATP-56 (AAR Procedures), his current project concerns improving NATO's AAR Interoperability.

Russian Federation and JAPCC Representatives.

A New Step in Cooperation!

NATO Russia Council Military Representatives

First Russian Federation Delegation Visit to JAPCC

In October 2011, a Delegation of the Russian Federation (RF) visited the Joint Air Power Competence Centre (JAPCC) in Kalkar, Germany. This was the first time a RF delegation visited the JAPCC. It was also the first instance where the JAPCC, as the strategic Air and Space Power 'Think Tank', was directly involved in NATO's cooperation with the RF. The Delegation was headed by the Chief of Staff of the RF Air Force HQ, Major General Victor Bondarev and accompanied by Major General Pasechnik as the representative of the RF General Staff.

Following the defined focused areas as outlined in "Taking the NATO Russia Council Forward" paper signed in 2009 and the "NATO-Russia Council Joint Statement" signed in Nov 2010, the JAPCC proposed a balanced schedule for the first meeting with a mix of general information and detailed project updates. The JAPCC project updates were related to Joint integrated Air and Missile defence, Counter Piracy and Search and Rescue.

As assessed by the NATO Russia Council Military Representatives, the visit was an issue of high strategic political interest, mentored by the NATO IMS and the NATO Russian Council Military Representatives. At the completion of the visit, the RF emphasized the value of the trip and the open mindedness and friendly approach of the JAPCC staff. As a result the NATO Russia Council Military Representatives have scheduled three new activities in their annual work plan 2012, which will result in a visit of JAPCC Representatives to RF Air and Space Power Components and the invitation of a RF Delegation to the JAPCC Conference in 2012. ●

Joint Air and Space Power Conference 2011

In October 2011, the Annual JAPCC Conference took place in Kleve, Germany. The Conference was organised under the theme "Understanding Air Power – A Joint Appraisal". The event attracted a distinguished audience, consisting of 60 Flag Officers and 200 senior Air and Space Power experts, between them representing 25 countries. The conference opened with 4 keynote speeches from General Stéphane Abrial, Professor Philip Sabin, Lieutenant General (rtd) Horst Martin and Colonel Jim Sturgeon. It then moved on to address the theme in more detail through panel discussions organised along Service environmental lines. Some of the more challenging conclusions, many of which will be factored into JAPCC's future work, are listed below:

Lieutenant General (rtd) David Deptula, a key strategist during Operation Desert Storm, moderates.

- The present economic climate offers the opportunity to force the 'smart defence' issue. Unfortunately, past experience is not a cause for optimism.
- We are bad at predicting the future so it is essential to maintain a balance of forces both as a deterrent and as an insurance policy.
- We must plan jointly and not just ask what Air can bring to the Land plan.
- There is a general perception of Air as a destructive force. We need to stress the positives to ensure this does not become our Achilles' heel.
- Air has largely solved the problem of precision. Legal issues and ROE are now the biggest constrain on the use of Air Power. Greater legal clarity regarding 'war' against non-state actors is urgently required.
- Air effects at the strategic level often take longer than expected. We are trying to have a cognitive effect and this generally takes time.
- Any operational experience distorts individual views. We need to guard against this, especially when an individual only has one such experience to draw on. ●

The JAPCC Executive Director, Lt Gen Dieter Naskrent and Director, Gen Mark Welsh III kick off the Joint Air and Space Power Conference 2011.

Education and Training

Operation Unified Protector Lessons Identified

A briefing was given to the JAPCC by CPT (US Navy) Bill 'Ziggy' Sigler on NATO's Joint Warfare Centre's (JWC) findings during Operation Unified Protector (Libya). CPT Sigler has been the head of the JWC Air Training Team on various NRF certifications and ISAF exercises and has a large amount of operational experience from previous assignments as an F-18 pilot and commanding officer in the US Navy. Parallel to the findings a JAPCC team of officers collected at the CAOC in Poggio Renatico during Operation Unified Protector (on behalf of AC Izmir) were the lessons collected by the JWC at the Joint Force Command in Naples and Air Command in Izmir. The training day briefing at the JAPCC gave the staff a unique insight into operations. The JWC made interesting observations towards improving their preparation for exercises taken from the Libyan air operations point of view. As the Alliance's Air Power Centre of Excellence, and in alignment with mission priorities, the JAPCC is poised to provide high-quality and timely customer support with Air and Space expertise to inform and enable these decision makers.

Staff Ride

In October 2011 the JAPCC personnel went on a staff ride to the 'House of the History of the Federal Republic of Germany in Bonn'. The House of History is a museum of the contemporary history of Germany and one of the most popular museums in Germany. The museum's emphasis is on a vibrant presentation of historical events. To achieve the objectives of the JAPCC Education and Training Strategy, a group of six staff officers were in charge of preparations. To enrich the task and the individual education and training experience for members, more than the administrative arrangements had to be accomplished. In addition to the guided tour from the museum staff, each JAPCC staff officer had to prepare a three to five minute explanation of an exhibition piece or a historical event matching part of the exhibition. As those individuals were coming from various nations, it provided a good opportunity to familiarise or to deepen the knowledge on German history and JAPCC's host nation. The trip concluded with a short visit to the German Air Forces Headquarters in Cologne to study its museum. ●

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- 'Diving Victory: Airpower in the 2006 Israel-Hezbollah War'
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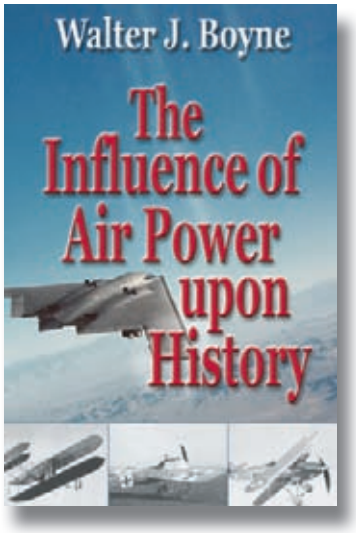
‘The Influence of Air Power upon History’



By Walter J.Boyne
Pelican Publishing Company
Reviewed by:
Col Bob Sardo, ITA AF, JAPCC

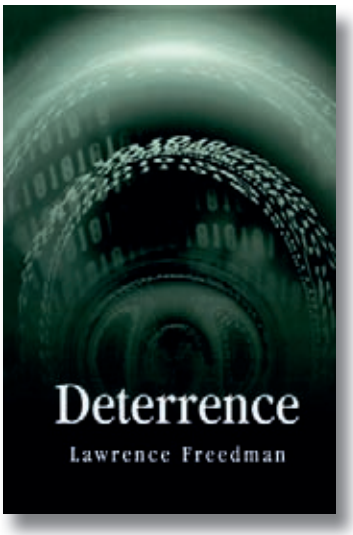
Walter Boyne is a retired U.S. Air Force Officer and Command pilot who has written 36 different books on aviation. He was one of the first directors of the Smithsonian Air & Space Museum and founded the bestselling aviation magazine Air&Space.

This book, from 2003, starts from the very beginning of the quest for the air, studying the development of Air Power philosophy and its evolution from theory to practice, through innovative thinkers’ influence and technological improvements that impacted not only military, but also commercial aviation, until the translation to Air and Space Power. In this pattern it offers a comprehensive outlook of the use of Air Power to influence politics, not only from the military perspective, but also covering the commercial and humanitarian viewpoint.

The analysis covers from the early times of balloons through the exploitation of space, through the two World Wars, the Cold War, Middle East conflicts etc., leading to some interesting, controversial conclusions, departing from the generally accepted scenarios of Air Power.

‘Deterrence’

The history of deterrence is often dominated by reference to the Cold War and, consequently, the policies of nuclear deterrence. In this work, from 2004, Lawrence Freedman attempts to redress the balance, taking a broader look at the concept in all its various guises from conventional to nuclear, from denial to punishment and from hard to soft power. Freedman is acutely aware of the importance of context, both in framing deterrence-based strategies and in assessing their performance, the latter task greatly complicated by the fact that any study of successful deterrence is, by definition, a study of non-events. The sheer range of variables at play within the field of International Relations (IR) makes the search for comparable examples of deterrent strategies, which may then be compared and contrasted, an exceptionally difficult one. It is therefore unsurprising that Freedman returns to the origins of deterrence theory in criminology and law enforcement where studies have shown that increasing the probability of apprehension is usually more effective than raising the level of punishment. Here he also explores the importance of ‘norms’ in setting societal limits on acceptable behaviour. The latter theme, in particular, is subsequently re-framed from an IR perspective with Freedman postulating that military deterrence of the future may be driven more by the enforcement of international ‘norms’ than the interests of individual states. This wide-ranging book also touches upon the utility of pre-emptive and preventative strategies, concluding that deterrence has its place even against those opponents that we conveniently label as ‘rogue’ or ‘irrational’.



By Lawrence Freedman
Polity Press
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