Transforming Joint Air Power

The Journal of the JAPCC

Edition 7

Joint Air Power Conference 2008

Joint Air & Space Power

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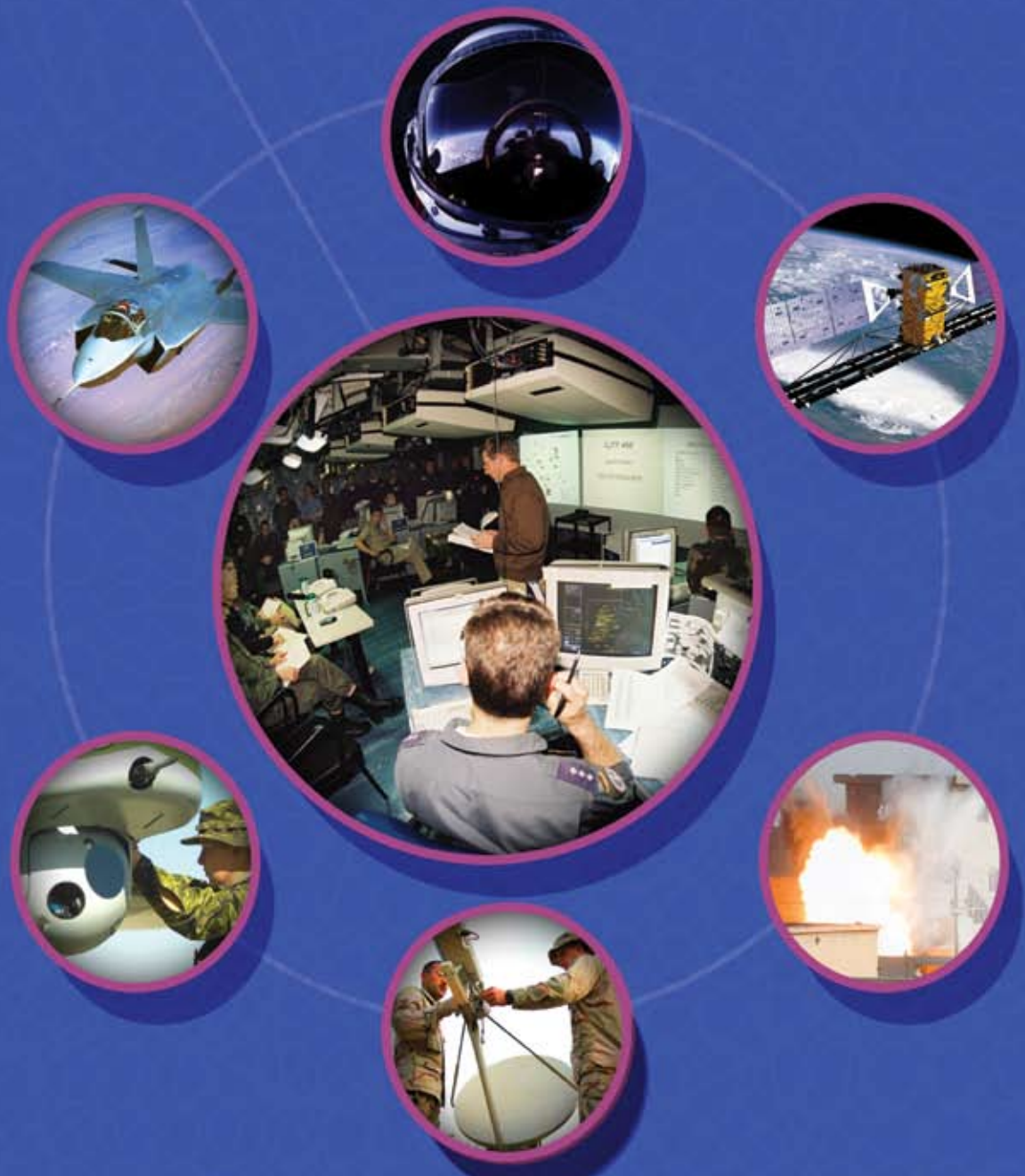
Decision Superiority in the 21st Century



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Editorial

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Leadership is the art of getting someone else to do something you want done because he wants to do it.

General Dwight D Eisenhower

I introduce this Edition of the JAPCC Journal with the above quote for a variety of reasons, not the least of which was the fact that its author oversaw one of history's largest Battlespace Management (BSM) challenges – the amphibious assault on Normandy in 1944. An endeavour, which required the highest degree of cross-environmental co-ordination and, incidentally, was predicated on the delivery of unchallenged dominance of the skies!

It also rather succinctly draws a connection between BSM and Command, a theme we introduce in the opening article and the challenge we set out to explore from an air perspective throughout this Journal. Network enabling is the driver for this review of BSM. I hope you will agree, from the analysis of early networking in the Battle of Britain, to reflections on the very real challenges of contemporary operations, through to how BSM might evolve as new capabilities and concepts emerge, that the Air and Space environment is potentially in an era of seismic change. Our objective, therefore, is to open the debate on how that change might take place, rather than wait for it to unfurl around us.

I am also delighted to include 2 articles from one of the newer NATO members, Romania. In particular, our thanks go to Lt Gen Croitoru for his valuable insight into his Air Force's on-going experience since joining the Alliance. We have also included a follow-up article on Space and a new subject, the Psychology of Remote Control Warfare, both aimed at broadening our perspective of all aspects of our operating domain. Indeed, these articles also act as a lead-in to our next Journal, Edition 8, where we do not intend to follow a single theme, but declare open season and ask for submissions on any subject associated with the evolution of Air and Space Power. So if you have an Air and Space Power itch you want to scratch, please pick up a pen! Similarly, if you disagree with anything we have published, write and tell us – I assure you, we will air your view.

Better still, come and join the debate at the JAPCC Conference 2008, the first to be hosted by our new Director, Gen Brady, on 'Joint Air and Space Power - Decision Superiority in the 21st Century' between 14-16 Oct. See you there!

Garfield Porter
Air Commodore, GBR AF
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Transforming Joint Air Power
The Journal of the JAPCC

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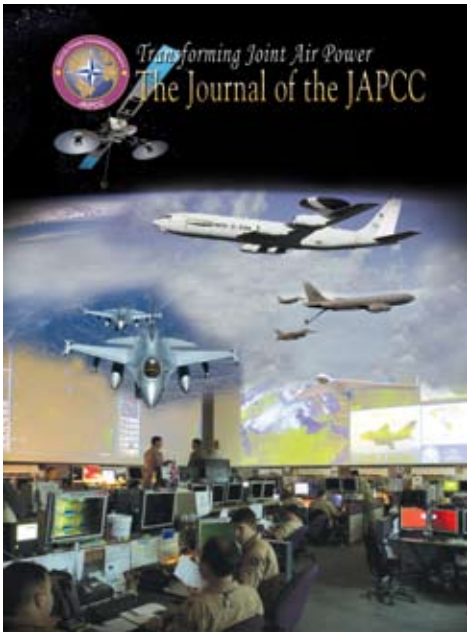

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Command and Battlespace Management within the Context of an Effects Based Approach to Operations – An Air Perspective

By Air Commodore Garfield Porter, GBR AF

There are 2 developments that will increasingly affect the way we do business in the first quarter of the 21st Century: an Effects Based Approach to Operations (EBAO) and Network Enabled Capability (NEC). Each is closely linked to the other, although it is probable that the promise of a compelling, comprehensive product from the Information Age, which NEC offers, provided the rationale to pursue an EBAO.

This article aims to investigate, in conceptual terms, the impact of EBAO and NEC on C4ISR; in particular, the article focuses on the functions of Command and the subsequent enabling of Command Intent through Battlespace Management (BSM). Having explored such a generic construct, it then looks more closely at the emerging implications for Air and Space practitioners.

Effects Based Approach To Operations

An EBAO might be usefully summarised as:

Actions carried out to achieve Effects, which lead to the realisation of decisive Objectives in the pursuit of favourable long term End-states.

Working back from a command planning perspective, an End-State represents the desired outcome – a Strategic level product. The Objectives necessary to achieve such a position will be identified at the Operational level, albeit most likely with Strategic input. The Effects necessary to reach such Objectives will also be identified at the Operational (Joint and Interagency) level, but this time with significant input from the higher Tactical (Component) entities. Finally, the Actions necessary to achieve Effects will predominately be the playing out and aggregation of Tactical activities.

Command

A key function of Command within EBAO is, therefore, to set the parameters, in terms of Actions, Effects, Objectives and End-states, appropriate to the level of Command exercised. This implies an approach, which reaches at least one-level up and down; for example, a Component Commander[1] should aim to influence the setting of Joint Effects (to meet Objectives) and then orchestrate Actions within his domain to help realise those Effects. Given that a Component Commander will only rarely have the wherewithal to realise an Effect in isolation, it follows that sensitivity to, and an ability to

synchronise with, the Actions of other Components is critical to achieving Joint Effects. Essentially, this model reflects the basic tenets of Mission Command, albeit updated to embrace an emerging EBAO vocabulary. Moreover, it places particular emphasis on accurately articulating Command Intent in effects based terms at all levels of command from the Strategic to the Tactical.

Battlespace Management Today

Traditionally, BSM (Airspace Control, Waterspace Management, Land Boundaries) has been based on the procedural division of environmental time and space in which planned activities are carried out.[2] Thus, in the execution of operations, the BSM emphasis has been very much on Control. This explains why Command (the decision and planning basis for operations) and Control are invariably interlinked as C2. There are, of course, other control mechanisms as well as the where and when; these are likely to endure (for example ROE) and will often also set the conditions for operations.

> '... this brief article challenges the very idea of C4ISR as a useful future construct.'

In addition, through Tactical Data Links (TDL), Air and Maritime forces have increasingly been able to bring a degree of Shared Situational Awareness (SSA) to the BSM equation that has allowed them, to a limited extent, to self-synchronise in the pursuit of their missions.[3] Until now, however, the ubiquity of such TDL and the granularity of detail they have provided, even in these environments, has been uneven and so, except in optimal circumstances, the Control (procedural and direct) emphasis has prevailed.

Network Enabling

So what is changing that will bring the necessary agility to operations to allow us to transfer to a BSM regime that is more conducive to an EBAO? The commonly perceived wisdom is that network enabling will be at the vanguard of this transformation, but how? It will certainly enhance C4ISR such that the Commander has a timelier, richer understanding of context, which should enable decision superiority at all levels in the planning process. Moreover, the result – the Commander's Intent – through network enabling should also be widely understood (in terms of Objectives, Effects and Actions) across the Battlespace. Equally important, this very same networking should increasingly deliver a degree of SSA to all environments (and, critically, linked across them!), which will

NATO Airborne Early Warning and Control team in action.

allow the operators to routinely self-synchronise their Actions to optimise the pursuit of Effects to the benefit of all, whilst identifying and mitigating any unintended Effects along the way. Combined, these advantages set the ideal conditions to pursue Mission Command, where the aims and constraints are specified, but their attainment is left to the creative wherewithal of the appropriate subordinate commander.

Battlespace Management Tomorrow

From this, we can also deduce that BSM in the future will comprise 2 supporting elements: Control and SSA. Moreover, given that SSA will become more widespread as network enabling takes hold and that Mission Command appears to offer the best route to delivering a truly agile EBAO, we should expect to see the demands on Control diminish with time. The alternative is to use network enabling for the ultimate exercise of the long 'Control' screw-driver, which (whilst perhaps accurately reflecting high level Command Intent) would risk both eroding initiative across the battlespace and being unresponsive to the 'atmospheric' changes that herald unintended consequences, which in reality must be avoided at every turn.

C4ISR

By focusing on Command and BSM, this brief article challenges the very idea of C4ISR as a useful future construct. In particular, what does C4 really mean? Command is fine and enduring – it is the decision making and directive process that underpins operations. However, as we have seen, Control is really a part (and arguably a diminishing part) of BSM. Moreover, Communications and Computers are systems/equipments that support the C2/ISR processes; actually, they are more than that, they are the equipments on which network enabling is based and, importantly, enable the second element of BSM - SSA. It could be concluded, therefore, that C4ISR is an unhelpful term and does little to add clarity of thought to EBAO thinking. Perhaps C4ISR should be recast to place more emphasis on BSM and, within an EBAO, focus specifically on Command? To this end, C4ISR might be replaced by Command, Battlespace Management, Intelligence, Surveillance and Reconnaissance (CBISR). This change may appear to be semantics-based and cosmetic, but it is necessary to encourage mindset shift, to focus leaders on the rigours and challenges of Command (rather than the attractions of Control), and to identify and strike the right balance between Control and SSA in the BSM equation. As to the necessity of retaining ISR as equal acronym partners, a discussion perhaps for another day……

Implications for Air & Space

Given that the Air and Space environment is of prime importance in enabling NEC across all environments, it follows that dominance of Air and Space will remain a paramount consideration for Joint Commanders and their Staffs – an Objective, in EBAO

'Command is fine and enduring – it is the decision making and directive process that underpins operations.'

The US Global Hawk on an ISR mission.

terms, necessary to achieving a favourable End-state.

Beyond enabling the Joint effort, the Air (and Space[4]) Component will need to develop new methods to meet the challenges of such an emerging regime. At the Joint Force (perhaps even Interagency[5]) level, the Air Commander will need to play his part in influencing the setting and monitoring of both Objectives and Effects. To this end, it may be that the key Joint functions centre around a Joint Objectives and Effects Board rather than the kinetically centric Joint Targeting Board of today. Either way, it will be for the Air Commander to promote the use of air activities to realise the desired Effects.

Moreover, having brokered Air's place in the Joint marketplace, the Air Commander will need to deliver a rich and comprehensive Command Intent through his Air Operations Directive (AOD). Given that this will need to include those Effects that need to be achieved (and the Objectives they support), as well as those that will need to be avoided, it is likely that the shape of the AOD will need to evolve along with our experience. Significantly, greater SSA should also allow us to cascade responsibility for delivering specified Actions in support of Effects and Objectives to subordinate commanders; for example, the responsibility for planning and delivering Surface-to-Surface Missile (SSM) suppression in a designated area might be allocated to Wing or Group Commander. An Air take, perhaps, on devolved Mission Command and an opportunity to capitalise on the operational and creative wherewithal of our air unit commanders in the field, who under current practise do little more than marshal their units to meet the demands of the ATO.

Such a development would clearly require a different ATO/ACO/ACM[6] regime from today. I am not suggesting that Control mechanisms have had their day, more that the balance between Control and SSA will need to be redefined and that NEC should provide the wherewithal for a more responsive, interactive approach. Indeed, this analysis begs whether the Air Environment should explore the possibilities of creating an interactive ATO market place, where subordinate commanders are encouraged to add value to the process, rather than continuing to rely on the current top-down monolithic approach?

A final implication that will need careful interpretation will be the roll-out of SSA across the Joint Force. As mentioned previously, the Air and Maritime domains have invariably been ahead of Land in this area. This could well change, but it is probably reasonable to assume that SSA across the entire Battlespace will remain uneven. Therefore, it follows that BSM across the component seams will remain a critical area for future commanders to resolve. This will, no doubt, add further nuances to the Control/SSA balance; however, given that any Blue on Blue engagement is ultimately a failure in BSM, it will require as much, if not more, attention from commanders than their own environmental arrangements. ■

Endnotes:

1. Assuming components survive the EBAO/NEC cultural shift.
2. Albeit tempered by the initiative encouraged in the concept of Mission Command.
3. TDL in the Air and Maritime environments have been encouraged by the need for interoperability at platform level, rather than the formation level requirement traditionally assumed for Land forces.
4. It is unclear how the Air and Space environment might be managed in this construct, given that Space transcends normal Operational (AOR type) boundaries.
5. The Comprehensive Approach has not been addressed in this article, although it is accepted that some form of Interagency BSM would need to orchestrated at the Joint level and above.
6. ATO is Air Tasking Order, ACO is Air Co-ordination Order and ACM is Air Co-ordination Measures.

Romanian Air Force Transformation; A Must for a Secure Environment

By Air Flotilla General Doctor Florian Râpan, ROU AF

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In autumn 2007, the Chief of the Romanian Air Force Staff discussed the restructuring of the Romanian Air Force (ROU AF) in an article published in *The Romanian Military Thinking*,[1] a Romanian General Staff magazine. Focus areas for the restructuring process follow an aggressive strategy and include: establishing flexible and agile organisations / structures, which continuously collaborate to facilitate transformation and to institutionalise cultural change; establishing deployable force packages; developing innovative thinking, which guides transformational activities; changing from planning and programming centred on threats and platforms to planning and programming based on capabilities and effects, enabled by concepts and ideas of the information era.[2] This article looks at the restructuring underway in the ROU AF with a view towards transformation and overcoming the challenges facing transformation.

Romanian Air Force Transformation

Transformation of the Romanian Armed Forces, as a whole, and the modernisation of the ROU AF in particular, represent a permanent development process; new concepts, strategies, doctrines and integration of capabilities are required to improve effectiveness and interoperability in a continuously evolving security environment.

The challenges facing transformation of the ROU AF include:

- Modernising the air platforms to enable the carriage and launch of precision guided munitions.
- Improving the ability to deploy forces, by means of transport and logistic support, to remote areas.
- Integrating the multi-mission capabilities to support other forces' activities.
- Expanding the air data merging system by integrating data from sensors such as AWACS and, possibly, sensors of other nations.
- Developing a protected and secure voice and data communications system that is resistant to jamming.

- Establishing an air command and control system, which includes deployable forces and integrates with other Romanian national systems.

The transformation of the ROU AF should be neither a goal per se nor an isolated target. Aligning with our NATO allies and other partners, identifying and overcoming cultural, informational, physical, financial and organisational barriers, is possible when the whole process is based on principles, requirements and rules accepted and consistently applied throughout the Alliance in accordance with Alliance transformational goals. What follows are some rules or, rather, tenets of the transformational process.

The Transformation Process

The transformation process is a strategic necessity. It must be moulded and influenced by the imperious needs of the information age, integrated fighting capabilities of Joint coalition warfare, and by the network enabled capabilities. Specifically, Air Power's effectiveness in the information age will be determined by:

- The capacity to provide and assimilate information.
- Instant access to information.
- Speed of reaction.

The transformation process is a technological necessity. The combination of technological progress, globalisation, and scientific development has created some significant trends for the evolution of strategy and defence planning, which include:

- The advance of technology regarding sensors, data processing and targeting systems throughout the Defence Industry. This rise was made possible both by technological means and the co-evolution of operational concepts, as well as by improvements to training and experimentation.
- The increase of nuclear biological chemical (NBC) and intercontinental ballistic missile threats by way of experts, materials and technology transfer to hostile countries and by the development of ballistic missile technologies in countries with hostile regimes.
- The possible increase of a new military space and cyber-space race as many states develop micro and nano-satellite capabilities and offensive information operations capabilities, which can be used to attack both trade and military systems.
- The increased potential to use new information technologies to gain information and knowledge for the development of weapons of mass destruction (WMD).

The transformation process is a threat-determined necessity.

Romanian Forces ramp ceremony at Kabul International Airport.

MiG-21 LanceR aircraft on air-policing mission.

Trends in this field include:

- Lowering protection, as a result of new technologies, which allows enemies to reach across geographical boundaries.
- Raising danger of regional conflicts, as a result of WMD and ballistic missile technology development.
- Raising asymmetric threat.
- Increasing danger from ungoverned areas or unreliable political regimes that support terrorist networks.
- Spreading power and military capabilities to fundamentalist non-state actors, who support world terrorism.
- Continuing difficulty to foresee possible locations of future conflicts.

Defence policies and strategies need to be adapted. The force planning process in the ROU AF will be based on both Joint and specialised role concepts as well as on NATO recommendations considering the role structure at an inter-allied level. The specialising fields must be identified according to commitments and the way they are included in Romania's Reform Planning, with a view to meeting the requirements of the *Prague Capabilities Commitment* NATO initiative.

Given that there is no major territorial threat to Romania and its allies, wider security risks drive ROU AF transformation. Besides terrorism, the current range of risks includes human and weaponry trafficking, an acute state of regional instability, illegal migration, civilian emergencies, WMD proliferation and the means to use them. Determinations imposed by threats, as well as current and future risks, demand the following capability requirements:

- Fast deployment of forces including the means for their self-support in a limited time-frame.
- Ensuring multidimensional protection for own forces against all threats, including NBC.
- Interoperability with Allied Forces.
- Ensuring optimum capabilities based on full options analysis in time.

The Romanian Air Force Requirements

This assessment of the transformation process leads to deductions about the ROU AF capability requirements:

- A lower number of Air Force structures, but with increased action capabilities and full interoperability with those capabilities of the NATO member countries.
- Larger air coverage for the Alliance mission spectrum, according to the Prague Capabilities Commitments, which includes the fight against terrorism and the associated

training, instruction, equipment and supplies.

- Compliance with the political-military agreements between Romania and NATO countries.
- Clear deadlines for the time when forces must be operationally ready to the time of actual action in a theatre of operation.
- The achievement of in-theatre exchange and rotation, and a level of readiness for the operational capabilities, as well as their support according to the funding possibilities and the economic status of the country.
- Alignment of capabilities throughout all services within the Romanian Armed Forces.
- The ability to act within the European Union also, according to pre-existing agreements.
- Improving and providing flexibility to develop the Forces' leadership.
- Considering the new operational concepts and the operational way to apply them (network-based warfare, effects-based approach to operations, and decisive rapid operations).

The key to achieve the winding transformation process is to apply solutions, which allow the Romanian leadership to address challenges brought by exercises and operations. In a nutshell, military structures do not transform by themselves. What is needed is a change in behaviour, at the staff and organisational level, and the ability to face challenges collectively amongst both military and civilian leaders. Such change of mindset allows a root transformation to occur in a way in which military operations are planned and unfolded. The future will not necessarily belong to the most technologically advanced militaries, but to those who will be able to adequately understand the character of the conflict and to properly transform themselves, and obtain or maintain their competitive advantage.

Adapting to become Flexible and Agile

The ROU AF has made huge strides on its journey of transformation. Within this edition of the JAPCC Journal, the Chief of the Romanian Air Force Staff, Lieutenant General Croitoru, offers a comprehensive view of our transformational progress. The ROU AF has come a long way since 2002, when we deployed a C-130 aircraft into Afghanistan in support of the coalition effort there. This was the first deployment mission that our Air Force carried out abroad since WWII. In 2005, we deployed four IAR-330 SOCAT helicopters into Bosnia and then in 2006, Romania became lead nation of the KAIA (Kabul Afghanistan International Airport). In the KAIA mission, we realised the vital role of our ground personnel operating in this most demanding environment. Lessons learnt from these missions have served to help the ROU AF evolve towards a more deployable and expeditionary force.

Full integration into NATO is our foremost goal. From the first day Romania entered NATO, the ROU AF conducted air policing under NATO command in accordance with NATO standards. Currently, more than 60% of NATO-designated forces are certified through the NATO TACEVAL[3] programme. The acquisition of a Link-16 capable multi-role aircraft, which will replace the MiG-21 LanceR aircraft, will position the ROU AF as an expeditionary and network-enabled force, capable of integrating with other Air Forces in the Alliance. Equally important will be Romania's realisation of its goal to fully integrate into the Alliance's homogeneous Air Command and Control System (ACCS) with the implementation of an ARS[4] in Romania.

Significant change is underway in the ROU AF, a force that is adapting to become flexible and agile in this new age.

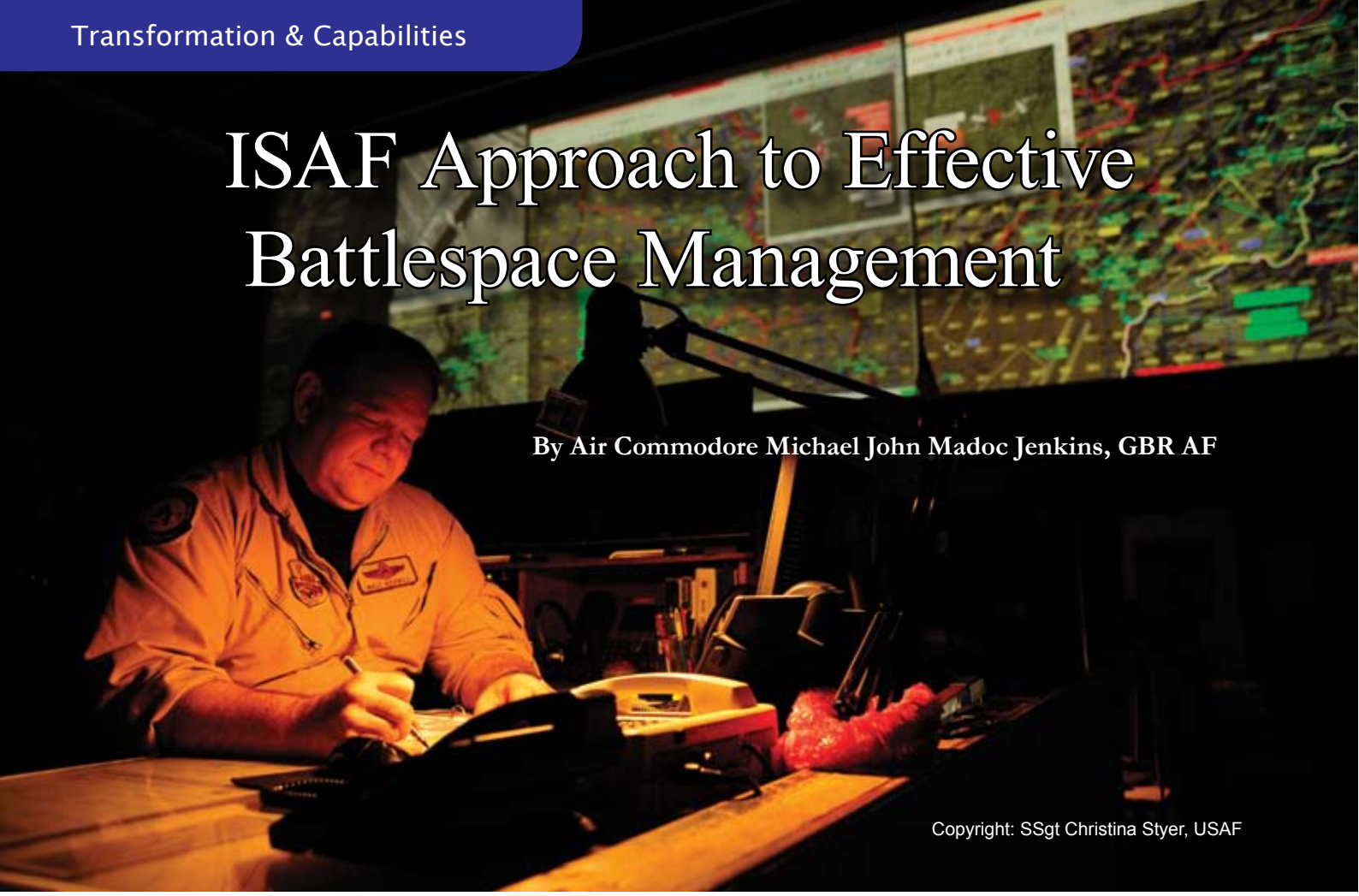
Endnotes:

1. Lieutenant General Constantin Croitoru, *Current Directions and Priorities of the Air Force Transformation*, The Romanian Military Thinking, No. 5 / 2007, page 11, Bucharest, Romania
2. Ibid, page 12.
3. TACEVAL, an abbreviation for Tactical Evaluation, is a training and evaluation programme which tests, unit by unit, the operational readiness of NATO forces.
4. ARS, an Air Command and Control System (ACCS) entity, is composed of the Air Control Centre (ACC), the RAP Production Centre (RPC), and the Sensor Fusion Post (SFP). The ARS may be static or deployable.

IAR-330 SOCAT helicopter.

ISAF Approach to Effective Battlespace Management

By Air Commodore Michael John Madoc Jenkins, GBR AF



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Afghanistan presents NATO with diverse expeditionary challenges both as an alliance and as an ad hoc coalition. These challenges include the mix of traditional and non-traditional military missions, integration with a large International Community and non-governmental reconstruction effort and the need to operate within a country of geographic extremes. All this is set against a country with a history of instability, ethnic war, occupation and more recently criminality, corruption, narcotics production/ trafficking and with open borders and a fragile Central Government. Thirty-seven coalition nations with different warfighting cultures, disclosure and security implications, less than optimal communications and radar coverage, and a military air campaign set within a growing civil aviation structure make for a complicated battlespace.

In addition, the employment of an ever-increasing number of diverse air platforms has challenged traditional command and control systems. During 9 months as Director of the ISAF Air Coordination Element in Kabul, I worked to develop effective Air Combat and Control, and Command, Control, Communications and Intelligence (C3I) structures designed to meet these expeditionary challenges and to enhance the execution of effective air support. Maj Gen Meulman, DCOM (Air) ISAF X, provided an excellent insight in his article for JAPCC Edition 6.

We should overcome national approaches and interests and work in the best interest of the men and women on the ground, who are executing their mission on a daily basis. […] It may be that the biggest challenge is to Command and Control the Coalition, thereby keeping it together and focussed at times when it is most needed.

Following on, let us look at the command and control challenges at the tactical level in delivering full-spectrum, effects based[1] Air Power in a safe and effective way; producing and executing both the Air Tasking Order (ATO) and the Air Coordination Order (ACO). I hope to outline and illustrate 3 key challenges, which face the ATO: visibility, time-cycle and mobility, and then turn to the complexities of the ACO: air environment, geography and security.

Strategy to Task

An effective air battlespace is reliant on information collection, processing and dissemination processes [the Joint Tactical Air Request (JTAR) to the ATO process] and coherence in 'strategy to task.' Before we can deliver an effective ACO/ATO, the context has to be derived from the Commander's intent.

That intent, expressed through the campaign plan, describes a series of operations, integrated in time space, whose purpose is to achieve objectives within a strategic goal. The delivery of the air element of this integrated campaign is expressed in the Joint Air Operations Plan (JAOP) and in the Air Operations Directive (AOD) that, together, set the context for air missions and, to land commanders, the air priorities and effects available to them.

In counter-insurgency (COIN) operations, as opposed to Major Combat Operations (MCO), the operational environment is one mixed between warfighting and reconstruction/normallife. Friendly forces (FF) do not necessarily own the initiative in 'military' operations and the campaign must be won through an enduring effort of public influence to alienate the opposition, in terms of politics or ideals, and make the conduct of violent activities unacceptable. All FF activity must be intelligence led, localised and often reactive in order to take advantage of the local operational environment or 'spontaneous opportunity.' The geographically localised or tactical focus adds to the complexities of the ATO and ACO in part by introducing a plethora of local air vehicles from light aircraft for Provincial Reconstruction Teams to tactical Unmanned Aerial Vehicles (UAV) for FF. Therefore, COIN presents significant challenges for a centralised air command and control system working alongside a decentralised land process.

To maximise air effect, we need a flexible and focussed JAOP, weekly AOD and integrated planning (not Joint where a land plan is given to air to add air support, but where the air and land effects are integrated to deliver the objective), clear objectives and the mechanism for reporting against these missions or objectives. To achieve integrated planning, expert airmen are required in the planning teams of the land tactical elements to advise how air effects can be made available.[2]

Since air can't 'afford' to commit scarce assets to every activity, air support has to be 'bid for' and employed effectively. This requires a tasking process, which is driven to achieve procedural standardization (on the ground and in the air) and which manages geographical splits. The process must operate in a complex C3I regime where physical security, freedom of movement, information 'releasability,' diverse information technology and voice systems all complicate the production, dissemination and execution of the ATO. Simply put, everybody wants air support to minimise the risk to the FF since air provides an undeniable advantage in COIN operations. The 'bid' must be supported with justification through the JTAR and performance reporting is provided through mission reports (MISREPs, Ground/Contact reports and Joint Tactical Air Controller (JTAC) reports).

Consequently, an Air Priority Matrix (APM) is required that

Afghan National Army trainees prepare to learn perimeter security during training at the Kabul Military Training Center.

The MH-60 Black Hawk supports ground operations in ISAF.

reflects the campaign plan but also prioritizes activities for support in accordance with the ground commander's intent. Initially, a unit priority system was in place for Afghanistan as opposed to a mission based system. However, this did not correctly reflect a scheme of manoeuvre and required a complete rethink to ensure the right people at the right time received the right air support. The resultant air led CJ3/5[3] APM ensured maximum support whilst allowing flexibility to enable the spectrum of air effects and tasks. Execution was dramatically enhanced by the use of multi-role platforms and exploitation of latent capabilities – non-traditional intelligence surveillance and reconnaissance using targeting pods for real time full motion video support to JTACs and for collection.

So, using the Afghan model of expeditionary ops and its effective mechanism of air command and control, let's move on to address the question, 'Building the ACO-ATO in expeditionary warfare: UAS, Rotary Wing, Fixed Wing – is there room for all?' In other words, 'can we overcome the challenges to the ACO/ATO process?'

The ATO is a relatively simple challenge but reliant on 2 factors; visibility of assets and also, the responsiveness and capacity of the ATO planning cycle. The ATO provides a task order to synchronize air activities, taking into account national caveats/capabilities, geographical constraints through basing or coverage and finally life support provision (Air-to-Air Refuelling and Search and Rescue). The challenges, therefore, relate to the knowledge of the platforms within the theatre and if they are available for more than just parochial use. Without the visibility of air capabilities and land intent, the ATO will fail – this is a similar principle to weapons to target matching. The ATO is the execution order for legal purposes and it works.

The ACO is a simple expression of a complex airspace. However, unlike the ATO, it can be enduring. The ACO provides the backbone of both flight safety and Combat ID; it may be procedural or actively managed. However, it is critical that it is adhered to. This highlights the first of its 3 challenges: All military airspace users must comply with the ACO; however, it is worth noting that on a number of occasions civil aircraft have taken short-cuts through active Restricted Operating Zones (ROZ) to achieve direct routing. The second challenge is that of dissemination, every military air user must have access to the ACO and receive updates of ROZ or other changes depending upon activities. Clearly this has transmission, security and time sensitive consequences and challenges. Finally, the third challenge is to address the complex airspace 'geography' with adequate flexibility to allow reactive and dynamic ground operations to be supported by air. We cannot

micro-manage everything and so procedural airspace management is perfectly acceptable, by default therefore, our process is adequate for the new environment.

Conclusion

I have outlined an effective air command and control in COIN and have drawn a key conclusion: The management of the ATO and ACO processes is critical for the future. However, in the expeditionary context, the 'enemies' are distance, geography, operating constraints and the proliferation of platforms. Nonetheless, adherence to the ACO and a culture of sound airmanship provides adequate safety for air operations conducted by 'kite runners' to B1s in the same battle space. So, if the ACO is a valid mechanism for the safe execution of air activities, the follow on question is, 'Are our land commanders, UAV/JTAC and artillery operators sufficiently air-minded to be trusted/compliant operators within the ACO?' I think there is work to be done in this area for many nations - if not all.

Turning to the ATO, we need an ATO process that is flexible enough, yet robust enough to manage MCO and COIN/humanitarian operations. In Afghanistan and in the Combined Air Operations Centre, it is just about there! To capture these new ways of working and learn them, we need to expose as many of our people to them and disseminate the right lessons. NATO has moved a long way since our Cold War posture, but adapting our Article 5 organisation and doctrine at a pace to keep up with 'reality' and support a 10-20 yr enduring operation is challenging. We are learning fast and CC-Air, JAPCC and others are working hard to 'spread the word.' We need every soldier, sailor and airman to be open to new ways of business and we must also ensure we retain our MCO ability. As Lord Tedder RAF said in 1947:

We British are often accused of preparing for the last war, or even the last war but one. The rate of technical development is now so rapid, and the effects of changes in techniques so far-reaching, that it may well be fatal to lag behind. For our own security we must think in terms of modern war. The last war is not modern; it is out of date!

Endnotes:

1. Albeit many nations do not fully embrace the effects based concepts.
2. In Afghanistan, most capabilities are not in individual national order of battle reports and so national airmen can be challenged to understand the full range of capabilities which can be available to the coalition forces.
3. The CJ3/5 represents the Combined Joint Staff from both the operations directorate (CJ3) and the plans & policy directorate (CJ5).

The Bamiyan Cliff, once a Buddhist shrine, holds back the daunting Afghan terrain and shadows an emerging peaceful community.

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Operational Mentor and Liaison Teams: Tomorrow's Battlespace Management – Today

By Colonel Dan Lewandowski, USA AF

In Plato's Republic, book II, Socrates is noted to have said 'Yet the true creator is necessity, who is the mother of our invention.' Operations in Afghanistan are once again proving Socrates was right. The NATO-led International Security Assistance Force (ISAF) has invented a new kind of military unit due to the necessity of the situation. This new unit of 12 to 19 personnel is called an Operational Mentor and Liaison Team (OMLT).[1] The concept of a NATO-led OMLT is that it is embedded into an Afghan National Army (ANA) unit to provide training, mentoring and liaison capabilities to ensure that ANA forces receive enabling support. At first glance, an OMLT may seem like nothing more than a way for allies to lend assistance. This type of military cooperation is not new. So, what is new then? What is the new invention? The invention is that of network enabled capability. The new capability is the combination of shared situational awareness and control capabilities to achieve unprecedented Battlespace Management. ISAF combat operations have led to this invention, and Air Power is the key enabler.

The Importance of Air Power

Since NATO took command of the ISAF mission in August 2003, many difficulties have been encountered.[2] The ISAF forces are far from their support systems, they speak many different languages (39 different nations are currently participating), there is a constant spin-up cycle due to rotations of personnel every 12 months or less, there is very little or no transportation infrastructure, the Host Nation support is very limited, the weather and geography are difficult, and the adversary is well versed in combat operations due to continued combat over the past 25+ years. How is it then that NATO forces have been so successful?

Besides a strong comprehensive approach, NATO has the advantage of Air Power. Air Power provides the means to quickly emplace and remove units. Air Power provides enhanced situational awareness through its wide reaching intelligence, surveillance and reconnaissance capabilities. Air Power provides the means to deliver supplies to remote areas, even in adverse weather conditions. Air Power provides close air support

and close combat support so that maneuver units don't need their own artillery support everywhere they go. Convoys can operate and know that overwhelming force application is available should they run into an ambush. In some cases, a simple low 'Show of Force' flyby will be enough to stop the Taliban from firing on coalition forces. The Taliban fear Air Power that much. In short, Air Power provides ISAF the single most important asymmetric advantage.

Tomorrow's Battlespace Management Today

Air Power has been so successful that the demand for it continues to increase. Helicopters for transportation are in short supply. The small number of large serviceable airfields and the lack of transport aircraft have led to airlift operations that are far less than required. In Close Air Support (CAS), the demand can not be met by the supply. In this case, ironically, aircraft availability is not the problem. The deficiency rests with Forward Air Controllers (FACs).[3] It is these critical personnel on the ground who direct the firepower from the air. Nations have not been training enough of these personnel, and no capability rests with the ANA. One recent estimate stated that US forces had only about one-third the ground controllers that were needed. The result is a severe degradation of CAS effectiveness. If ISAF or ANA forces went on missions without a FAC, they could be in great danger if attacked and the probability of engaging the wrong target, including Blue-on-Blue, is vastly increased. In one example in 2007, an ANA unit was away from base with a few ISAF support personnel when it was ambushed. No FAC was part of the unit, and the Taliban massacred the ANA/ISAF unit even though Air Power was available.

This ability to draw support whenever and from wherever it is needed became a necessity in ISAF and was one of the reasons the NATO command structure developed the OMLT concept. With an OMLT embedded within ANA forces, that ANA unit immediately becomes network enabled. That ANA unit can get intelligence support, it can get weather information, and it can get Air Power. The unit can request support and, because of the connectivity that NATO Network Enabled Capability (NNEC) offers, that support could come very quickly. Since April 2007, the French have increased their contribution from 6 to 160 OMLT personnel and they expect to add even more in 2008.[4] But again, the problem is supply and demand. There still aren't enough OMLTs for all of the ANA forces. As of early January 2008, 26 OMLTs were deployed in the ISAF area of operations.[5] Fortunately, this number is expected to grow to about four times that amount.[6]

Effective use of Air Power

The key for effective OMLT use of Air Power for CAS or close contact support is the FAC. FACs are specifically trained to control any coalition aircraft that engages in combat with ground troops and they are expected to be part of most OMLTs. However, not all OMLTs need FACs as the ANA unit that they are assigned to may not deploy into the field of combat. In operations, aircraft may be planned or they may be called in

'It is these critical personnel on the ground who direct the firepower from the air.'

Nations that have contributed to the programme	Nations that plan to contribute in the near future
Canada, Croatia, Czech Republic, France, Germany, Italy, Netherlands, Norway, Poland, Slovenia, Sweden, Spain, United Kingdom, United States	Latvia, Portugal and Romania

Figure 1 - ISAF OMLTs and Embedded Training Teams [7]

on short notice for unexpected firefights. The FAC will gather information about the troops-in-contact such as the location of the friendly ground forces, location of important structures like mosques, and the location of the target(s). If the OMLT has only a Joint Fires Observer (JFO), that JFO must work through a FAC. The JFO becomes the eyes and ears for the FAC, since only FACs are trained to directly control aircraft. It is with these ground controllers that the asymmetric advantage of Air Power can be applied at nearly any time, in nearly any place. And this is another example of network enabling – the JFO is the sensor providing decision superiority via the FAC hub.

OMLTs provide more than just FACs to support CAS operations. They serve as teachers. They talk the military language with Afghan leaders in a mentoring capacity. They call in aero-medical evacuation. They fight alongside the ANA when the going gets tough. They don't command the ANA units that they are attached to, they just help.[8] The goal of every OMLT is to work themselves out of a job. They want the ANA units to be self sufficient. To meet this goal, from the Air Power perspective, the Afghan National Army Air Corps (ANAAC) is working on its airlift capacity and, by 2013, it hopes to have CAS capable aircraft. Until the ANAAC has its full operational capability though, the OMLTs will need to be there to assist. Figure 1 shows the nations that contribute to the OMLT programme.

At the more strategic level, battlespace management is enabled by OMLTs; through their ability to remain connected to the ANA and to the NATO command structure. As a result of the OMLTs, the ANA/OMLT units can be guided through the battlespace. They can be positioned at the right place, at the right time. They can bring to bear the appropriate actions to achieve the desired effects. Is it working? In a recent Pentagon news conference, Major General David Rodriquez stated that Taliban and al-Qaida fighters are now operating from havens in the largely ungoverned tribal areas of western Pakistan and they appear to have shifted their focus toward targets inside Pakistan rather than across the border in Afghanistan.[9] Could the reason be that there is virtually no Air Power available in the Pakistan battles?

As Seneca stated in the first century AD, 'You cannot escape necessities, but you can conquer them.'[10] NATO, enabled by NNEC, is conquering the necessities of ISAF operations. OMLTs, and their use of Air Power, are showing the positive effects of innovation in the battlespace. ■

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'The goal of every OMLT is to work themselves out of a job.'

Endnotes:

1. NATO Fact Sheet on Operational Mentor and Liaison Team (OMLT) Programme, September 2007, www.nato.int/issues/afghanistan/factsheets/omlt.html
2. The ISAF Mandate is based upon eight UN Security Council Resolutions (1386, 1413, 1444, 1510, 1563, 1623, 1707 and 1776), the Bonn Conference of December 2001 and the Military Technical Agreement of January 2002, www.nato.int/isaf/topics/mandate/index.html
3. NATO Standards use the term Forward Air Controller (FAC), the United States uses the term Joint Terminal Attack Controller (JTAC). Both terms describe the same person doing the same job.
4. President Sarkozy's visit to Afghanistan, Saturday 22 December 2007, www.ambafrance-au.org/article.php3?id_article=2608
5. 'Operational Mentor and Liaison Teams,' 4 Jan 08, http://shapesitrep.com/?p=12
6. 'DoD News Briefing with Gen Craddock from the Pentagon,' 10 October 2007, www.defenselink.mil
7. NATO Fact Sheet for Operational Mentor and Liaison Team Programme, valid as of September 2007, www.nato.int/issues/afghanistan/factsheets/omlt.html
8. 'OMLT: Slowly working themselves out of a job,' Kristina Davis, National Defence and the Canadian Forces, July 2007
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JAPCC CONFERENCE 2007

The Role of Joint Air Power in Expeditionary Security and Stability Operations

The 3rd annual JAPCC Conference, held in Kleve, Germany, 16-18 October 2007, considered 'The Role of Joint Air Power in Expeditionary Security and Stability Operations'.

Opening Presentations

General William T. Hobbins (United States Air Force), Commander, US Air Forces Europe; Commander, Component Command Air, Ramstein and Director JAPCC opened the conference. General Hobbins emphasised that Air Power remains a critical contributor to the joint battle and an essential factor in today's coalition battle space. The Conference aimed to explore how Air and Space Power in traditional warfare is best translated into a decisive edge in expeditionary security and stability operations, with special reference to NATO's ongoing International Security Assistance Force operations in Afghanistan.

In the Keynote Address, General Egon Ramms (German Army), Commander, Allied Joint Force Command Brunssum, underlined that conflicts with non-state actors, known variously as irregular warfare, small wars, Military Operations Other Than War, Low Intensity Conflict, and including Counterinsurgency operations, are now the prevalent form of warfare, and could remain so for the foreseeable future. Despite frequent update, Air Power doctrine remained focused on inter-state conventional conflict. There was now an urgent need for airmen to consider how the air and space environments can be exploited to facilitate and deliver cognitive effects in this new warfare environment.

Following General Ramms' address, Lieutenant General James N. Soligan (United States Air Force), Deputy Chief of Staff Transformation at Headquarters Supreme Allied Command Transformation gave an update on ACT's work to transform NATO Air and Space Power to the requirements of today's warfare.

Air Commodore Garfield Porter (Royal Air Force), Assistant Director Transformation JAPCC then set the scene for the panel discussions with a presentation on Air Power in Expeditionary, Security and Stability Operations.

Panel Discussions

The panels and audience comprised a mix of joint, land, maritime and air commanders, specialist staff officers, academics and representatives of industry. The panels in turn discussed the following:

Panel 1 – The Comprehensive Approach. Panel 1 identified that a Comprehensive Approach is ideal in irregular warfare, but at present in Afghanistan, there was no single organisation responsible for leading such an approach and thus, the cross-organisational leadership and definition of objectives are lacking. The 'Lead Nation' concept was a possible solution but this carried with it significant political complications. There is a need for military authorities at all levels to work closely in harmony with their civilian counterparts.

Panel 2 – Command & Control and Intelligence, Surveillance & Reconnaissance. Panel 2 focussed upon the need to integrate the capabilities of all contributing components into a truly joint operation. In this endeavour, NATO should leverage the 'Information Age' thinking to upgrade its Command of Air and Space policy and doctrine.

Continued on page 54

Air Marshal Walker responds to questions during the 2007 JAPCC Conference.

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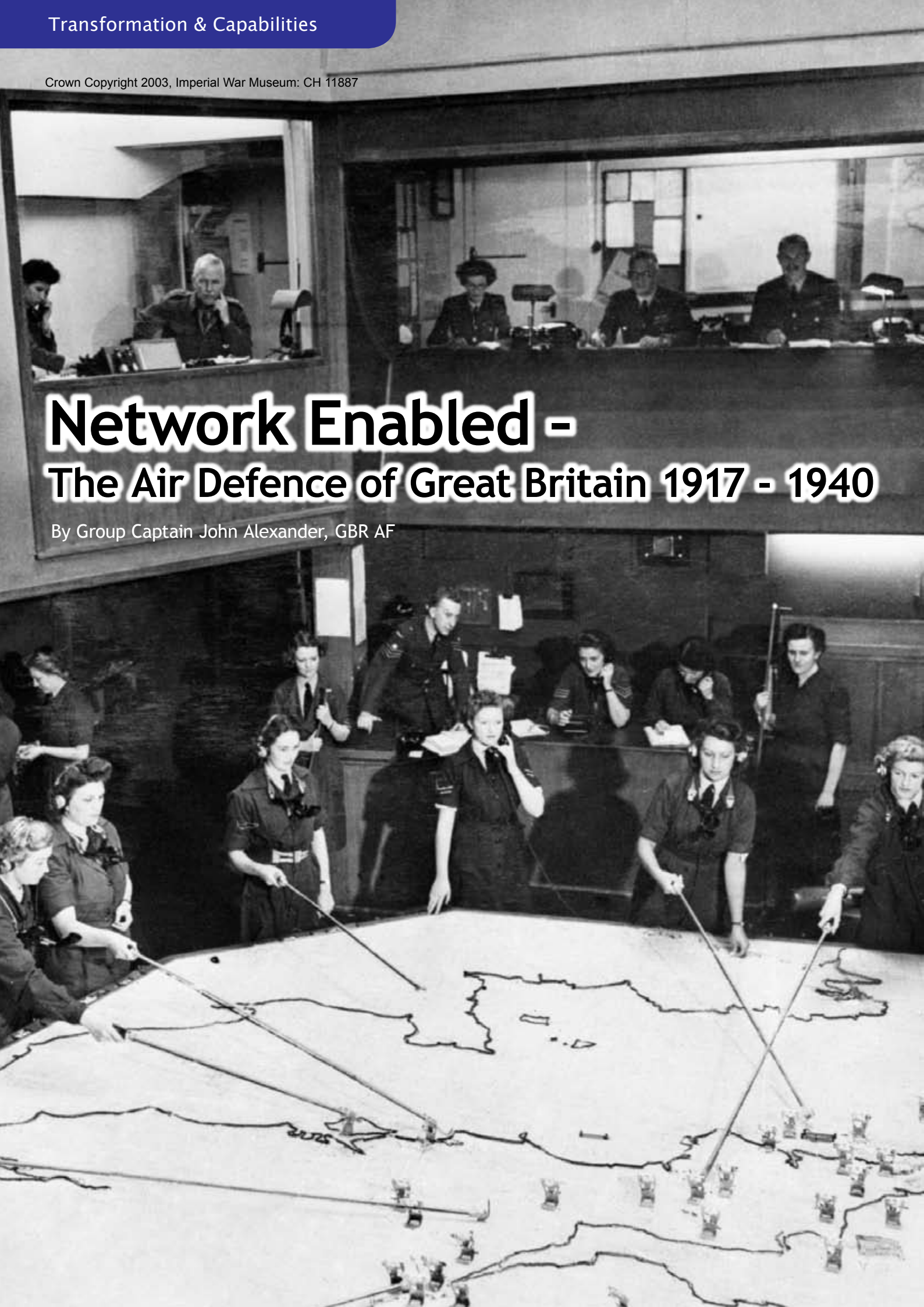


Network Enabled –
The Air Defence of Great Britain 1917 - 1940

By Group Captain John Alexander, GBR AF

The Battle of Britain in 1940 was a battle for control of the air between Britain and Germany over southern England and the surrounding waters. For the Luftwaffe, control of the air would make invasion and British defeat possible. British control of the air would prevent defeat. As the only major, self-contained and absolutely decisive air battle in history, the Battle's machine against machine engagements could be said to characterise industrial age warfare. Indeed, the Battle between a few thousand aircrew on each side harked back to a chivalrous age of warfare between individuals - Churchill described the British aircrew as 'the Few'. But the Battle of Britain was also the first battle of the information age. The Luftwaffe came close to fatally weakening Fighter Command by late August 1940 through its offensive counter air operation, but because of poor intelligence the Luftwaffe did not know it was being successful, and so switched to bombing cities. On the other hand, British decision superiority was such that John Ferris has described the battle as a walkover.[1] While this may be an exaggerated view, this article sets out to show that the world's first integrated air defence system was based on a network concept, first used in 1917, and developed into a network enabled capability that by 1940 provided a level of shared situational awareness that permitted effective command and battlespace management during the Battle.

A study of the development of British air defence demonstrates that the network concept came first, to which capabilities such as radar were developed and added, not the other way round, as in Germany and the USA. The development of an integrated air defence system for Great Britain started as a response to German Gotha daylight bomber raids on London in June and July 1917 which killed 219 people, wounded many others and caused panic, despite an uncoordinated response by a large number of defending aircraft. The officer appointed to command the London Air Defence Area (LADA), Brigadier General 'Splash' Ashmore, a pilot, Royal Flying Corps Brigade Commander, and former artilleryman, realised the key to an effective air defence system was the rapid and accurate collection and dissemination of information through a centralised command structure.

'... the world's first integrated air defence system was based on a network concept, first used in 1917 ...'

The battlespace was managed through the use of three defensive rings – an outer ring of anti-aircraft (AA) guns and search lights to break-up German formations, a middle ring of fighters – the Fighting Zone - and an inner ring of AA guns, searchlights and barrage balloons. Intelligence and information gathering was based on Signals Intelligence (SIGINT) and the direction finding of German radio transmissions. A dedicated telephone system allowed all the elements of the LADA – guns, searchlights, aerodromes, observation posts - to connect to one of 25 regional sub-control rooms, which plotted reports for the region, and then 'told' the reports to the central control room in London where, in modern terminology, they were fused into an air picture. The London control centre used direct lines to the aerodromes to scramble fighters to fly on patrol lines at staggered heights, and by 1918 it was using wireless to direct airborne fighters. While the sensor, processing and communication technology at that time was limited – resulting in a lack of accuracy – this integrated air defence system had some success against German bombers, which flew at less than 70 knots and relied on visual navigation. By the end of 1917, German bombers were forced to fly at night. Throughout 1918 German bombers had a 21% combat and accident loss rate and Ashmore expected 12% of his fighters to intercept incoming bombers. By May 1918, the LADA was the world's most advanced command and battlespace management system, and a network enabled capability, albeit with centralised situational awareness.[2]

Although disbanded completely after the War, the air defence system was revived in 1923 and then continually developed. A Home Defence Air Force was created as the world's first strategic air force using the 1924 doctrinal principle that 'the bombing squadrons should be as numerous as possible, and the fighters as few as public opinion and the necessity for defending vital objectives will permit'.[3] Contrary to Trenchard's strategic bombing theories, the RAF's air defence interest was focused by British Army threats to seize the role. Both the Army and RAF's air defence organisations were led by experienced commanders and from 1923 to 1939 Britain spent more on strategic air defence than any other state. A dedicated strategic air defence HQ was formed (Fighting Area HQ and from 1936 RAF Fighter Command), collocated with the Army's AA Command. Air defence would rely on fighters backed up by AA guns. The layout of the fighter and AA gun zones was adapted as capabilities developed. SIGINT continued to be used, a

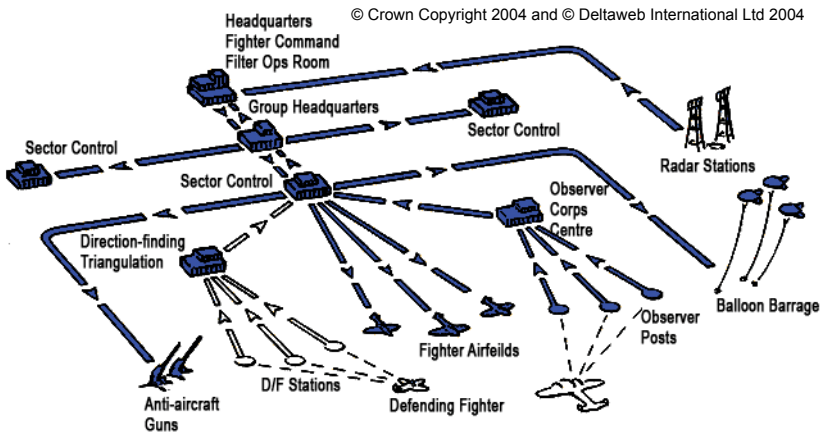


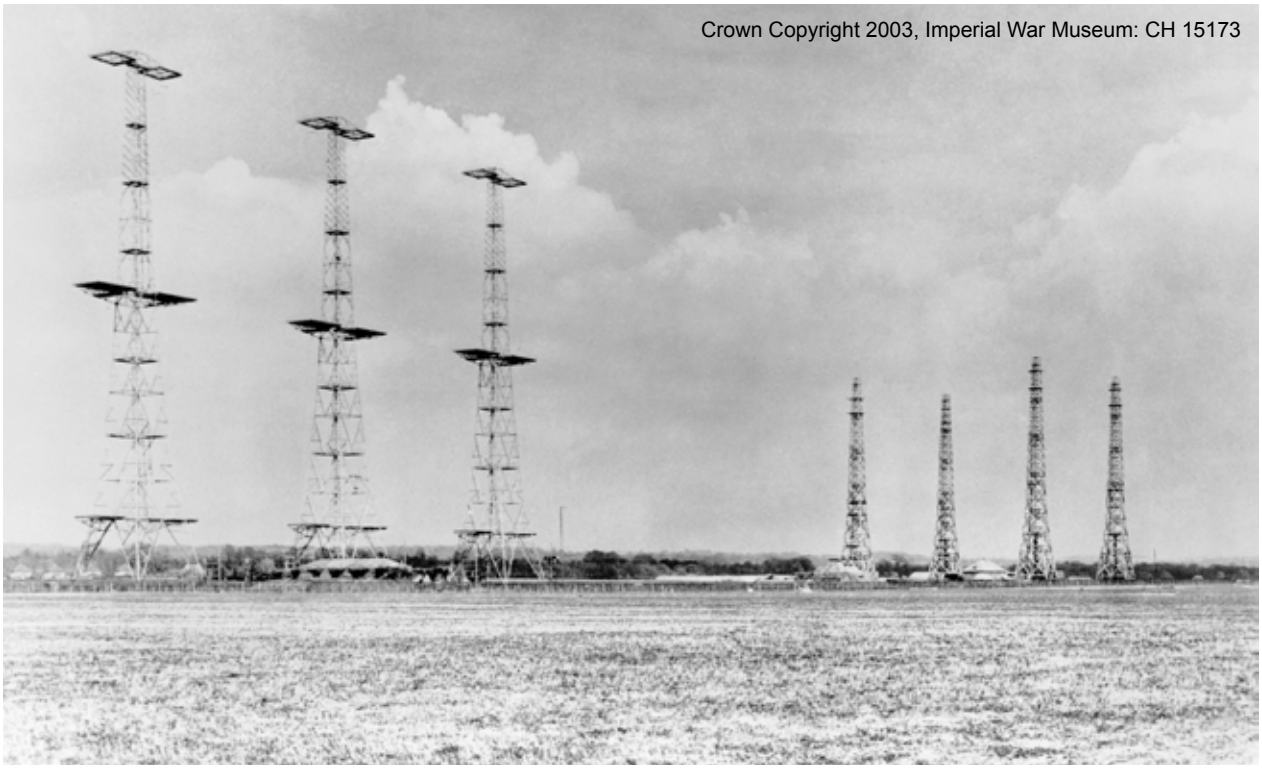
Figure 1 - The RAF Fighter Control System 1940.[4]

civilian-manned Observer Corps was formed, sound locating acoustic mirrors developed, and eventually radio direction finding (RDF), or as we now call it, radar, introduced. A dedicated telephone network was established and ground-to-air radios developed. From 1930, twice yearly exercises pitted the metropolitan RAF's fighters and bombers against each other, and proved that air defence capabilities were keeping up with the bombers. The science of Operational Research was developed and each development was characterised by the close working of air force officers and scientists. Together through experimentation and testing in exercises, they developed methods such as filtering track information and vectoring fighters onto enemy bomber formations, rather than as previously deploying fighters in a screen across the expected bomber path.

By 1940 the Dowding System (named after Air Chief Marshal Sir Hugh (Stuffy) Dowding, Commander in Chief Fighter Command), shown at Figure 1, had evolved into the following:

- All intelligence data from radar stations was sent by telephone or teleprinter to the Fighter Command filter room.
- The Filter room filtered raw data and plotted it on the Filter Room map. Plots were transmitted to the Fighter Command Operations Room and plotted.
- An assessment by the Operations Room was passed to appropriate Group Operations Rooms.
- The Group Operations Rooms plotted raids and assigned intercepts to Sectors.
- The Sector Controller scrambled fighters and vectored fighters onto enemy formations.
- The Fighters intercepted bombers at or near the coast.

During the Battle of Britain, the air defence system came under great pressure and continued to be refined, particularly as a result of Operational Research. The RAF's



A Royal Air Force radar, 1939-1945, at Poling, Sussex.

Air Historical Branch's secret official studies of the Battle, the radar and the air defence system concluded that the 'air struggle was fought without any large deviation from the technique of raid reporting, and [the] fighter control organization evolved for defence in air exercises before the war'. The first Fighter Command engagement of World War Two was a fratricide on 6 September 1939 and most RAF aircraft were not fitted with the new Identification Friend or Foe (IFF) until October 1940. It was realised very late that the abilities of the filterers were essential, and that science or mathematics graduates were needed. However, the most significant flaw was that during times of large attacks the system verged on collapse caused by information overload on the single filter room. This concern had been raised in January 1940 when the Chief of Air Staff asked Dowding to consider creating filter rooms for sensor fusion at Group level. This was not implemented before the Battle, causing Radio Stations to pass general information on raids when overloaded during the Battle. Dowding eventually established Group filter rooms after Air Council intervention in October 1940 once all fighters had been fitted with IFF, in order to ensure the reliability of the recognised air picture.

The British air defence system was therefore a robust network that enabled command and battlespace management, through shared situational awareness. It allowed activity and effects to be prioritised and synchronised throughout the operational environment. If network enabled capability implies near real-time gathering, processing and diffusion of information to enable the high tempo conduct of activities, then Fighter Command was a network enabled capability. The key concept was the network, a network that could be adapted as technology, including information technology, was developed. In 1917 situational awareness was only available in the LADA control room, which therefore exercised both command and control. By 1940, the improvements in early warning provided by radar allowed the decentralisation of shared situational awareness, and permitted mission command to be decentralised to Sectors, and by late 1940 sensor fusion could be delegated once all fighters were fitted with IFF. In modern terminology, the Dowding System consisted of human and synthetic enablers that, together, through shared situational awareness and distributed collaborative working, delivered decisive advantage and favourable outcomes. The concept, and people (like the filterers) were as important as the information technology (radar, telephones and radio).

While today's networks are required to function across joint and combined boundaries, the Dowding System worked within a self-contained air environment of fighters and ground based air defence, limited geographically to England and the surrounding airspace. The division of the metropolitan RAF into functional strategic commands – Fighter, Bomber, Coastal and Training – allowed Fighter Command to focus on air defence. However, this functional organisation detracted from what we would now call Combined Joint Force Air Component planning, operations, training and development. Contemporary RAF fighter and other British operations outside of the Fighter Command network, and in joint and combined operations, as in France and Norway proved much less effective, although during the Battle of Britain Bomber Command raided enemy ports and aggressive anti-shipping work was undertaken by Coastal Command. In contrast, the German self-contained *Luftflottes* proved much more effective in joint, expeditionary operations, with excellent liaison between the German services at the operational and tactical levels, and based on joint training at the tactical level. However, Germany moved to a functional air defence system when on the defensive later in the war.

Network enabled capability based decision superiority, using a concept continually evolved from 1917, was critical to the RAF preventing the Luftwaffe gaining the degree of control of the air required to mount an invasion. The Germans never realised the importance of the system, and never conducted deliberate command and control warfare against it. Dowding survived the Air Council's 1 October 1940 criticism of the lack of Group filter rooms, but a few weeks later Fighter Command's failure to counter night bombing raids on British cities by an enemy denied, as in 1917, control of the air over England by day probably contributed to Dowding's replacement. Night interceptions were made possible by the fielding of the Airborne Intercept Radar equipped night fighters already in development – but that is another part of the network enabled story.

Endnotes:

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Firebird Operations in the Nevada Desert

Integrating Unmanned Aircraft Systems into Joint Terminal Controller Training

By Major Dean Driskill – US Marine Corps, and
Major Pat Filbert – US Army

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In September 2007, Operation Firebird[1] was executed in the Nevada desert, successfully fusing two major objectives of the United States Joint Forces Command (USJFCOM), the United States Navy Naval Strike and Air Warfare Center (NSAWC), and the Joint Unmanned Aircraft Systems Center of Excellence (JUAS COE). The Firebird operation not only provided real-world data to support joint tactics, techniques, and procedures (JTTP) for employment of unmanned aircraft systems (UAS) in joint close air support (JCAS), but it also tested the value of a UAS to the joint terminal attack controller (JTAC).

Firebird operations also tested the feasibility of using commercial UAS for training purposes – the JUAS COE worked with the NSAWC to incorporate a Viking 300 into their planned JTAC training exercises. The training exercises and the NSAWC facility at Fallon, Nevada, provided an ideal venue for accomplishing all objectives.

The event included participation by all four US Services, Allied Nations, Joint Staff, Joint Agencies, and civilian contractors.

Expanded Role of UAS

Operation Firebird originated in response to the enhanced role of UAS in military operations. Though traditional UAS missions included long-range fires spotting and intelligence, surveillance, reconnaissance, the number and capabilities of UAS have grown, and so have their functions. One result is that UAS operators are being pressed into more areas of responsibility to support missions such as JCAS.

Joint Close Air Support

JCAS is arguably the most delicate mission that military air can execute. The ability to quickly and accurately employ fires from the air in close proximity to ground forces (while simultaneously accounting for the fire and movement of those forces) is often a key aspect of successful military operations. The ability to direct and control kinetic and non-kinetic fires from aircraft remains closely linked to effective military combat operations.

The modern operational environment allows for two primary methods to control airborne fires. One is to have a

terminal controller direct fire from the cockpit of an aircraft, and the other is to use a terminal controller on the ground. As technology advances, JCAS fires continue to become more lethal, accurate, and timely. It is increasingly important to leverage advances in technology with the time-honoured and combat-proven tactics for effective JCAS.

Current UAS technology can provide the joint warfighter with additional capability when conducting JCAS missions.

Training Gaps

Increasingly sophisticated system capabilities demand commensurate training, and operators in JCAS environments must learn to operate in increasingly congested airspace occupied by both manned and unmanned systems. However, training for such missions is frequently not reflected in pre-deployment training syllabi. Also, it is important to note that a large percentage of JTACs have not received dedicated, in-depth training to incorporate UAS into their 'tool kits.' Too often, these JTACs have deployed to combat theatres with the bare minimum of UAS integration experience. The JTACs must then go through a significant amount of 'on the job training.'

Training for incoming personnel has often been limited to pass-down of procedures learned from previous units, or partial training obtained from trial and error. Additionally, this training in the field is not standardized and is often an imperfect reality of combat operations. Furthermore, UAS integration training received at the JTAC and other close air support schoolhouses often includes only a few classroom lectures, classroom sand table exercises, and a notional UAS 'simulated' with no actual UAS flying during training or during practical field exercises.

Several factors account for the absence of UAS material in JCAS training and qualification exercises. For example, the operational tempo for military UAS units leaves little, if any, time to support JTAC training prior to deployment. The vast majority of military UAS sorties are used for ongoing operations, often leaving no extra sorties available to support JCAS training courses.

Also, resources necessary for an effective JTAC training programme are sometimes lost in the planning stages due to inexact requests. Planners equate a capability (eg, full motion video from an unmanned platform) with a materiel solution (eg, Predator UAS). When planners request a specific UAS solution instead of a capability, the requests are frequently returned unfilled.

A commercially controlled UAS supports JTAC training and qualification.

One method to potentially alleviate this shortfall is to request capabilities rather than specific UAS platforms. For instance, instead of asking for a 'Predator' for sixty-five hours, a request for 'sixty-five hours of day and night full motion video, supplied by an unmanned system, compatible with a remote video terminal' may come back with additional options to support the JTAC training.[2]

However, what if there are no Service UAS available to support training? With a majority of military UAS units unable to support the training, a JTAC training planner may conclude that the door is shut for UAS support, turning instead to a notional UAS or a 'surrogate' UAS.

Live versus 'Surrogate' UAS

A 'surrogate' UAS is simply a manned aircraft with an imagery sensor installed. Such an aircraft can provide some limited training for recognition of aerial imagery on a remote video terminal. However, a manned 'surrogate' does not provide the same level of training as an actual UAS. Too often, airspace integration and sensor 'pointing' are not accomplished by the intended JTAC, but by the personnel operating the surrogate or by simulating the UAS through artificial means (ie, through computer simulation).

So, we're back to the question of how to provide a viable solution for this dilemma. Is there another option? The answer is a firm 'yes' - a commercially contracted UAS, as part of an overarching UAS services contract, to support JTAC training and qualification.

The JUAS COE worked with NSAWC from December 2006 to August 2007 to plan the incorporation of a UAS into the JTAC training course at Naval Air Station Fallon. NSAWC provided a statement of required capability for a UAS, and the JUAS COE conducted the search for available assets to fulfil this need. After both a Service and commercial solution search, the UAS selected the BAI Aerospace Viking 300 UAS, as part of an overall UAS services contract.

Execution

The JUAS COE involvement in Operation Firebird was on a not-to-interfere basis—it was designed so that it did not deviate from the established NSAWC JTAC training syllabus or cause a JTAC student to fail his course.

During the September JTAC Course, the Viking 300 UAS, designated 'Firebird,' conducted active support to day and night JCAS missions, and provided support for artillery indirect fire

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Training UAS crews and JTACs to work cooperatively under a common standard.

adjustment. Since this JTAC course coincided with a Carrier Air Wing pre-deployment training exercise, the Viking 300 was also integrated into dynamic strike and killbox training for the Air Wing; UAS integration was not required for Carrier Air Wing pre-deployment training. Throughout the exercises, the Viking 300 operated from a dry lake bed while flying in a restricted area with manned aircraft seamlessly and safely operating above, below, and through the airspace. The UAS was integrated into all phases of the missions including planning, briefing, execution, and debriefing.

There were several constraints placed on UAS operations, primarily for training safety purposes. The UAS flew with lateral and altitude separation while complying with the requirement to remain within a geographically small (approximately 11 nautical miles in diameter) restricted operating area. Also, the scenarios were scripted to follow existing JTAC and Carrier Air Wing training, which meant the target sets were clearly visible during day JCAS missions. Further, the JTACs could control fires visually, as they could see the target set during the day missions — the need to use UAS video increases dramatically at night or when the terminal controllers are in a less structured environment.

Results

UAS integration during Operation Firebird was focused toward real-world data collection to support Service validation of UAS in JCAS JTTP. The JTTPs had been developed during an eight-month study conducted by the JUAS COE in 2006 to support quantification of existing joint doctrine. Working together with USJFCOM, the JUAS COE is supporting integration of these JTTPs into U.S. Joint Publication 3-09.3, Joint Tactics, Techniques, and Procedures for Close Air Support. The JUAS COE also supports parallel work to facilitate specific UAS integration requirements into the JTAC and Joint Forward Air Controller (Airborne) memorandums of agreement.[3]

The JTTPs are summarized below. The September integration event focused on the first six. The armed (weaponized) UAS JTTP was not evaluated at that time.

- Support to JCAS Missions via target identification/full motion video/bomb damage assessment/ bomb hit assessment.
- Planner/operator awareness of UAS characteristics.
- Evaluation of payload effectiveness (electro-optical/ infrared, laser target designator/ laser target pointer).
- Use of Data links.
- Planning considerations with regard to UAS.
- Evaluation of UAS flight profiles and deconfliction methods.
- Armed UAS.

Conclusions

Data gathered to support overall validation of UAS in JCAS JTTPs indicate the JTTPs are framed correctly for joint doctrine incorporation. This exercise also highlighted a need to develop training for UAS crews (eg, aircraft operator, sensor operator, UAS Mission Commander) to effectively work with JTACs. Training of both UAS crews and JTACs to work cooperatively under a common standard and certification process across the Services will ensure effective UAS integration and employment during JCAS missions in a dynamic target environment.

To facilitate data collection in support of USJFCOM JTTP validation, JUAS COE consolidated data collected from the September event into a final report, finalized in January 2008. The report supports integration of military, or commercial, UAS into training exercises to provide necessary 'hands-on' and decision-based training that surrogate UAS may not provide.

This exercise at Naval Air Station Fallon demonstrated that UAS can be effectively integrated to improve JCAS training. Recurring training for JTACs integrated with UAS crews and related equipment can have noticeable, positive impacts on improving JCAS combat operations support. The exercise identified shortfalls requiring further training integration to ensure a stronger, more integrated JCAS team. It also demonstrated that UAS can serve as another tool for the JTAC, specifically, by adding another set of 'eyes' to generate target coordinates for manned aircraft munitions delivery and ground artillery mission adjustments.

The JUAS COE will maintain the momentum built by the work that culminated in Operation Firebird to further assist integration of UAS in JCAS operations. This work will continue to support USJFCOM JCAS efforts to better support U.S. and Coalition operations. ■

Endnotes:

1. 'Firebird' is the radio call sign designated for UAS at Naval Air Station Fallon.
2. A remote video terminal could be in the form of a remote optical video enhanced receiver or one system remote video terminal.
3. The JUAS COE and the JAPCC co-hosted a Concept of Employment / Concept of Operations workshop for UAS on 20-21 Sep 07. Cooperative work continues in this area of UAS operations.

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Sensor Data Fusion in a Network-Centric Environment

By Colonel Sandro Sampaoli, ITA AF

Network-Centric Warfare (NCW) capabilities can provide the warfighter with an unprecedented level of Shared Situational Awareness (SSA), which in turn allows friendly forces decision superiority over an adversary. NCW principles applied to the full spectrum of military activities can provide the following advantages:

- Higher speed of command.
- Forces capable of self-synchronisation.
- Increased lethality, survivability and responsiveness.

These improvements to operational effectiveness are, of course, attractive but their implementation is dependent upon the successful transition from legacy to open-architecture systems, which are capable of managing the information domain as well as we are able to manage other warfare domains. The technical challenges of developing an 'infostructure' capable of offering high quality information services with low latency, large bandwidth, secure and robust data links need to coincide with the development of doctrine, concepts of operations, tactics, techniques, procedures and a new way of thinking about information management and Command and Control (C2).

NATO Experiences in SIGINT and EW Fusion

NATO organisations have been working on these issues for a long time, promoting valuable initiatives to enable the transformational process on both technical and conceptual issues. In particular, the NATO Signals Intelligence and Electronic Warfare Working Group (SEWWG) organised two highly successful demonstrations to develop a collaborative environment between Signals Intelligence (SIGINT) and Suppression of Enemy Air Defences (SEAD)/ Electronic Warfare (EW). In April 2005, the SEWWG organised Trial HAMMER 05 on the Franco-German electronic warfare range at Polygone. This trial established a common data reporting format (NATO Common ELINT and ESM Reporting Format) for the NATO SIGINT and EW Operations Centre (SEWOC), which was responsible for processing and distributing a common Electronic Order of Battle. The SEWOC also aimed to improve tactical coordination between the air assets provided by ten NATO Nations into two main mission areas: the Intelligence Preparation of the Battlespace and SEAD. The trial revealed significant shortfalls

in interoperability and in the availability of secure tactical data links to exchange information - only three platforms were equipped with Link 16.

In November 2006, the same working group organised Trial SPARTAN HAMMER 06 in Greece. As well as implementing the concepts and procedures produced from Trial HAMMER 05, the new trial focused upon using the data link system, Improved Data Modem (IDM), in a wider range of joint mission areas. In particular, 14 NATO Nations provided air, land, maritime and special operations forces to establish the geographic location of threat emitters by means of the cooperative exchange and processing of emitters' parametric data.

The Italian Air Force took part in both HAMMER trials and defined a roadmap to achieve a progressive improvement in operational capabilities. We developed the Joint Forces Fusion Centre to collect data from Air Force and Army collectors through multiple data link sources (Link 16 and IDM), to perform electronic warfare data fusion and to distribute the results via the same data links to higher echelon Commands and to the forces in the air. This collaborative environment offered an opportunity to test and evaluate the benefits/constraints of a larger scale net-centric environment both technically and operationally.

Technical Considerations

The sensor data fusion process used during the trial involved the following steps:

- Transformation of analogue sensor signals into raw digital data.
- Analysis/synthesis of sensor raw digital data into sensor processed data.
- Multiple sensor processed data fusion/correlation to derive usable information.
- Transformation of information into knowledge by means of experienced operators, who are then able to make proper tactical/operational decisions.

The challenge was to define the architecture where these four tasks occurred, what the processing method would be and how the exchange of data/information should be organised. Legacy and new generation assets normally perform the first task at platform level but after that, a collaborative virtual environment using digital networks is needed to enable the exchange of data/information. New generation assets equipped with multiple sensors possess the processing power to perform all tasks at platform level, but sensor/data exchange, correlation and fusion are still required to exploit the capabilities offered by other platforms' sensors.[1] The


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An efficient "infostructure" is a pre-requisite for the application of NCW principles.

overall concept is not new; the improvements to the recognised air picture provided by increased capabilities of the Airborne Warning and Control System and Link 16 are an example of improved data fusion. The innovation lies in the fact that the fighter could receive information in the cockpit, during the mission in real time, as well as information/knowledge about all domains of the battlespace: friendly/enemy, air/ground/maritime forces and the operational environment.

Operational Considerations

Experiences gained from the sensor data fusion process during the Trial SPARTAN HAMMER revealed:

- A need for multi-dimensional horizontal distribution of information to the forces (besides the traditional vertical/hierarchical information flow) to allow self-synchronisation and the desired reduction of the sensor-to-shooter chain.
- A need to adopt new ways of thinking in the C2 domain and to develop concepts and procedures to allow the re-tasking of air assets in real time.

Multi-dimensional Horizontal Fusion

Traditionally, information flows from the platforms/sensors in the combat arena up the chain of command, where it is processed, and then re-distributed back to the forces. This procedure prevents partial or bad intelligence being distributed to forces. However, the process time is not acceptable for high tempo operations. Speed of processing can adversely affect accuracy, but the NCW of today offers acceptable levels of accuracy in near-real-time. The exchange of data/information in real-time among available air assets and across service and/or operational domains (air, land, maritime and special operations) can provide a good balance between accuracy, timeliness and completeness of the picture provided. Sensor data fusion can take place at the lowest hierarchical level appropriate to the accomplishment of a specific mission. It is easy to see the potential benefits of this horizontal multi-dimensional fusion in close air support, but the same synergistic effect can assist many other types of air missions. Transferring information and concentrating the effects, instead of concentrating forces, can overcome geographic constraints. A small number of aircraft geographically dispersed, but capable of concentrating their effects, could achieve results equivalent to those of a composite air operations package. The horizontal multi-dimensional fusion must be complemented by the traditional hierarchical

The exchange of information in real-time among available air assets and across services provides completeness of picture.

Information needs to be exchanged and fused at the lowest hierarchical level and across the services and operational domains.

information flow in order to allow processing and updates of the Common Operational Picture (COP) provided to Commanders and back to the forces.

C2 Issues

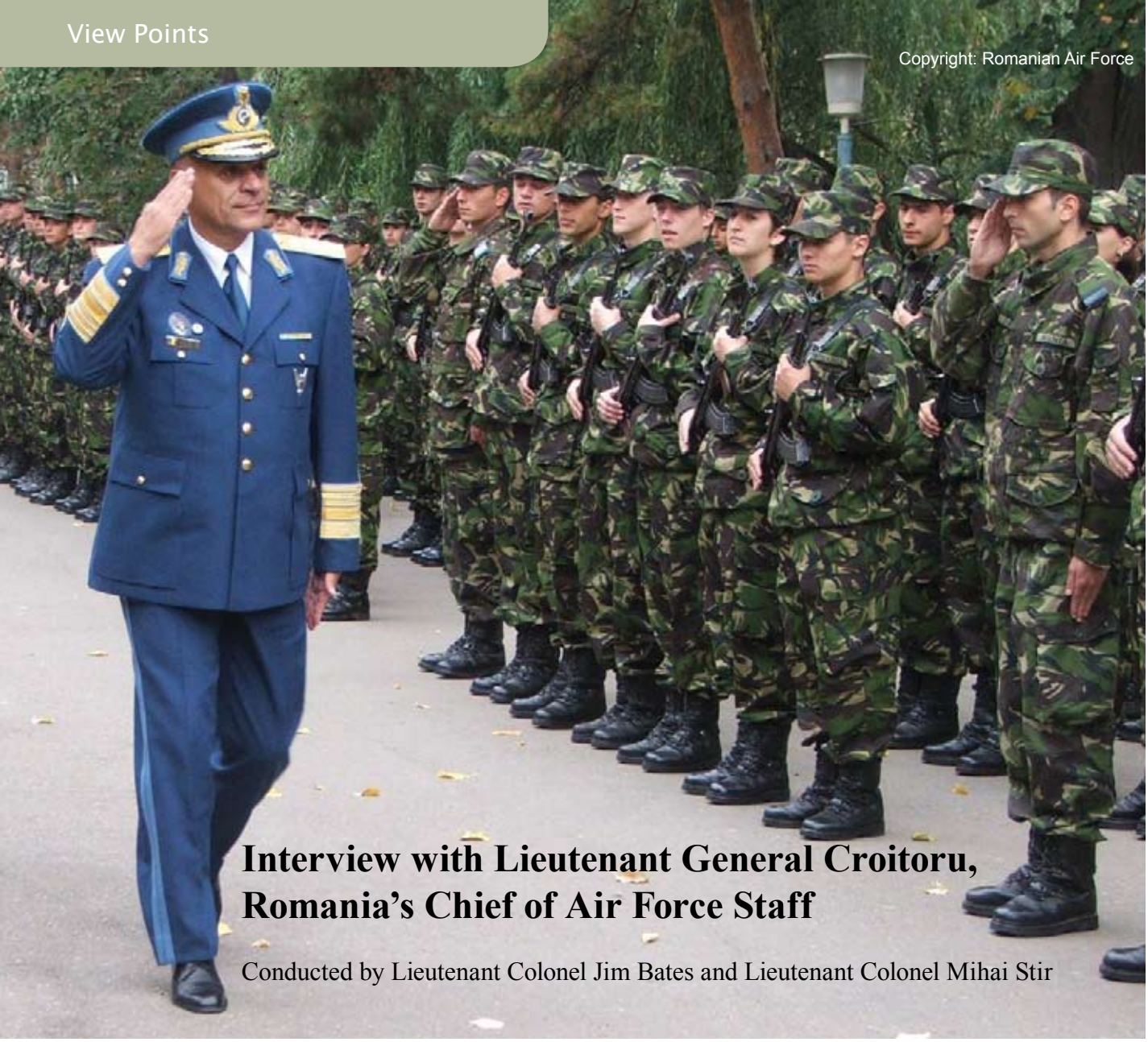
Currently, Time-Sensitive-Targeting (TST) involves all command levels because of the nature and sensitivity of the targets. In fact, it is often possible for aircrew to identify a number of mobile/volatile targets that do not have the same Joint Force Commander priority, but which may contribute equally to the achievement of the 'Commander's Intent.' Presently, the engagement of such targets involves the operator referring the potential target back up his chain of command to, ultimately, re-task attack assets. This laborious process has been a constant source of frustration - especially to our land and maritime colleagues. SSA can improve self-synchronisation if the aircraft (mission) commander is delegated decision authority for real-time re-tasking, but it will be necessary to explore new concepts and procedures to allow the necessary flexibility. This self-synchronisation concept is not limited to lethal target engagement. It can be applied across the spectrum of air operations; eg, to intelligence, surveillance, and reconnaissance asset support and to non-lethal target engagement.

Conclusions

NCW principles applied to the full spectrum of military operations can provide a higher speed of command, forces with the ability to self-synchronise within the Commander's Intent and a dramatic increase in the effectiveness of Air and Space Power. The availability of an efficient 'infostructure' is a pre-requisite for the application of these principles, but the technology must be matched by a new way of thinking about military operations. Within NATO HAMMER Trials, the Italian Air Force had the chance to evaluate the benefits of sensor data fusion in the SIGINT and Electronic Warfare domains. Operationally, we determined that information needs to be exchanged and fused at the lowest hierarchical level; among air assets and across the services and operational domains. TST and dynamic re-tasking procedures are well established within the Air Force, but the current lack of a comprehensive COP makes joint integration difficult. Nevertheless, new concepts and procedures can be evolved which will allow the necessary flexibility to permit self-synchronisation and re-tasking in real time across the spectrum of air operations. Experimentation with the NCW Concept will continue with Trial IMPERIAL HAMMER 2008, when Italy will act as Host Nation. ■

Endnote:

1. Own platform sensor acquisition range is limited and well defined but acquisition capabilities can be dramatically enhanced by the information shared on the network.



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Interview with Lieutenant General Croitoru, Romania's Chief of Air Force Staff

Conducted by Lieutenant Colonel Jim Bates and Lieutenant Colonel Mihai Stir

This interview was conducted in late 2007.

The strategic environment today is complex and subject to unforeseeable developments. Terrorism, instability due to failed or failing states, regional crisis and conflicts are but some examples. Can you tell us how the Romanian Air Force is remaining relevant in today's challenging environment?

Talking about these strategic aspects of the worldwide threats today, I think that, firstly, we must talk about the aspects which involve NATO and EU. I cannot talk about the implications for the Romanian Air Force in isolation, because the Romanian Air Force is getting involved where Romanian politics is involved. We can only be specific about the national level when referring to renegade aspects. I can say this because at the national level, we act in conformity with all NATO standards and procedures. We have our Main Air Operational Centre (MAOC), which is NATO connected and we perform the air policing mission directly under NATO command. We are subordinate to Combined Air Operation Centre (CAOC) 7 Larissa and then to Component Command Air Headquarters (CC Air HQ) Izmir. This could be taken as a particular aspect of this idea of responding to direct threats. We will respond as an Air Force wherever Romanian politics is involved. Although it is not particularly a defence against terrorism issue, we are currently performing air policing in the Baltic States. As an Air Force, we are already operating in Iraq, Afghanistan and the Balkans with our transport aircraft. In this regard, we remain involved in the missions, which the Alliance and the EU are establishing for themselves.

How has Romania's integration into NATO impacted your Air Force?

Yes, joining NATO impacted the Romanian Air Force. Let's talk through this in stages. Immediately

after joining NATO in 2004, from the first day, the Romanian Air Force began performing air policing missions under NATO command. It is true that we started with our own aircraft under command of the Romanian MAOC, in full compliance with NATO from the technical, procedural and personnel training perspective. This was the opinion of the NATO evaluation team from CC Air HQ Izmir and other teams that assessed our readiness, including the team led by General Hobbins from CC Air HQ Ramstein, your Director. However, there was no need for a transition period to implement NATO standards in the Romanian Air Force due to our intense preparation prior to joining NATO. The day we entered NATO, we began using NATO's air policing procedures immediately.

How have the people adjusted to NATO?

Quickly. For a long time, they were facing west. Then came the Partnership for Peace period, beginning in 1994 with Romania being the first nation to sign up, a period highlighted by our participation in many NATO and bilateral exercises. The Romanian Air Force has been out in front of the Romanian Army & Navy personnel – while they were talking about NATO, our pilots and aircrew were taking part in common exercises with NATO Airmen.

So your Air Force took a leading role within Romania's military to become a full NATO partner?

It's not easy for the others to accept, but it's true.

Looking to the future, how are NATO's transformational goals impacting the Romanian Air Force?

Projecting our Air Force into the future, based on NATO's guidance, we quickly changed our approach to training, we changed our force structure and, regarding our Air Force's future acquisition programmes, our goal is to be aligned with the Alliance's requirements. We are looking forward to the acquisition of a multirole combat aircraft, able to perform from the outset inside NATO operations, having avoided from the beginning a Russian solution. We are finalising the upgrade to our Air C2 system in 2008, fully compliant with NATO standards. We have acquired new air defence radars, all NATO compliant. We have a short-range air defence system acquisition, sourced from NATO, and looking to 2010 and beyond, we can talk about a long-range surface-to-air missile system acquisition. We are trying hard to implement NATO's transformational goals into our transformational projects. We aim to keep everything deployable, particularly aircraft and short range missiles, because this is a NATO requirement.

Continuing with the theme of remaining relevant, could you tell us your views on developing the people of the Romanian Air Force to take on their challenging roles?

Our personnel understood quickly that we needed to conform to new rules. It was not easy at all. We had to send all our people to different training courses because I did not want to create a new philosophy but rather comply with NATO's philosophy. In all branches of the Air Force, we used all the personnel training opportunities offered by different partners. I am not against those who are old and want to leave the system because it is well known that the younger generation adapts much faster to the new rules. This is the moment. It is not easy at all - talking about social aspects and financial aspects - but we have to do this, the modification needs to be done!

How has the recruiting system had to adjust as a result of the newer generation?

As you probably know, we no longer have mandatory military service. We have only professionals,

IAR-330 Socat helicopters.

soldiers employed by contract. We have to accept that the young people we are employing today are already highly educated. We are trying to train them through a direct and indirect system, using the indirect system especially for the technical branches and for training the NCOs. Previously the Romanian Air Force had many officers, more-or-less equal in number to the NCOs. We are now trying to respect a NATO rule to have one officer to 3 NCOs. These are major and difficult modifications because at the same time we are changing structures, training people, and performing the required missions.

Could you share with us some of the Air Force's lessons learned based on the experiences of your Airmen serving abroad in Iraq, Afghanistan, and in the Balkans?

I'm thinking of at least 3 particular examples. We had a good experience as Lead Nation during the Kabul International Airport mission. That demonstrated to me that, in future, I also have to have permanently prepared personnel for ground activities because if we are going to have expeditionary missions, I will not go only with pilots. I will need those who act on the ground, especially logistic and force protection personnel. This was one example. Secondly, our participation in Operation Althea in Bosnia was a good experience, which compelled some changes to our training manuals, in particular the in-theatre night training with helicopters and the use of night vision goggles. In addition, a third example is in regard to the capability to operate the C-130 in theatre: what does the pilot training for specific zones and the maintenance of the aircraft mean when you deploy? I have to say that at the moment, we cannot operate from a bare base without facilities and host nation support. In 4 or 5 years, once we receive the new multirole aircraft and new logistics, I could say that we will be able to do this. And, I could also say with pleasure that, wherever we as a nation deployed, we have received very good support from our coalition partners.

How is the Romanian Air Force able to sustain simultaneous missions in Iraq, Afghanistan, and in the Balkans?

It is very hard for me to say that I can get involved in all areas. At this moment, of course keeping in mind the proportion amongst the nations, we can get involved in 2 theatres or, let's say, 2 areas, but not with the same aviation categories in each. For example, we can go with helicopters in one area and fighters in another, or with both in the same place. We cannot do more at the moment.

Where do you see the Romanian Air Force applying its focus in expeditionary operations?

I think that, without doubt, the transportation aspects can be set - airlift and combat search and rescue. Once our multirole aircraft arrive in Romania, probably in 2011 or 2012, I could perform more missions in theatre. Until this date, for me with the MiG-21 LanceR, it will be very, very hard, although not impossible, but will be very difficult to deploy these airplanes anywhere, especially without support.

We have deployed 4 MiG-21 LanceRs to the Baltic countries for air policing, however, the costs are not the same when we discuss a deployment to Iraq, for example.

Where is the Romanian Air Force applying its modernisation effort to become a force of the future?

There are 3 aspects to deal with the modernisation process. Let's start with the personnel training, which we already discussed and which is done 100% according to NATO standards. Secondly, talking about the new acquisitions, all are complying with the NATO requirements and, additionally, I try to create the structures and the logistics to have them deployable. Any acquisition on this topic is sustaining this idea. At the same time, regarding the Romanian Air C2 system, I am trying to comply with all the NATO rules. I cannot talk about a deployable Air C2 system because, as you know, NATO has only projected 2 such systems – the 2 Deployable CAOCs.

What are your views on Romania's integration into NATO's Battlespace Management, now and in the future?

If we keep the proportions, the first aspect we are debating directly with NATO, at the moment, is the implementation of an ARS[1] in Romania. As you know, NATO has decided to establish 16 fixed and 2 deployable ARS in different countries. The new countries joining NATO were not taken into account; however, a requirement and a recommendation of the NATO Military Committee (NMC) from 2003 states that NATO countries should have such a facility. We have already forwarded a request on this to NATO and we are now awaiting a decision. Even though SHAPE, to a certain extent, is vacillating, we are waiting for the NMC decision. All NATO decision makers are aware of this aspect. As well, I believe it is fitting and we must have this ARS in Romania, because in this very short period we have quickly complied with the imposed rules in terms of

IAR-99 Hawk trainer.

Command and Control. Another issue, which is more quickly achievable, and responds to this topic, is the implementation this autumn [2007] and the following spring of both the CRONOS[2] and ICC[3] systems. This will directly connect our MAOC and our air bases, which are performing air policing, to NATO's Air C2. It will be much easier to transmit specific orders in this way. What's more, we performed already the first test with AWACS[4] and our MAOC using Link-11. In the very near future, we will resolve the Link-16 problem [the Link-16 connectivity between the MAOC and NATO aircraft]. From this point of view, our MAOC connection with the E-3A AWACS will be resolved very quickly. In fact, we will use all these technical possibilities during the NATO Summit in April next year in Bucharest.

Is it the intent that your multirole aircraft will evolve to Link-16 capability?

Sure, it is a NATO requirement. But you know there are some specific steps in this way. From the legal point of view, a technical agreement must exist between the US government and our government. We have already sent a letter of request on this specific matter, regarding the Link-16 connection between our MAOC and the AWACS. For the next step, we must decide, first of all, what our multirole aircraft will be and then, after that, to establish inside the government whether it will have Link-16. I think we are moving in the right direction and I must work these specific aspects during the next 3 to 4 years.

Sir, would you like to leave us with any final thoughts?

I think we have been very much involved in all current matters specific to the Alliance. Here we are talking about, let's call them, day-to-day activities but also about visions for the future. I am trying to train my personnel and the air bases in accordance with these requirements and, I recognise, it is not easy when I also have to consider the budget. I'm thinking optimistically from this point of view that we will be able to ensure a good level for all these needs. Sure, everything can be better and more beautiful if the budget were to increase. As you know, in Romania there are many needs in many domains but, our Gross Domestic Product is growing; it has a positive trend. So, I am hoping that if we properly plan for a couple of years we will resolve these problems. I also have to highlight that I am receiving plenty of support and help from different partners in different ways: we are talking about training, logistics help, and support in theatre. I believe this will help us fully integrate into NATO more quickly.

Sir, thank you for this interview.

Endnotes:

1. ARS, an Air Command and Control System (ACCS) entity, is composed of the Air Control Centre (ACC), the RAP Production Centre (RPC), and the Sensor Fusion Post (SFP). The ARS may be static or deployable.
2. CRONOS is NATO's classified network, formerly called the Crisis Response Operations in NATO Operating System (CRONOS).
3. ICC is the Integrated Command and Control system, NATO's Air C2 tool used at the CAOC.
4. AWACS is the Airborne Warning and Control System.

What is NATO's Position on Space?

By Major Tom 'Solo' Single, USA AF

NATO's transformation to an expeditionary, network enabled joint military force is predicated on space-based capabilities.

Current operations in Afghanistan highlight NATO's dependence on the use of space capabilities; however, NATO lacks a space policy, a military space strategy, and a space concept of employment. Persistence, precision, flexibility and network enabled operations are needs for NATO forces, and a critical enabler are the capabilities provided by space operations. Today's warfighter, and even more so in the future, has come to depend on the capabilities provided by space systems to gain decision superiority. Without proper guidance, how can the Alliance forces properly integrate and utilise space capabilities?

NATO's Reliance on Space

It is important to understand some of the ways space is already contributing to the joint fight. NATO's forces have become reliant on satellite communication, intelligence, weather and navigation systems. Space allows reachback with beyond line-of-sight communications, thereby reducing the footprint of forward deployed forces. This ability to reachback for support is a force multiplier for the warfighter. For example, intelligence personnel conduct analysis and then send the information to forward deployed forces. Satellite communications enable beyond line-of-sight command and control of forces, the distribution of information for global situational awareness and intelligence, friendly force tracking, missile warning and many other operational and planning tasks. Furthermore, intelligence products, such as imagery, and the Air Tasking Order are normally sent via satellite communications. Additionally, until forces can connect to a host nation network, expeditionary forces utilise satellite communications for internet delivery, providing email, voice over internet, data transfer and many other applications.

Space-based remote sensing greatly contributes to military operations and provides key information to planners and decision makers. Satellite capability includes electro-optical, infrared and radar imaging, as well as other intelligence gathering such as electronic and signals intelligence collection. This helps provide information on the location of enemy and non-combatant forces, identification of human activity, monitoring reconstitution of forces, treaty verification and violations, weapon selection and targeting, and battle damage assessment. One example of remote sensing is the detection of ballistic missile launches, provided by the US Defense Support Programme satellites. The detected launches are disseminated world-wide using satellite communications.

There are many applications for the civil military cooperation use of space capability in security and stability operations. Remote sensing, in particular commercial satellite imagery (CSI), can be used for crop yield prediction and precision farming, map creation, disaster monitoring, terrain analysis, monitoring recovery operations, infrastructure assessment, population demographic assessment, support to local police and non-government organisations, damage assessment and urban growth using change detection, engineering and construction analysis and planning, and civil aviation. Satellite imagery can be used to pick out suitable areas for food drops and to speed relief to refugee camps. CSI can be used for border and port security, monitoring special events (elections, Olympics, etc.), and counter-drug operations. The benefit of CSI is that it is unclassified and can be widely shared among coalition partners, civil agencies and host nation/indigenous decision makers and their forces.

Many satellite systems are dual use, meaning that they are used for both civil and military requirements. Except for some dedicated military satellites, communications and remote sensing satellites are dual use. Examples include weather satellites and the global positioning satellites that provide navigation and timing information. Space systems are used by decision makers, planners and forces conducting operations. Decision makers utilise space to monitor resources, climate change, disasters and pollution. Tracking is possible for VIPs in urban areas to masses of refugees in rural areas. Information is also provided on solar and deep space activities that could impact terrestrial operations. Lest we forget, these systems are available to just about anyone, including our adversaries, and satellite communications are being used for live television reporting, internet, email and data services in remote locations, videoconferencing, banking transactions, distance learning, etc.

It is important to note that unlike air assets, space systems are generally strategic in nature. They are owned by nations or commercial companies/ consortiums and while they may be tasked to support deployed forces, control of a satellite is not given to the Joint Force Commander. Tasking of satellite payloads (i.e. sensors and transponders) is not done by deployed forces. Deployed forces request support, which is prioritised and de-conflicted with other user requests. Therefore, in order to be able to use space assets, it is essential that space capabilities be planned well in advance of contingency operations, and when assigned those capabilities, the JFC should fully integrate the use of space capabilities into the strategy and planning phases of operations.

'... NATO has not clearly provided guidance to member nations on NATO's military space requirements.'

Security and Deterrence

The examples above demonstrate how reliant our forces have become on space capabilities. However, there are many questions that are difficult for NATO to answer. Can NATO create better shared situational awareness to enhance security and deterrence? How can NATO improve global situational awareness using space capabilities? How can space systems contribute to decision superiority? Does NATO need a joint common operations picture or single integrated space picture that contains status on all Alliance space assets (military and commercial)? How can NATO leverage existing bi-lateral and multi-lateral relationships to better integrate space capabilities for the warfighter? Does NATO have any requirements for a space surveillance network to better enable security and deterrence? To date, NATO has issued very little guidance on how to address these questions.

Governance

The biggest gap that NATO has for space operations is the lack of proper governance. What is NATO's vision for space? The EU has issued a space policy; where is NATO's? Is space support to the warfighter limited by not having a NATO space policy? I would postulate that it is. What directs military leadership or the warfighter to use and integrate space capabilities? Allied Joint Publication 3.3 (Air and Space Operations) only briefly touches on the subject. If NATO had a Space Policy, what are the key concerns that the policy should address? What principles should be contained in a Military Space Strategy? There isn't a Concept of Employment or Concept of Operations. How does NATO determine its space priorities and requirements? NATO's Defence Requirements Review clearly should have inputs from personnel with space expertise. Other than some niche areas, such as satellite communications, NATO has not clearly provided guidance

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'As the US continues to modernise, how can their space capability be integrated into Alliance .... operations?'

to member nations on NATO's military space requirements. Proper governance would address these and many other questions. To highlight the need for governance, for example, what would be NATO's response to an attack on a member nation's space system?

Requirements for Space Capabilities

Once governance has been established, military planners could expect guidance, properly directed and coordinated, to be used to determine the military utility of space capability and the priorities for development and integration. For example, ISR (Intelligence, Surveillance, and Reconnaissance) can be done from space, but what part of the ISR mission requirements should be done from space? What requirements does NATO have so that member nations may provide that capability? What is the military utility of small satellites and how can they contribute to military capability? Should NATO have the capability to conduct offensive or defensive space control missions? What research areas should NATO investigate? Member nations are aggressively pursuing national space programs without direction from the Alliance. Without proper guidance and without understanding how space capabilities can help the warfighter, it is difficult to determine system requirements.

Conducting Combined Space Operations

The US is far ahead of the other Alliance member nations in conducting joint space operations. They have the most capability and have been conducting space operations for many years. As the US continues to modernise, how can their space capability be integrated into Alliance and coalition operations? These other forces could be marginalised over time as the US rapidly advances its space capability. Therefore, how should NATO organise, train and equip its forces to best integrate space capabilities from all Allied nations? NATO does not have many personnel with space expertise, so what are the personnel and training requirements? Due to challenges with exchanging intelligence data from space systems, should there be a NATO common funded ISR space system? What should NATO's position be on Galileo, and should the Alliance standardise and require dual use receivers? There are many issues to be resolved before the Alliance can begin to conduct combined space operations; key among these issues is standardisation and interoperability.

Standards and Interoperability

One of NATO's strengths is its ability to write and enforce standards to ensure interoperability. In mission areas such as satellite communications, ISR, and friendly force tracking, NATO must establish or expand standards for space capabilities. Interoperability is a major concern for the use of space communications and intelligence systems. A key example related to the need for standards and interoperability is ISR information. Space assets can close the gap and help provide persistent ISR coverage, if they are properly employed. There is a lack of familiarity with space ISR system capabilities and limitations; consequently, space based ISR capability is often not utilised to its full potential. However, this is not the only issue; the critical challenge is over-coming classification and 'releasability' issues associated with national space intelligence capabilities.

> 'Space assets can close the gap and help provide persistent ISR coverage, if they are properly employed.'

Nations must work together to increase the amount and types of intelligence data exchange because it's needed by our warfighters currently deployed.

The Road Ahead

Without governance, NATO cannot properly develop, integrate and utilise space capabilities. Without proper requirements, NATO cannot tell the nations what space capability to provide. Without standards and interoperability, NATO will not be able to conduct combined space operations. NATO must address these issues immediately and the JAPCC is working hard to identify the gaps in its 'NATO Space Operations Assessment' that will be released to ACT in June 2008. Additionally, the next JAPCC Conference will, for the first time, have a panel dedicated to space operations. These are solvable issues and critical for support to our warfighters. So, what is NATO's position on space?

'Space assets allow ISAF to seize the initiative in the realm of decision superiority.' Major David Franklin, USAF / HQ ISAF

The Role of Knowledge Management for Effective Battlespace Management

By Doctor Dieter Jaepel and Lieutenant Colonel (retired) Wolfgang Schneider, IBM

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Until recently, Battlespace Management (BSM) inside a Control and Reporting Centre involved drawing areas and zones with grease pencils on radar scopes and boards. Today, headquarters, battle staffs and operations halls are full of electronic displays and information walls. But, despite all the advances in information technology, effective BSM is still characterized by the successfully executed synchronization of activities towards the achievement of a desired end state, and all of these activities continue to be based on information and knowledge. Effective information and knowledge management remains the most critical aspect of BSM.

Today, we live in the information age. We live in a world where the availability of, and access to, information is absolutely critical. Everyday, we see new technologies being introduced to assist the knowledge based enterprise in managing the growing volume of available information. Moreover, Globally Integrated Companies, like IBM, depend heavily on thoroughly designed and managed information exchange and knowledge transfer. This article is meant to be a pragmatic, practical and operational approach to the issue. Based on own experiences, coupled with knowledge drawn from a global enterprise, it argues that the usage of tools alone is not the right answer. Finally, the article postulates the necessity for a more comprehensive approach.

Information & Knowledge

In colloquial language the terms 'information' and 'knowledge' are frequently used interchangeably. Scientifically motivated definitions are typically abstract and lack operational differences, getting even worse with the distinction between terms like conscious and unconscious, demonstrative and intuitive, individual and organizational, internal and external, or explicit and implicit. This article follows rather a pragmatic approach: knowledge is created by bringing a piece of information, tacit or explicit, into a meaningful context thus enabling a person to execute an activity.[1]

Figure 1 shows how data evolves over a number of phases into competitiveness and survivability. Information is a prerequisite for gaining knowledge, and knowledge is just another phase in that hierarchy! Often, Knowledge Management (KM) is discussed with Information Technology (IT) tools in mind, eg, for visual representation. Figure 1 suggests that Information Management (IM) is supported by information and communications technology tooling which helps align business value and IT infrastructure within an information lifecycle management process.[2]

IM ensures that the resource 'information' is available to the right user in the right amount and quality at the right place and time. Knowledge and capabilities do not play a role in IM.

Obviously, it is possible to support IM processes with IT tools. In contrast, generating knowledge relies on people, organization and collaboration. KM has to be managed in a top-down process.

KM does not describe the storage and transmission of available information, but rather the process of achieving usability and capabilities. Support tools may be applied, but if people refuse to collaborate and to share knowledge, satisfactory KM is impossible. On the journey towards the goal of 'singularity,' the stage 'knowledge' is only an intermediate step. Military people, especially, are well aware that practice, will, and right action at the right time are the essentials to be better than the opponent.

KM Framework

We suggest discussing KM in a framework with three directions (Figure 2). At its base we find KM tools, security control as well as KM awareness and support. The two further directions cover (1) KM activities, KM measurements, rewards and incentives, and (2) governance, KM working groups, common shared values and leadership.

Four Action areas result from the three directions. KM tools need enabling technology and a KM infrastructure; ie, technology and infrastructure as well as the environment to enable people to use knowledge the right way at the right time. Often this part is misinterpreted as KM. The direction of KM activities leads to processes, in other words, to operate supporting KM processes, activities and measurements to capture, share and use knowledge of high quality. If KM activities, measurements and incentives are not geared towards processes, KM won't be either. Governance and leadership link with people and organizations; ie, to define roles in KM processes, to assign responsibilities to people and to build a supporting governance organization. People and organizations must have assigned responsibilities in the process. Both KM activities and personnel shape the KM strategy. The KM strategy has to be linked to the overall corporate or business strategy and, most importantly, top management and subordinated department heads must drive KM with strong leadership.

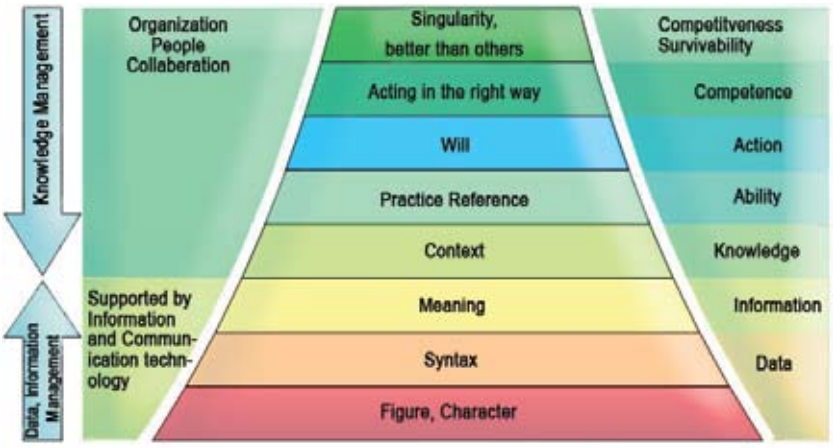

Figure 1 – The positioning of Knowledge in the chain of developing Competitiveness

Relevance of KM for BSM

Following the reasoning above, it now becomes obvious that KM is as important in the military domain as it is elsewhere. Especially in a net-centric environment, it is essential that individuals share knowledge. Network Centric Operations (NCO) do rely primarily on human networks and on the technical networks supporting them. NCO can only be efficient, if relations and networks of humans work in accordance with the 'need-to-share' paradigm instead of 'need-to-know.' We suggest an even stronger notion: the 'obligation-to-share.'

KM is a combination of strategy, processes, people, organization and the enabling technologies and infrastructures. These concepts can directly be applied to BSM.
Inside military operations, the integration of KM into an overall strategy is crucial. What used to be the principle of centralized planning and decentralized execution during Cold War times is now transformed into the information age parlance as 'power to the edge.' The purpose is quite similar: an individual within the chain of command or within the network may well have enough knowledge of the overall situation and the commander's strategy to come up with appropriate decisions. A difference might exist in the volume of available information.

Whether the actual security environment requires operations other than war or full scale conflict, an effects based approach to operations can be applied, with all its requirements for interagency coordination and interaction. As a consequence, BSM must reflect the overall political end state as well as, for example, diplomatic or economic objectives. An embedded KM strategy must ensure that adjacent domains are adequately represented and understood.

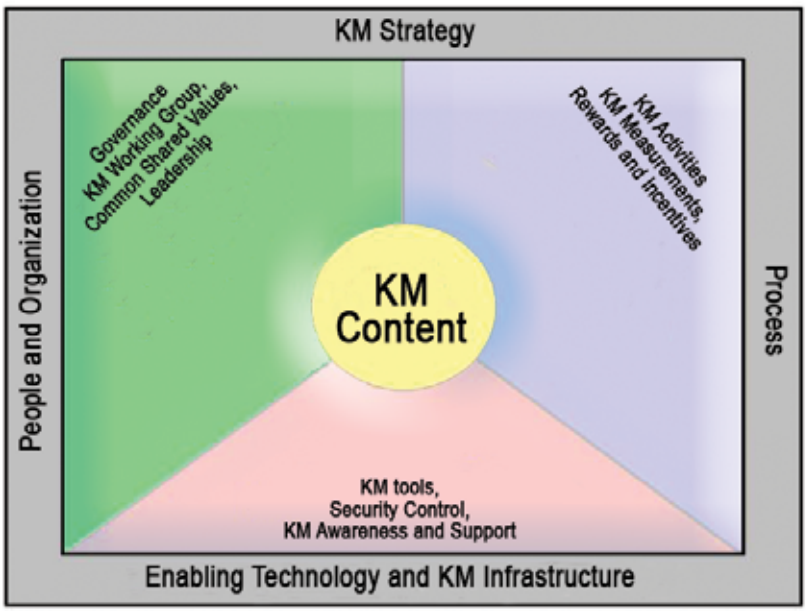

Figure 2 – Overview of Knowledge Management Framework

Such a KM strategy must be reflected in the processes, which in turn must assure availability of information to the right person, in the right quality and quantity, at the right place and time. In addition, a top-down process must guarantee that available knowledge and experience can be used properly.

The application of both strategy and processes depends on the willingness to accept them. People and the organization as a whole must recognize the value of KM in the BSM process, through improved situational awareness and common situational understanding. Maybe this requires a change in the incentive systems such that team results are rewarded, as opposed to individual results.

IT tools for end users are typically the presentation layer of associated processes. Tools supporting the KM process at the back end tend to be the more important ones. Tools can only help, if they are chosen appropriately. Choosing tools without properly reflecting overall strategy, involved processes, people's needs, and organizational aspects may result in an inappropriate toolset. Sometimes, IT tools were chosen to support legacy processes. This might be a possible solution in the case of information representation.

KM needs new processes and tools to support them, like Web 2.0 technologies. Users will no longer be simply consumers, rather they become contributors. Appropriate toolsets need to include support for collaboration, web conferencing, document management as well as instant messaging and net meeting. Such tools will significantly contribute to BSM as well: decision makers can have chats and web conferencing with the staff; documents can be produced in a collaborative and transparent manner; different levels of command may contribute simultaneously to orders and directives, and they may have the opportunity to prepare their own orders in parallel. Such an approach will definitely speed up the overall process, and it will lead to faster and better decisions.

Conclusion

KM must not be seen in isolation. KM, giving context to information, and BSM, synchronizing action inside the battlespace, have similar or even the same objectives, in particular in an NCO environment. It is not possible to orchestrate actions efficiently if incoming information cannot be analyzed in context, and if individuals' experiences cannot be included.

The main objective is to be better than an opponent, or competitor. In business terms, IBM learnt that lesson during the 90's, when the corporation started its transformation from a multi-national manufacturer of mainframes towards a globally integrated enterprise with services and consulting as its main business areas. This transformation was absolutely necessary to remain relevant and competitive. Lou Gerstner, the former chairman and CEO said: 'We needed to integrate as a team inside the company so that we could integrate for customers on their premises.'[3] This was a tremendous cultural change for IBM. In parallel, information and knowledge management processes and tools were introduced. The experience can well be applied to BSM. KM is an essential part of BSM, and it should be represented in any BSM's strategy, processes, technologies, and infrastructures. The most critical challenge though remains to change the way people think and behave, and how the organization works: a transformation towards a knowledge based defence enterprise.

Endnotes:

1. In order to execute this activity, an individual or a community then needs additionally skills, experiences, resources or artefacts, heuristics and natural talent.
2. The Distributed Information Services Hub (DISH), which was demonstrated during the last JAPCC Conference in October 2007 could be seen as one example of such a tool.
3. Gerstner, Louis V. Jr. "Who says Elephants Can't Dance?", HarperBusiness 2002. Available from Harvard

Pushing the Envelope – Joint Expeditionary Force Experiment

By Colonel Stephen Moulton, USA AF

Modern warfare is changing. The Joint Expeditionary Force Experiment (JEFX) is one of many ways in which the United States Air Force (USAF) strives to meet and anticipate the needs of the modern warfighter. As the name implies, JEFX is an experiment to assess the operational utility and technical readiness of emerging technologies. The aim is to transition technologies that solve practical warfighter problems, such as reducing 'Time Sensitive Targeting' timelines to single-digit minutes, much faster than in-use acquisition channels allow. The experiment uses robust modeling and simulation in a collaborative, synthetic environment, as well as live-flying. The most recent event, JEFX 08-1, involved over 640 participants at 17 different locations and included players from the US Army and Navy as well as representatives from our coalition partners.

Background

The JEFX program began in 1998 and has continually changed its methods, time-lines and structure to keep in step with the fast-paced world of cyber technology. The Air Force Global Cyberspace Integration Center (AF GCIC), the lead agency for JEFX, has scaled down its experiments to smaller, quarterly-paced events, which enable greater flexibility and increased focus.

JEFX 08-1 took place in Nov 07 and was the first of the leaner, more agile events. JEFX 08-2 will run for one week in early March 2008 and involves a rollout of the airborne network that will support the JEFX 08-3 live-fly event. JEFX 08-3 begins in April and will include live links to Air Force assets around the country to assess real-world kinetic and non-kinetic capabilities.

JEFX 08 Focus

This year's theme is collaboration and connectivity for the warfighter across the strategic, operational and tactical levels of command to better enable planning and execution of military operations.

To support this theme, the Air Force Chief of Staff directed five focus areas for JEFX 08 to include: Global Effects Integration; Globally Linked Air and Space Operations Centers; Unit-level Command and Control; Cyberspace; and Distributed Theater Operations. The goal is to provide a scenario-driven environment that stresses new technologies and/or processes (called initiatives) designed to improve vertical and horizontal integration of geographically-separated command elements as well as to enable machine-to-machine (M2M) transfer of critical warfighting information in a

The JEFX environment offers an effective means for assessing emerging technology.

highly-collaborative environment to include an airborne network.

JEFX 08 Initiatives

While JEFX events are hosted by the Air Force, they are also proving grounds for the services, combatant commands and our coalition partners. The FY08 experiment will integrate a total of 11 initiatives into its two main events.

One of the initiatives featured this year is the Army's Future Combat Systems (FCS). FCS is made up of a modular family of networked systems, unattended sensors/ munitions and unmanned aerial systems (UAS). FCS will establish a capability for evolving enterprise services to provide soldiers access to critical battlefield data and services.
The FCS initiative will demonstrate joint and multinational interoperability in this live, virtual and constructive JEFX environment. FCS objectives include disseminating positions of Blue Force and Red Ground Threats detected by unattended ground sensors, conducting Joint Networked Fires in support of the combatant commander, and integrating Army systems with the Air Force, Joint, Coalition, and NATO systems.

The experimentation results will be used to assess the current state of FCS network integration and interoperability, reduce related risks to the FCS program of record, provide information leading to improved and more rapid program development and help refine evolving doctrine and training support products.

The US Navy will experiment in JFEX with their Maritime Operation Center (MOC) initiative. MOC will provide a rapidly deployable, globally-networked headquarters capable of directing maritime and joint forces across a range of operations and intensity. The Maritime initiative is focused on the operational level of command and control using the MOC to collaborate with the Air and Space Operation Center (AOC).

The MOC is integrally involved in providing viable maritime strike options to the Joint Forces Maritime Component Commander. JEFX 08-1 allowed the Navy to experiment with collaboration capabilities between the respective Maritime and Air Force command centers.

Two JEFX 08 Air Force initiatives are Joint Coordinated Real-Time Engagement (JCRE) and Strategic Worldwide Integration Capability (SWIC).

JCRE is a United States Strategic Command (USSTRATCOM) sponsored Advanced Concept Technology Demonstration that demonstrates the synchronization

of global effects and actions executed either locally or from geographically dispersed locations. JCRE provides global capabilities, effects, actions, and event synchronization services designed to span from tactical to national levels. JCRE provides a way to visualize integrated global operations and track execution of missions developed during Deliberate or Time Sensitive Planning (TSP). The result of these combined services and the associated visualization capabilities provide a higher-level of global situational awareness to the associated Communities of Interest.

The TSP portion of the 08-1 event used the JCRE application to visualize the synchronization of Courses of Action (COAs). JCRE products were used in the COA Development and Commander's Estimate Briefings. Utilizing JCRE in conjunction with Adobe Connect, the primary JEFX collaboration tool, and ISPAN Global Operation Center-Collaborative Environment (GOC-CE) resulted in the development of initial Tactics, Techniques, and Procedures (TTP) for COA synchronization. This initiative shows great promise for USSTRATCOM planners.

SWIC is a prototype software application enabling shared awareness of critical mission planning and execution data and available assets across multiple command and control (C2) agencies worldwide. SWIC provides different command centers a continuous collaborative environment to provide detailed planning to quickly develop COAs in support of USSTRATCOM's Joint Global Strike TSP process.

SWIC accesses Friendly Order of Battle data from multiple theater AOCs and integrates with weather, space, refueling, intelligence, and other data from a multitude of additional sources. Using the integrated data, planners can collaborate quickly to develop Global Strike COAs, and pass them to the operational and tactical level units for detailed planning and execution. These capabilities enable SWIC to integrate kinetic and non-kinetic engagement COAs in a seamless global strike planning process. SWIC provides persistent integrated views of theater data, integrated with other global information to form accurate, shared data, and enabling quicker decisions by providing an 80% solution.

JEFX 08-3, which takes place in April, will focus on globally linking AOCs, distributed theater operations, airborne networking, and integration of cyberspace (non-kinetic) effects into AOC planning and execution efforts. It will culminate with a robust live-fly event; making that final linkage between the operations centers and live aircraft in order to assess system interoperability, operational utility, and technical maturity.

Conclusion

The JEFX environment is a cost-effective way to assess emerging technologies that will provide capabilities across units, forces, and theaters of operation. The USAF is committed to continuing the process of recognizing gaps in warfighter ability, and battlespace management, and identifying the ways and means of filling those gaps.

JEFX 08-03 will focus on globally linking AOCs.

Battlespace Management and Active Layered Theatre Ballistic Missile Defence

By Christopher Lombardi, ThalesRaytheon Systems

For more than a dozen years now, NATO leadership has recognised the risks associated with the proliferation of missile technology and its development across the globe. Whether such knowledge is being spread for personal profit, to support a rogue government bent on the destruction of an enemy, or for ideological purposes, it is clear that many more entities possess the requisite competence to build and launch ballistic missiles capable of substantial damage than existed a decade ago.

As far back as 1999, NATO officially included missile defence in its strategic concept and began to study specific missile defence options as an alliance in 2002.[1] Although the threat of hostile aircraft or other air-breathing elements has certainly not been eliminated, the additional threat of a missile attack against deployed NATO forces has increased immensely. The combination of NATO's increased emphasis on deployed operations and the proliferation of ballistic weapons in the hands of potential adversaries clearly means NATO's out-of-area operations face significant danger from ballistic missiles.

NATO has adopted a spiral approach to building ballistic missile defence (BMD) capabilities that will protect deployed forces while continuing to study how the Alliance should address territory and population centres. The concept behind NATO's approach is to start by fielding a 'layered' theatre missile defence system providing protection for deployed NATO forces. After several years of study, the Active Layered Theatre Ballistic Missile Defence (ALTBMD) concept began its first phase in the autumn of 2006, when an industrial team was selected to develop the architecture and interoperability test bed for the protection of deployed NATO forces from ballistic missile threats.

ACCS: The Core of ALTBMD

In terms of Battlespace Management, NATO's Air Command and Control System (ACCS) will be the automated system, which provides the tools that support the ALTBMD approach to missile defence. Basic BMD planning and simulation for training is part of the ACCS baseline system; however, the capabilities will need to be upgraded to bring ACCS to the full functionality required for the ALTBMD mission of the future. During the original ACCS requirements process, NATO incorporated an initial set of BMD related requirements and anticipated the need to add additional functionality later. As such, ACCS architecture has been specifically designed to enable the incorporation of future capabilities and NATO has positioned ACCS as the foundation Command and Control (C2) system for BMD.

The initial fielding of the ACCS provides key C2, Battle Management and Communications (C2BMC) functionality to support NATO's future BMD strategy. ACCS Limited Operational Capability 1 (LOC1) is being developed with initial BMD capabilities in the following areas: ballistic missile track reception; transmission; classification; processing; display (including 3D) and alerting; ballistic missile simulation and training; theatre ballistic missile sensor configuration; management and coverage analysis; and surface-to-air missile coverage determination based on missile profiles. Initially, these functions in ACCS are implemented in a limited way, although full functionality will be achieved after a well defined process of full requirements definition, software upgrades, and integration. Therefore, NATO's next step in their ALTBMD

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programme will be to upgrade or enhance ACCS to provide full capabilities within an integrated air and missile defence picture for NATO.

Battlespace Management

Applying ACCS to Battlespace Management for ALTBMD requires an understanding of the C2 process governing ALTBMD operations and ACCS capabilities. In any military operation, C2 is the vital centralising function for ensuring success and information is the key to that success. Management of ALTBMD operations requires getting the right information to the right place at the right time. The mission objectives, Rules Of Engagement (ROE), defended assets, resources, and threat scenarios must be conceived, planned, coordinated, communicated, executed, monitored and assessed – that is what ACCS does.

To accomplish the mission set out by the commander, ACCS uses an inter-connected web of personnel, communications, equipment, facilities, and a defined set of procedures to manage the flow of information and to exercise control over assigned sensor and weapon resources. The effectiveness of the C2 system is a function of personnel training, pre-planned procedures, and the speed and efficiency of the communications and IT systems used to distribute and utilise the information.

'Due to the very short time lines ... the opportunity for real-time intervention by an ARS controller is limited and much will depend on ROE procedures ...'

The primary operational entities of the ACCS system function within an integrated, secure information network. The Combined Air Operations Centre (CAOC) operates at the operational level of planning, tasking, and mission monitoring; while the ACC, RPC and SFP combine to form an ARS[2] at the tactical level for mission execution. Together these entities provide the capabilities to manage the ALTBMD mission from the strategic guidance provided by the Joint Force Commander (JFC) and the allocation of resources by a CAOC, through to the detection and tactical engagement phase by an ARS.

In ACCS, Battlespace Management at the CAOC begins as the BMD planners receive initial guidance from higher headquarters (JFC and the Joint Force Air Component Commander) concerning the prioritised defended areas or assets and the potential allocation and lay-down of defensive resources for


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The CAOC, together with the ARS, will provide the capabilities to manage the ALTBMD mission.

detection and engagement. From that guidance, the generated air tasking order and air coordination order governing operations will be distributed to all participants by the CAOC. During the execution phase of operations, the CAOC is monitoring air and BMD activity and managing changes using the joint environment picture and communications systems. As ALTBMD evolves to include more assets in the future, the importance of ACCS will increase for centralised C2BMC planning, re-planning, and tasking aspects at operational levels or higher echelons. Force generation, communications planning, and air-space co-ordination are examples of CAOC activities that will set the operational planning parameters of ALTBMD employment in conjunction with NATO out-of-area forces.

In the ARS, real-time operations are conducted using a combination of dedicated air and ALTBMD assigned resources to defend against threats. In the event of a missile launch against the area of responsibility, the first mission of the ARS is detection and sharing of information to all echelons of C2 - including weapons systems. The main surveillance capabilities used by operators in the ARS to manage the BMD related tasks are: ballistic object track handling (which includes track correlation, trajectory, and launch point); impact point prediction and early warning; ballistic missile sensor management (including controlling sensor detection, controlling sensor data, processing requests, processing measurement and additional ID data requests); and ballistic missile and space track picture dissemination.

In the boost phase, multiple sensors that observe the threat trajectory can contribute to a more accurate picture of the space tracks, providing advance cuing and potential fire control solutions for weapons that may be in a position to engage the target. ACCS provides the opportunity to integrate inputs from multiple external sensors and use them to enhance the shared BMD picture and the engagement decision process. ACCS will form the gateway for satellite launch warnings and sensors such as the airborne infrared system or other systems that may form part of the NATO ALTBMD architecture. The ACCS shared joint environment picture provides the capability to integrate air and BMD activity into the same strategic overview in a real-time situation.

In the ARS, operators trained in the BMD mission and weapons systems perform engagement monitoring and coordination. In the event of any hostile ballistic missile activity, ARS controllers have automated support tools to deal with the threat such as the space track picture, threat evaluation and ranking functions (calculating and prioritising inbound threats against defended assets), engagement modes of control (messages to weapons systems), engagement control solutions, sequencing multiple engagement solutions, weapon allocation, engagement monitoring, and kill assessment. Due to the very short time lines normally expected in a theatre missile event, and the capabilities of lower-tier weapons, the opportunity for real-time intervention by an ARS controller is limited and much will depend on ROE procedures and engagement authorities defined in advance.

The ALTBMD capabilities in ACCS are initially focussed on NATO out-of-area missions and interoperability with deployed NATO forces as well as reach-back into the NATO static C2 system in Europe. However, the interoperability standards employed by ACCS enable the data exchange with other BMD C2 systems and, in this context, NATO will be prepared to interface with the US C2BMC system for the exchange of planning information, situational awareness and track data. Although NATO ALTBMD is initially only for deployed forces, an ACCS interface with the US BMD systems will demonstrate a high degree of cooperation and provide potential two-way situational awareness between NATO Europe and US systems thus improving the operational effectiveness of both.

Conclusion

Although NATO leadership has been working for more than a decade on implementing a missile defence capability, recent world developments in the area of ballistic missile technology have validated the ALTBMD approach adopted by NATO and have underscored the importance of urgently completing the effort. Possibly the best pressure to apply to those states bent on developing ballistic missile weapons is through the deterrence that NATO ALTBMD provides. If NATO can protect troops deployed to Afghanistan or assets situated in the Mediterranean with the capabilities offered by ALTBMD, the threat of ballistic missile weapons programmes could be rendered ineffective. ■

Endnotes:

1. NATO Topic: Missile Defense; available at http://www.nato.int/issues/missile_defence/index.html (specific links to the official Prague Summit Declaration (2002) and the Alliance's Strategic Concept (1999))

2. The ARS is composed of the entity types that include the Air Control Centre (ACC), the Recognised Air Picture (RAP) Production Centre (RPC), and the Sensor Fusion Post (SFP). An ARS may be static or deployable.

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The Psychology of Remote Control Warfare

By Wing Commander Pete York, GBR AF

The development of robotics for use on and above the battlefield has allowed soldiers to distance themselves from dangerous, dirty and mundane tasks. During 2007, the United States conducted approximately 250,000 hours of Unmanned Aerial Systems (UAS) operations in theatres around the globe, a fraction of that expected in years to come. UAS operations have brought a new dimension to the idea of Remote Control Warfare (RCW). The UAS operator today controls multiple Unmanned Aerial Vehicles (UAVs), potentially in multiple areas of operation, connected to a community of warfighters in and outside the theatre through a virtual network, all from his comfortable office just a short distance from home. No longer does the warrior need to face the enemy in combat, to relate to his enemy or try to understand his motives, nor does he need to deploy forward, to live in austere conditions or even to dress for the occasion. In terms of its social connection to the network of warfighters, the RCW scenario is strikingly similar to online gaming, albeit the latter is, for the moment, artificial. The concept of the virtual warfighter is being pursued through the Joint Expeditionary Force Experiments and, to some extent, NATO's exercise Warfighter Alliance in a Virtual Environment.

RCW is reality, so what are the psychological implications of this new art of war? Does this development change the concept of modern warfare, is the change inevitable and what, if anything, should Commanders be doing to address the issues?

This article will examine some aspects of RCW under the generic headings of political, legal, operational and human factor implications with a view to identifying some possible consequences for military commanders to ponder.

Political Aspects

Public Opinion. The risk of casualties is a very real constraint on the foreign policy ambitions of political leadership.[1] RCW has much potential to reduce friendly loss of life simply because its warriors may no longer need to go to war. Moreover, a society that gets accustomed to RCW will become less and less capable of accepting friendly loss of life in battle. As long as boots on the ground are still required, the more risk averse a society becomes and the less likely it is to tolerate friendly casualties on enemy soil. For those nations with RCW capabilities, this reduced propensity to risk friendly loss of life, while improving a government's ability to impose its foreign policy objectives must be a good thing. However, with less risk of collateral, governments may also become more willing to start wars to achieve their political ambitions. Thus, the likelihood of proliferating world conflict could increase.

Economic Considerations. Defence budgets remain under perpetual scrutiny and Western multi-national military manpower levels continue to recede. Contractorisation of military tasks is now widespread. Recently, an enterprising Defence Industry company offered to provide, deploy, operate (remotely) and maintain UAVs in operational theatres in accordance with military requirements. Under this 'UAV by the Hour' concept, the military would simply order and receive required surveillance information from the UAV Company and pay accordingly for the service. This company was able to offer this concept for sale because the UAS offers 'minimum risk to the air vehicle operator.'[2] Again, this reduced risk to friendly military lives is welcome and, ultimately, the intelligence information provided could be cheaper than employing full time military operators to acquire it. However, the consequently reduced need for military risk-takers could prove irresistible to decision makers seeking to minimise front line military manpower levels and budgets. This dilution of military manpower in theatre could adversely affect a Commander's flexibility to manoeuvre when 'boots on the ground' are needed.

Reconstruction. Every conflict is inevitably followed by a reconstruction phase, when legitimate government is restored, legal systems are empowered, public services are re-established and economies are re-built, in order that internal stability can prevail; eg, Iraq and Afghanistan. External governments, who may have been the protagonists of bringing down a regime by RCW, could not then expect to occupy a fallen nation in order to begin this reconstruction process. At some point the RCW must stop and the real live, hands-on, in-theatre 'man on the ground' confidence building activities must start. The transition from RCW to this face-to-face contact will be tricky.

Legal Aspects

The legal aspects of RCW are complex. Specifically, RCW Commanders should consider their responsibilities under the Geneva Convention and whether or not Rules of Engagement (ROE) for Unmanned Combat Aerial Vehicles (UCAV) have been developed sufficiently.[3] Similarly, RCW forces will require sophisticated (and different, possibly more stringent) discipline to abide by ROE from a remote detached environment with only media images of the effects being perpetrated. Importantly, the increased possibilities of 'Blue-on-Blue' in an RCW situation must be very carefully considered.

Operational Aspects

'... the more technologically advanced nations remove the human factor from their fighting capabilities, the more they perpetuate asymmetric warfare and terrorism.'

Morale. Deploying forward with like-minded colleagues, dressing in uniform and living in austere conditions give military forces identity and a sense of belonging. Both are good for military morale and, therefore, the achievement of military objectives. Military commanders will need to devise means of replicating this collective morale for the RCW warrior, who may never physically meet his contemporaries in combat.

Situational awareness. The Effects Based Approach to Operations requires that warriors at all levels have a profound understanding of the effects they are aiming to achieve. Learning by seeing, feeling and 'suffering' alongside one's adversary all contribute to this situational understanding. From his 5-legged computer seat in a warm isolated office, the RCW warrior gets none of these inputs. Again, the discipline required of these UAS operators and their Commanders to raise their staff's battle situational awareness to the same level as 'in-contact' forces will be extraordinary.

UAS Flight Safety. The crew members of a manned aircraft routinely check the weather, terrain, performance hazards and flight parameters of every proposed flight plan because, *inter alia*, their very survival depends on it. The life of the UAV Controller is not subject to the same inherent dangers. However, the consequences of getting it wrong could be equally lethal; possibly not to the operator himself but to third parties! It takes a massive leap of self discipline to apply the same dedication to any activity that one would apply if one's life depended upon it – compare how carefully a rock climber looks after his safety equipment and procedures with how carefully a computer operator routinely boots up his computer. This presents a significant supervisory challenge for RCW Commanders.

Human Aspects

War is about 'People.' Military forces exist as a tool of government to inflict the will of one regime on that of another. This can be

The UAS operator is connected to a community of warfighters through a virtual network.

accomplished peacefully through humanitarian support, at one end of the spectrum of conflict, to aggressive kinetic intervention at the other; either way, face-to-face human contact is most often the most effective persuasive force. Ultimately, rather than fear of the sledgehammer,[4] it is the respect of one nation for another that changes political will. That respect is difficult to generate if the attacked perceives that his attacker is sitting at home (metaphorically) in his carpet slippers! Moreover, it is indeed difficult to imagine how a UAV operator will win a medal for gallantry.

Non-Technological Solutions. History tells us that no matter how technologically superior one force may be over another, the less technologically able will always find a way of attacking stronger or opposing nations' people centres (eg, 9/11) as a means of imposing their will. It could be argued that the more technologically advanced nations remove the human factor from their fighting capabilities, the more they perpetuate asymmetric warfare and terrorism.

Selection and Training. An overweight computer geek with green hair who misspent his youth playing 'war' games on a *Play Station* may make a better UAS Controller than an athlete. He or she may have all the coordination skills for the job and possibly the capability to assimilate and react to multiple inputs in a potentially high workload and high pressure environment. Moreover, *Play Station* games simulate conflict, violence and loss of life – good virtual warfighter training. On the other hand, would that same computer geek have the equivalent self discipline and decision making ability of today's military warrior? Moreover, as UAS technology improves with time, the need to employ UAV operators with live flying experience will diminish. Could a Commander rely upon a *Play Station* expert without actual flying experience to make consistently safe aviation-related judgement calls for his vehicle in the air?

The Future

There is, of course, a need to apply perspective. Advancing technology is a familiar, welcome and inescapable fact[5] and UAS and other means of achieving effects remotely will, at least for the foreseeable future, only be one club in the military golf bag, which will be used alongside other capabilities, including traditional fighting. The increasing capabilities of not only UAV and UCAV in particular, but also of reach-back command centres, Cruise Missiles, Inter-Continental Ballistic Missiles, Space, Satellite and Net-Centric communications links, High Altitude Airships with endurances up to 18 months, the Internet, reducing military manpower levels and the CNN factor will all contribute towards a move away from traditional, territorial warfare and towards increased RCW in the future. However, we would be prudent to exercise caution by considering the ethics and effects of this progress. Once the real effects of RCW become apparent, multi-millions will have been spent on development of remotely controlled weapon systems. At that point, it will be politically very difficult to scrap those systems for ethical reasons.

This article is intended to provide food for thought, rather than all the answers to how we should address the challenges that advancing technology will inevitably bring. JAPCC will continue to follow up work on this subject. If you have a view or information on the subject, we would be delighted to hear from you. ■

Endnotes:

1. Body bags returning home bring the harsh reality of warfare into the public eye and have the potential to turn public opinion sharply against the operations themselves. Ultimately, this can be a 'vote loser' for the politicians, who made the decision(s) to get the home nation involved. This is especially relevant when those operations pose no perceived direct threat to homeland security. Vietnam, Iraq and Afghanistan are contemporary examples.

2. It is recognised that UAV maintenance and launch/recovery crews (military or civilian) would need to operate forward, but in most cases they could operate at a safe distance from the JOA and 'out of harm's way.'

3. Consider a tactical situation where the crew of a manned aircraft can 'see' that the required effects of an attack have been accomplished using a part weapon load and that further attack would result in unnecessary loss of life, which could, ultimately, have an overall detrimental effect on achieving the strategic effects. A UAV operator denied this 'eyes on target' information, may continue to prosecute further attacks with obvious negative effects on the overall mission.

4. For example, during WWII neither German bombing attacks on British cities nor the British counter bombing of German cities succeeded in changing the stance of either Nation. Instead, both increased the resolve of respective populations to overcome their aggressor.

5. RCW began with the development of the longbow!

Continued from page 21

Panel 3 – Physical and Cognitive Effects. Non-kinetic Air and Space capabilities are a critical enabler with great potential in the delivery of cognitive effect. However, in order to maximise these capabilities in irregular warfare, Panel 3 agreed that there was a need to develop new ideas and doctrine for Air and Space Power Information Operations.

Panel 4 – The Role of Joint Air Power in Reconstruction and Development. Panel 4 discussed rehabilitation in the context of building a new state. Civilian authorities play the major part in this effort but the military contribution remained significant and more could be done to exploit military success in rehabilitation operations; the earthquake relief operation in Pakistan was a good example.

In his closing remarks, Lieutenant General Friedrich W. Ploeger (German Air Force), Executive Director JAPCC, commented that the Conference discussions had reinforced the relevance of Air and Space Power in today's complex environment. He reiterated that there was much work to do to adapt Air and Space doctrine to the needs of irregular warfare. It was the intention of the JAPCC to address many of the policy and doctrinal issues raised by the Conference during coming months.

The Conference paper, renamed 'Air Power and Irregular Warfare,' has subsequently been refined. This paper is being used to inform and shape the JAPCC's development of the NATO Future Joint Air and Space Power concept and the development of Allied Joint Doctrine for Air and Space Operations (AJP-3.3) and Crisis Response Operations (AJP-3.4).

NEWS

New Faces in the Leadership of the JAPCC

In early December 2007, the JAPCC said goodbye to its Director, General William "Tom" Hobbins, as he retired from the US Air Force. General Hobbins brought the JAPCC from its fledgling Centre of Excellence status in December 2005, through Full Operational Capability and into its current leading position championing Air and Space Power transformation for NATO.

In January 2008, we welcomed General Roger Brady as our new JAPCC Director. General Brady came to the JAPCC from the Headquarters US Air Force Deputy Chief of Staff for Personnel role. He also commands NATO's Component Command Air Ramstein and US Air Forces in Europe.

Lt Gen Ploeger and Col Clampitt welcome Gen Brady to the JAPCC Conference Centre.

The JAPCC bids a warm welcome to Commodore Jan van Hoof, RNLAF, who has succeeded Brigadier General Elia Baldazzi, ITAF, as Assistant Director Capabilities. The JAPCC community wishes General Baldazzi well in his new appointment in Rome.

NATO Future Joint Air and Space Power

JAPCC has almost completed a project to examine the future of NATO Joint Air and Space Power over the forthcoming 20 years. The paper examines the future Strategic Environment and the part Air and Space Power will play in likely Joint operations of the future. It examines a proposal to

apply the principles of 'Mission Command' to the command of Air and Space Power and it shows how we should aim to harness emerging Air and Space technologies to optimum effect. Finally, the paper recommends steps which can be taken now to maximise the benefits of Air and Space Power in the future.

Air C4ISR Roadmap

In November 2007, the Director, General Hobbins, approved the JAPCC Roadmap for Air C4ISR in NATO. The project achieved its goal of establishing the Air C4ISR baseline for NATO as a whole and for NATO Nations, and identifying capability gaps and appropriate corrective measures.

Space

As part of JAPCC's 2008 capstone theme, Air & Space's Contribution to Battlespace Management, JAPCC will deliver to SACT by 1 June 2008 a NATO Space Operations Assessment. In support of this project, the JAPCC will host a NATO Space Workshop in Kalkar on 22 April 2008. Space is vital to NATO transformation and as such it is imperative that NATO should address the Space Operations mission area. The aim of the workshop and the follow-on assessment is to identify gaps and to provide recommendations to address shortfalls.

JAPCC Encourages R&D of Automated and UAV AAR

JAPCC's Combat Support Branch submitted a paper, Automated and UAV AAR: Getting the Second Hand on the Wheel, for the Air Refuelling System Advisory Group's Conference in April 2008. We also provided an operator's perspective on the development of these nascent capabilities in a special topic discussion at the conference, and recommended a systematic research plan to identify the military utility and potential operational requirements of employing Air-to-Air Refuelling to extend UAV operations. Moreover, military operators and industry designers were encouraged to take a cooperative, interactive two-hands-on-the-wheel approach to steering development paths. JAPCC AAR experts participate in several panels each year at the annual conference where over 400 industry and military representatives gather to share AAR information and solutions.

UAS Flight Plan for NATO 2008 - Update

The JAPCC Unmanned Aircraft Systems (UAS) project team has completed its work on updating the JAPCC Flight Plan for UAS in NATO. The new Flight Plan includes updates to the 26 issues raised in the 2007 Flight Plan as well as new information on sensors and UAS in NATO. The additional information will be particularly useful to personnel engaged in operational planning. The UAS project team is also leading the NATO effort for the production of an agreed Concept of Employment of UAS in NATO. An Air Forum was held in Kalkar in February 2008 and the working group will meet again in Rome in May 2008. We hope to be in a position to elicit comment on the final draft Concept of Employment from NATO Nations by the fall of 2008.

Close Air Support - Forward Air Controller Project

The newly completed STANAGs 7144 and 3797 reflect real-world operations in ISAF and assist NATO Nations to standardize CAS-FAC training and equipment. Congratulations are extended to Lt Col Dietmar Heine (German Air Force), the custodian of these documents, for his outstanding leadership of the project. Work on CAS-FAC project continues, as we aim to standardize training of FACs and to draw helicopter procedures closer to those of fixed wing aircraft.

Maritime Air Coordination Conference

The Maritime Air Coordination Conference will take place this autumn in Kalkar, Germany. The JAPCC co-chairs this annual meeting with Component Command-Maritime Northwood to discuss important maritime air issues. Please refer to the JAPCC website (www.japcc.org) for more information on this forthcoming event.

JAPCC Conference Centre

The new state of the art JAPCC Conference Centre has proven invaluable in hosting symposia and working group meetings critical to the transformation of Air and Space Power. The facility is available for external charter. Initial enquiries should be directed to Mr Simon Ingram on Commercial: +49 (0)2824 90 2108.

The JAPCC Journal welcomes your feedback.

Go to www.japcc.org

Biographies

Lieutenant General Croitoru, Chief of Romanian Air Force Staff, was born in Ditesti, Prahova County, on 5th May 1952 and graduated from the Air Force Military School in 1974. After attending courses at the Academy of High Military Studies from 1981 to 1983, he was appointed Chief Instructor, 70th Air Division, a post he held until 1990 when he moved to the Military Air Force Command. In 2000 he became the Chief of Staff of the 1st Air Division 'Siret', before taking command of the 90th Airlift Base, the 1st Air Division and then the Main Air Operational Command. In 2005, he was appointed Deputy Director of the General Staff and a year later the General Director of Defence Intelligence. He assumed his current appointment as Chief of the Air Force Staff in March 2007. General Croitoru has accumulated over 1500 flying hours on MiG-15, MiG-21 LanceR, MiG-29, HONG-5, and IAR-316 aircraft. He is married and has a son.

Air Flotilla General Florian Râpan joined the Romanian Air Force in 1974 and served initially as a traffic controller with the 91st Aviation Regiment. He attended the Military Academy in 1983 before returning to the 91st Aviation Regiment as Head of the Command Point. In 1987 he turned to academics as a lecturer and university professor of Aviation Tactics at the Academy of Advanced Military Sciences. Air Flotilla General Râpan was awarded a PhD in Military Sciences in 1998. In 2004 he became the Deputy Commandant of the National Defence University. He has written numerous publications on military aviation issues. In addition to his native language, he speaks English, Russian and French. He is married with 3 children.

Colonel Stephen K. Moulton is the Director of the Air Force Modernization and Innovation Directorate, Global Cyberspace Integration Center. Colonel Moulton entered the Air Force in May 1985. In achieving command pilot status, he has accumulated over 4000 flying hours mainly on B-52 and B-2 bombers as a pilot, instructor pilot, evaluator, squadron commander and deputy commander of an operations group. He has a Bachelor of Science degree in Aeronautical Engineering and a Master of Science in Aerospace Science Technology. He has extensive staff experience in the management of training and as the Chief of Bomber Operations, ACC Inspector General Squadron, Langley AFB, Virginia.

Commissioned as a pilot in 1981, **Air Commodore Michael John Madoc Jenkins** immediately became a flying instructor. In 1986, he joined the Harrier Force and gained operational flying experience in Operations WARDEN, DENY FLIGHT and DECISIVE EDGE. He has commanded No 20(R) Squadron and RAF Wittering. In January 2003, he deployed as Operation TELIC Deployed Operating Base Commander. He has served on the staffs of the Air Warfare Centre, the Ministry of Defence, as Joint Force 2000 Implementation Team Leader and as Chief of Staff HQ 1 Group. More recently, he spent 9 months in Afghanistan as the Director of the Air Coordination Element, ISAF. He is a Fellow of the Royal Aeronautical Society, an active musician and a keen sailor. He was awarded the OBE in June 2003.

Air Commodore Garfield Porter joined the RAF in 1978. A navigator, he has served as a crew captain, Flight Commander and Squadron Commander on the RAF's Nimrod Maritime Patrol Aircraft amassing some 5500 flying hours. He was awarded the Queen's Commendation for Valuable Service in the Air for the Search and Rescue operation following the Piper Alpha oil rig disaster. Following attendance at the RAF Staff College in 1993, his ground tours have predominately been in strategic plans and programmes, and concepts and doctrine. He assumed command of RAF Kinloss in 2002 and, more recently, completed an operational tour as the UK Air Component Commander Middle East. He joined the JAPCC in May 2007 as Assistant Director Transformation from his previous assignment as Director Air and Space in the UK's Development, Concepts and Doctrine Centre.

Colonel Dan Lewandowski is Chief Combat Air Branch at the JAPCC. He was one of the first career space operations officers in the USAF. He was the Branch Chief for space and C4ISR programs for the Deputy Under Secretary of the Air Force for International Affairs. In 2002, he took command of the 50th Operations Support Squadron, responsible for 130 personnel and the combat readiness training of over 530 crew personnel, operating over 140 satellites. He has four masters degrees in Strategic Studies, Military Operational Art and Science, Space Systems and Business Administration.

Biographies

Group Captain John Alexander is Chief Combat Service Support at the JAPCC. Commissioned in the RAF Regiment, he served with RAF Rapier units in Germany, Belize and the Falkland Islands; USAF Rapier in the UK; on secondment in Oman; as Adjutant of a Light Armoured Wing in the Gulf 1990-91; in staff appointments at the Central Tactics and Trials Organization, in MOD operational requirements, at the Air Warfare Centre, in the MOD on Iraq WMD counter-proliferation policy and in PJHQ(UK) J3; on operations to disarm Iraq in 2003 and in HQ MNF-I to support the January 2005 Iraqi elections; and he has commanded 37 Squadron RAF Regiment and the Joint Rapier Training Unit. He is a graduate of Newcastle University (BA(Hons) Geography), the Open University (MBA and Postgraduate Diploma in History), the Royal School of Artillery Gunnery Staff Course and the Air Battle Staff Course, and has taught on the Advanced and Higher Command and Staff Courses.

Lieutenant Colonel Mihai Stir has nearly 24 years of operations and staff experience, including assignments in National Air Force structures and, most recently, in the Romanian General Staff. Since February 2006 he has been the Romanian Senior National Representative in the JAPCC, where, in the Future Capabilities Branch, he has contributed to the Transformation of Air and Space Power in NATO. He has focussed particularly on manned and unmanned aircraft issues and the transformation of NATO Air Command and Control structures. Lt Col Stir received his bachelor's degree in economics in 1992 from the West University, Timisoara, Romania, his home town. He was recently awarded a PhD in Post Conflict Air Operations issues at the National Defence University "CAROL 1st" in Bucharest, Romania. He is married with 2 children.

Major Tom Single is a member of the JAPCC C4ISTAR Branch. His operational experience includes ICBM, space and AOC weapon systems. He has combat experience in support of OIF and OEF and has participated in several major exercises as a theatre space operations duty officer. He has a BS in Aerospace Engineering, a MBA and a MS in Space Operations from the Air Force Institute of Technology. In his previous assignment, he was the Chief of Theatre Support at HQ Air Force Space Command. He arrived in Kalkar in March of 2007 and serves as the JAPCC subject matter expert on space operations.

Colonel Sandro Sampaoli joined the Italian Air Force in 1981 and has spent most of his operational career flying for the 155th Squadron as a Tornado Weapon System Officer. He flew combat missions in Operations DESERT STORM and ALLIED FORCE. In 2001, he was assigned to ReSTOGE, the Italian Air Force Electronic Warfare Centre and was appointed Chief of the Centre in 2006. Under Col Sampaoli's lead, ReSTOGE has become increasingly involved with the NATO EW Community. The Centre has organized, coordinated and executed several national and multinational Operational Test Trials and Campaigns, including TRIAL HAMMER 05 and TRIAL SPARTAN HAMMER 06. Col Sampaoli was recently appointed Trial Manager for TRIAL IMPERIAL HAMMER 08.

Wing Commander Pete York is a VIP transport navigator who arrived at JAPCC in 2005 from CC-Air Izmir, Turkey where he was the Director of Staff. Prior to that, he was CC-Air Izmir's CJFACC Planning Chief and responsible for the implementation of NATO's CJFACC and NRF Concepts. He has experience in planning and execution of the flying schedules for RAF AT, AAR and VIP transport fleets during peacetime routine and crisis operations. He has also been a tutor in the Muharraq Al-Abdullah Command and Staff College in Kuwait.

Major Dean Driskill, US Marine Corps, was the JUAS COE lead at Naval Air Station Fallon for 'Operation Firebird.' Commissioned from the US Naval Academy in 1997 with a Bachelor of Science degree in History, he became a Marine EA-6B Electronic Countermeasures Officer. He attended the Marine Corps Weapons and Tactics Instructor course in 2002 and is working on his master's degree from the Air Command and Staff College. He has made numerous deployments to the Far East and in support of Operation IRAQI FREEDOM. Prior to arriving at the JUAS COE, he was an instructor at the EA-6B training squadron, Naval Air Station Whidbey Island, Washington.

Biographies

Dr. Dieter Jaepel is a computer scientist with a Doctorate Degree from the Erlangen Technical University. Initially, his research interest focused around the greater field of Pattern Recognition and Artificial Intelligence, in particular character recognition, speech analysis, and image analysis. In 1986, Dr. Jaepel joined the IBM Research Laboratory in Rueschlikon/Switzerland, where his work focused on computer communication, including Local Area Network technology, broadband networks and mobile computing. More recently, Dr. Dieter Jaepel has resumed work on Artificial Intelligence and Knowledge Management. For many years, Dr. Jaepel's interests have revolved around the impact of technology on industry with a focus on innovation. Since 2002, he has been a member of the IBM Industry Solutions Lab (ISL) at IBM Zurich Research, developing and running innovation workshops for IBM customers in the Insurance, HealthCare, Pharmaceutical, Government, and Defense industries.

Major Pat Filbert, US Army, was the lead JUAS COE 'Operation Firebird' planner. Major Filbert was commissioned an Armor Officer in 1986, and later shifted to military intelligence, with a Bachelor of Arts degree in History from the University of Hawaii. He is a graduate of the US Army Command and General Staff College and will complete his master's degree in Intelligence in fall 2008. He has served in the US, Bosnia-Herzegovina, Saudi Arabia, Iraq, Kuwait, Korea, and Germany. He was the Army programmatics lead for several UAS from 2001-2003. Prior to arriving at the JUAS COE, he was the US Army Europe G2 Planner in Heidelberg.

Lieutenant Colonel Jim Bates joined the Canadian Forces in 1986. He commanded telecommunications squadrons at 4 Wing Cold Lake, Alberta and at 22 Wing North Bay, Ontario. In 2002 he deployed to Bosnia and Herzegovina as the G6 in support of the Canadian Battle Group in SFOR. Working in the C4ISTAR Branch of JAPCC, he is responsible for deployed communications and information systems. Lt Col Bates is a graduate of the Canadian Forces Command and Staff College in Toronto; he holds a Bachelor of Electrical Engineering and a Master of Business Administration.

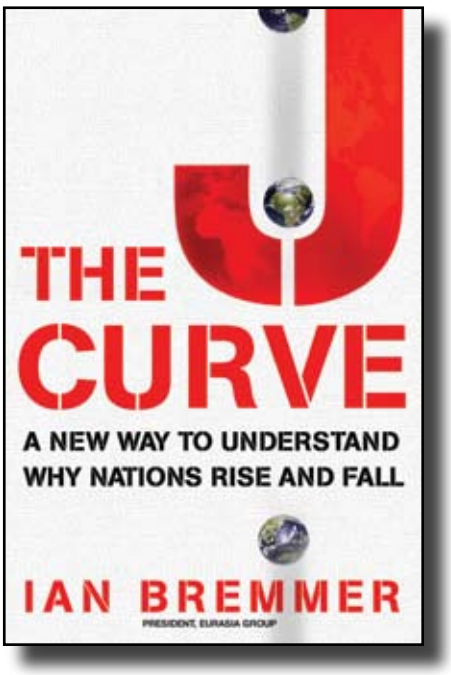
Lieutenant Colonel (retired) Wolfgang Schneider is Senior Managing Consultant at IBM Deutschland GmbH. He graduated from Bundeswehr University Hamburg as a business economist and engineer and spent most of his service in different air battle management functions in different German Control and Reporting Centres. He has served at the GAF Regional Command South as a staff officer and he has commanded the Tactical Air Control Company 221 in Messstetten. He attended the 46th General Staff Officers Course at the German Armed Forces Command and Staff College from 2001 to 2003, followed by an assignment as Branch Chief for Modelling and Simulation in Bundeswehr Centre for Transformation. In 2006 he moved to the German Ministry of Defence, where he was Assistant Branch Chief Air Staff III 6, responsible for C4ISR within the GAF. He retired from the Bundeswehr in 2007 and joined IBM Deutschland, where his responsibility is to support the Bundeswehr Transformation process.

Lieutenant Colonel Miklós Szabó, HU AF is the attack helicopter specialist in the Combat Air Branch of JAPCC. He graduated in 1989 from the College of Military Aviation in Hungary becoming an engineer of helicopter maintenance and also a transport helicopter pilot flying the MI-8 and the MI-17 HIP. He is a graduate of the US Army's Aviation Officers Advanced Course at Fort Rucker, Alabama. After holding different positions at his unit he became the squadron commander of the Transport Helicopter Squadron. He holds a bachelor degree of Finance and Accountancy and a master's degree of Military Leadership as a graduate of the Hungarian Defence University in Budapest in 2000.

Christopher Lombardi joined ThalesRaytheon Sytems in March 2006 as Manager, International Business Development. Currently, he is part of the team responsible for the NATO Air Command and Control System (ACCS). Mr. Lombardi was born in 1970 in Denville, New Jersey. He received a bachelor's degree in international affairs and political science from the University of Colorado in 1993 and a master's degree in international relations from The Paul H. Nitze School of Advanced International Studies (SAIS), Johns Hopkins University in 1997. In addition, Mr. Lombardi took European studies courses at Oxford University in England. He is married and has two children.

Book Reviews

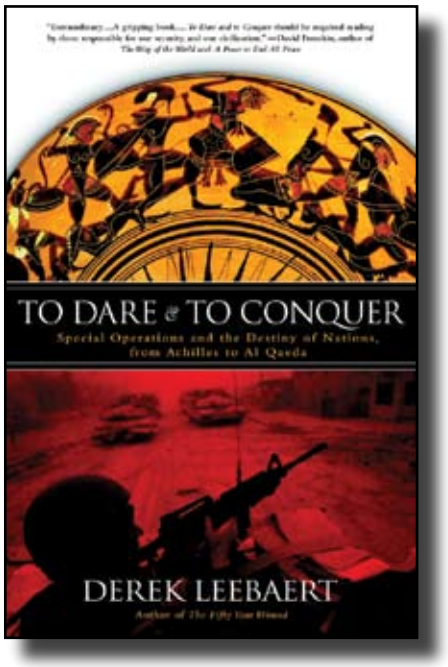
The J Curve: A New Way to Understand Why Nations Rise and Fall
By Ian Bremmer
Simon & Schuster Ltd 2006



The J-Curve presents a model for looking at stability amongst nations, which will be of interest to any student of international relations, particularly those in the military keen to understand potential causes of instability and ungoverned space. In the early chapters, the author uses a J-shaped curve to locate nations in terms of stability – the short steep left side for authoritarian states (closed) and the longer less inclined right side for those that are more democratic and institutionally stable (open). The catch is that for a state to transition from the authoritarian left side to the sunny uplands of the right, it must first travel through the bottom of the curve; in other words, risk even greater instability in the short term for greater gains over time! The remainder of the book then looks at several case studies of countries at different points on the curve to identify how stability transition might be best managed. If you want to get to the bottom of effects based thinking in its widest sense, this book is a good place to start.

Review by Air Commodore Garfield Porter, GBR AF

To Dare and to Conquer: Special Operations and the Destiny of Nations from Achilles to Al Qaeda
By Derek Leebaert
Little, Brown and Company Publishing, 2006



Special operations have become an integral part of every commander's tool kit, maturing through thousands of years of history. It is no coincidence that a silver Trojan Horse has been featured on the badge of the 10th Special Forces Group ever since the Green Berets were created some three millennia after that city fell. In this groundbreaking exploration of war and politics, the author chronicles the adventures of a very special breed of soldier and uncovers the stories of special operations from Troy to Al Qaeda.

While examining the history-changing rewards of special warfare, the book also explains how this method of conflict came into being and how it has evolved; how its practitioners have reasoned; what prowess, arms and doctrine they have resorted to from the days of spears and bows to nuclear weapons; and what may now be lurking in the anteroom.

The book is not only a chronicle of military history; it gives the reader a political, diplomatic, technical and cultural flavour of the events which shaped it. The continuity of adventure-filled stories and the voice of a story-teller keep the pages turning while reading this monumental book.

Reviewed by Lieutenant Colonel Miklós Szabó, HUN AF

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