Transforming Joint Air Power

The Journal of the JAPCC

Edition 5

Joint Air Power Competence Centre
Air & Space Power Conference

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

The conference will consider traditional kinetic air power effects used in an unconventional environment and the role of air power in achieving non-kinetic effects such as information operations and civil military cooperation.

16 to 18 October 2007 in Kleve Germany

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Editorial

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We encourage comments on the articles in order to promote discussion concerning Air and Space Power inside NATO's Joint Air community. All comments should be sent to journalads@japcc.de

The Journal of the JAPCC,
Roemerstrasse 140, D-47546 Kalkar Germany

… the great uncertainty of all data in War is a peculiar difficulty, because all action must, to a certain extent, be planned in a mere twilight, which in addition not infrequently - like the effect of a fog or moonshine - gives to things exaggerated dimensions and an unnatural appearance.

Clausewitz On War

Air Power has been used to minimize the 'fog of war' since its invention. During the French Revolutionary Wars balloons were used to observe the enemy, to allow commanders to orientate, decide and act more quickly than the enemy. The aeroplanes' first combat mission was observation. The ability to command and control air power within joint and combined operations, underpinned by Intelligence, Surveillance and Reconnaissance is just as important today over what our Executive Director, Lieutenant General Schubert, in his article, calls the empty battlefield. The theme of this edition of the JAPCC Journal is the transformation of Air C4ISR.

General Hobbins, Director JAPCC, leads with his vision for the future of C4ISR - Net-Centricity. Shifting the focus from machines to information, Net-centricity involves people, processes, information fusion, and systems. ACT then outlines its efforts to bring coherence to Joint ISR.

A common theme is the transformational aspects of NATO's lessons learned in ISAF – led by General Back's article on ISAF ISR. Another theme is the human aspects of C4ISR transformation – of command and control, of locating the air commander, and the management of change in the NATO AEW Force. Then there is the challenge for ISR to find an elusive irregular foe. Also we have the German view on the notion of a network enabled, effects-based, comprehensive approach to conflict, and a perspective on the same subject from a British author. Other articles include the use of data standards, the use of targeting pods for ISR, and an Israeli view on man machine interface and the display of information.

Many articles emphasise the challenge of the role of Air Power in irregular warfare. This is the theme of the next edition of the JAPCC Journal and of the Annual JAPCC Conference in Kleve on 16-18 October 2007.

The JAPCC continues to transform. We have articles from our outgoing and incoming Assistant Directors Transformation (and Journal Editors) – Air Commodores Dugmore and Porter. Finally, this is General Schubert's last edition of the Journal as our Executive Director before he retires in September. The Journal, like much of the JAPCC, has been General Schubert's conception, and its success a product of his leadership.

John Alexander
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Transforming Joint Air Power:
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Transformation & Capabilities

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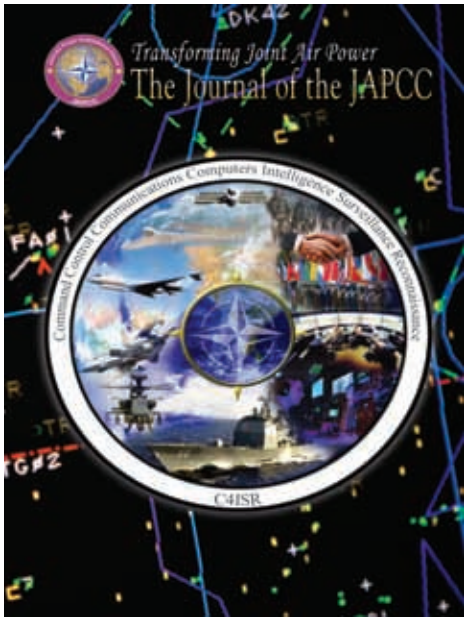

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Air C4ISR Roadmap: Convergence of Capabilities Towards Net-Centricity

by General Tom Hobbins, USAF
Director of the JAPCC

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The coalition environment in which we operate consists of multiple dimensions and domains. Fusing the data, information, and systems across the air, land, sea, space, and cyber domains into a net-centric capability that provides all operators across the service, joint, national, and coalition dimensions of the battlespace with timely, actionable knowledge is key to superiority in future engagements. Clearly, a case for net-centricity is all about the need to share, fuse and present relevant information.

C4ISR Roadmap

To make sense of the many ongoing efforts to achieve net-centricity in NATO air and space, the Joint Air Power Competence Centre (JAPCC) has developed a roadmap for NATO Air C4ISR. This article steps through the roadmap to show how NATO is doing on its journey to reach the goal of net-centricity. We begin by looking at the current status of NATO Air C4ISR capability, which includes Command and Control (C2) systems, communications and computer systems, and ISR systems, and we show the NATO plans and programs underway that will shape future capability. In doing this, we identify the areas of alignment and the areas that need improvement. In addition, we look at force development and governance that are equally important to achieving our vision: a fully interoperable joint net-centric NATO C4ISR capability that enables decision superiority to achieve the desired effect. However, we are a long way from that end state.

Command and Control

Our look at the Air C4ISR scene today begins with NATO's Air C2 systems. The NATO Air Defence Ground Environment (NADGE) is the existing C2 structure that has evolved from the Early Warning system set up in 1967. It consists of 18 NATO and 13 national elements using 9 different automatic data processing systems connected to 143 long range air defense radars of different configurations.

Two examples of the 9 automatic data processing systems include Multiple Aegis Site Emulator (MASE) and United Kingdom's Air Defence Ground Environment (UKADGE). MASE, the only NATO common funded and maintained data system in use, was developed by the NATO Programming Centre Glons, Belgium and is in use by 10 NATO nations. While the United Kingdom is part of the MASE program they also have their own data system, UKADGE. A further example of multiple data systems within a single nation is depicted by Germany's use of ARKONA (system name, not an abbreviation) and the German Improved Air Defence System.

Improvements have been made to NATO's Air C2, such as the NATO Airborne Early Warning and Control E-3A program and integration of the Combined Air Operation Centres (CAOCs). However, basic functionality of NADGE has remained relatively unchanged since the Cold War era. It is a legacy environment, characterized by limited data exchange and limited use of automation, which places a high demand on human intervention.

Communications and Computer Systems

Continuing through the C4ISR acronym, the communications and computer systems are all supported by the NATO General Communications System (NGCS), the backbone network that connects NATO elements. It includes the NATO Secret, Mission Secret, and NATO Unclassified networks. NGCS is a patchwork of disparate networks, both digital and analog, that delivers core services such as email, telephone, and video teleconferencing, as well as some basic functional services to higher headquarters. The network also supports the flow of tactical voice and data among the NADGE elements via the legacy and very limited Link-1 protocol. To illustrate the limited nature of Link-1, air and surface tracks sent from the E3-A to a Control and Reporting Center by Link-16, as part of the Recognized Air Picture, are stripped down in the conversion to the Link-1 protocol, with the loss of valuable information. Link-16 to Link-1 conversion takes a high capacity and accurate situational image and reduces it to basic elements such as position, altitude, and limited identification. This loss of information fidelity negatively impacts situational awareness to the warfighter.

Still within the communications realm, the NATO Satellite Communications (SATCOM) Post 2000 (NSP2K) program, consisting of SATCOM services provided by France, Italy, and the United Kingdom, is today extending NGCS services into ISAF. However, the limited number of satellite ground terminals in the NATO Signals Battalions' inventory restricts our use of the full bandwidth potential to less than one-quarter, which means we need to rely on commercial SATCOM providers to deliver communications services in ISAF. Another shortcoming of our communications system is the lack of connectivity between NATO networks and national networks, further restricting our ability to exchange information within the Alliance.

Intelligence, Surveillance, and Reconnaissance Systems

Shifting now to ISR, in NATO today, ISR is limited to resources provided by the nations with the exception of the inherent ISR capability that the E3-A system offers. The roadmap looks at the broad range of manned and unmanned national air ISR assets that support the intelligence disciplines including signals, electronic, imagery, and combat reconnaissance. In a parallel effort, the JAPCC Unmanned Aircraft Systems Flight Plan identified the rapid and uncoordinated growth occurring in the unmanned ISR arena. NATO nations are developing ISR capabilities, often in isolation. Noted ISR shortcomings throughout the Alliance include doctrine development, standardization agreement, system integration, and interoperability. Since information fusion begins at the sensor, there will be little net-centric effect gained from the addition of these ISR platforms without proper emphasis on standardized information definitions, categorizations, and exchanges. From a macro perspective, the acquisition of non-interoperable systems only further burdens users. This overshadows any short-term or local effects gained through their employment in a NATO environment.

Today, the C4ISR scene within NATO is based on stovepipe solutions; however, improvements are taking place. The NATO Network-Enabled Capability Roadmap (July 2006), provides a blueprint for the establishment of the Networking and Information Infrastructure that will enable improved net-centric information sharing and collaboration. Nations are in agreement about the need for greater interoperability between the different C4ISR elements. There are promising developments on the experimentation and demonstration front with new technologies and commercial solutions from many nations coming together in the labs of our experimentation centers. For example, the Coalition Warfare

Interoperability Demonstration (CWID) and the Multi-Sensor Aerospace/Ground Joint ISR Interoperability Coalition (MAJIIC) simulation experiment are two important technology demonstrations in the NATO C4ISR arena. Additionally, ongoing C4ISR projects are benefiting from lessons learned in the lab. However, realizing the advantages of these demonstrations and getting capabilities into the field to help the warfighter today is the challenge. New NATO C4ISR programs and our efforts in force development and governance will help improve fielded capabilities that lead to net-centricity in NATO.

NATO C4ISR Programs

There are numerous C4ISR programs underway in NATO and some just waiting for the green light to launch. All of these programs are essential to achieving our vision of a fully interoperable, joint net-centric NATO C4ISR capability. This is a short overview of some of the programs.

On the C2 front, the Air Command and Control System (ACCS), the Bi-Strategic Command Automated Information System (Bi-SC AIS) and the E-3A upgrade are three important programs. ACCS promises to deliver a modern Air C2 system in the 2009-2010 timeframe with automated tools, ISR sensor interfaces, and tactical communications to support C2 at the CAOC level and below. ACCS will provide our people with the collaborative tools and the interconnections to access the right information when needed. The Air Command and Control Information System, part of Bi-SC AIS, is geared towards the operational and strategic levels with links into ACCS. Bi-SC AIS is at a critical stage in the design and implementation. It will deliver about 100 projects over the next several years that will see convergence of core and functional information services that include C2 tools, decision aids, and improved situation awareness. The E-3A system modernization program will ensure that this important NATO C2 battlespace management capability is fully interoperable in a joint environment. Collectively these programs will shift the data fusion burden from the operator to the system supporting him, thereby enhancing his situational awareness and thus enabling decision superiority.

> 'C4ISR programs must be focused on delivering much needed net-centric systems that empower our Soldiers, Sailors, and Airmen to enable fully interoperable coalition net-centric operations.'

With regard to communications, the NGCS is rapidly evolving to connect the NATO networks to the national networks through Information Exchange Gateways within a federation of systems. According to the NGCS Roadmap that looks out to the year 2014, NATO is moving towards 'everything over IP,' black core networks, and common data standards to improve interoperability and the means to share information. By moving everything to IP and using common data standards, NGCS will facilitate increased data fusion; while the addition of black core networks will allow multiple levels of secure data to traverse the same core infrastructure enabling role-based access and true net-centric information sharing advantages.

The NSP2K program will provide Extremely High Frequency bandwidth in the 2010 timeframe offering improved information-exchange capability to our deployed forces, and the Deployable Communications and Information Systems project

Capt Scheffler, French Air Force, briefs Gen Hobbins on air operations in support of ISAF.

will deliver the much needed satellite ground terminals. The ACCS project will also deliver SATCOM ground terminals to improve communications to deployed operations by making full use of the available NATO SATCOM bandwidth. These C2 and communications programs will form the foundation that is essential to support the JISR capability that the NATO Alliance Ground Surveillance (AGS) system will deliver beginning in the 2013 timeframe.

AGS and national ISR assets that are assigned to NATO operations will plug into a robust network and provide higher levels of spherical situational awareness in order to dominate the battlespace in support of a broad range of missions. Supporting those missions is the recently formed NATO Intelligence Fusion Centre at Royal Air Force Molesworth in the United Kingdom. It brings together 19 NATO nations (with more expected to join), in order to collaboratively analyze vital intelligence information and share the resulting products.

Force Development

Delivery of these programs will significantly improve NATO's C4ISR systems and networks. However, to truly create new net-centric capability, every aspect of force development must be measured and aligned, specifically the people of the up-and-coming force. The force of tomorrow is growing up in a digital age, much more adept at net-centric communications than their predecessors.

Tomorrow's force prefers communications methods that are fused and multi-dimensional such as blogging, chatting, and using unique social networking capabilities that fuse both data and multimedia. We must harvest this aptitude and leverage it when developing our future net-centric forces. This means better education and training, simulation, demonstrations trials, and exercises, to mention a few. Each and every one of these is an essential enabler of force development across NATO. However, none of this will happen without a coordinated team effort and the governance to realize a comprehensive C4ISR capability.

'... to truly create new net-centric capability, every aspect of force development must be measured and aligned, specifically the people of the up-and-coming force.'

Governance

Many organizations throughout NATO and in our nations are involved in bringing the individual elements of C4ISR to reality. Yet, coordinating the entire C4ISR effort requires focused governance. Reaching out to these organizations has been difficult in the past because there is not a recognized NATO C4ISR community, but that is changing. Headquarters Supreme Allied Command Transformation, C4I Division, gathered the known Joint ISR stakeholders in a meeting on 31 January 2007 to chart the course ahead. The community is called the Joint Intelligence Surveillance Reconnaissance-Integrated Capabilities Development Team (JISR-ICDT) and its objective at this time is to coordinate JISR stakeholders, to enhance collaboration, and to move collectively towards improving our NATO JISR capability. The creation of the JISR-ICDT is a very positive step forward, but we will need to step carefully. The JISR-ICDT must coordinate closely with the C2 and communications community to ensure the whole C4ISR effort advances in a coherent manner.

The Road Ahead

Based on the Air C4ISR Roadmap, NATO air and space capabilities and operations in 2015 will look very different than they do today. I anticipate a net-centric CAOC that is fully integrated, flexible, and efficient. The CAOC of the future will empower the Air Component Commander with appropriately tailored decision aids that reduce today's manually driven processes by synthesizing the information from the technologies mentioned above to provide him with the knowledge to make effective decisions. Accomplishing this important transformation will take a concerted effort by all stakeholders. Ultimately, our people are the key to mission success. C4ISR programs must be focused on delivering much needed net-centric systems that empower our Soldiers, Sailors, and Airmen to enable fully interoperable coalition net-centric operations.

We must press on steadfastly towards net-centricity and look toward knowledge-centricity in the future. There is no looking back if we want to feed our warfighters the knowledge they require in today's compressed battlespace (in both time and space) so that we can always stay at least one step ahead of our adversaries' decision cycle. ■

Human Factors and Command and Control

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by Doctor Malcolm James Cook
and Ms Yvonne Masakowski

The rise in integrated computers and communication technologies within US and Allied command and control systems seems to suggest that the Skynet vision of future wars, portrayed in the *Terminator* series of movies, is just around the corner. Although not flawless, that portrayal suggests that there is incredible power in Network Enabled Capability. The actual network is not connected to artificial intelligence with executive functions and is unlikely to be so for many years. The human being is still the effective decision maker within the command and control network. The current and future socio-technical systems are likely to be a bastardised mix of legacy and future technologies with the increasing pressure on budgets limiting the big bang or revolutionary changes in systems and equipment that some industries would desire. The military need to address what this reality means for operational use of command and control systems in the field in the near and medium term. It is likely that in the longer term technological development driven by commercial interests will outstrip or nullify any bespoke military developments driven by much smaller budgets. The military no longer drive the train of development

Humans and Machines

It is all too easy to analyse the relationship between humans and machines superficially and to imagine some state chart, action sequence or task analysis representing the relationship in its entirety. It is probably true that when an individual interacts with a machine initially they are sequentially focussed on superficial actions and reactions. This is the nature of early skill development described by Anderson and Rasmussen. However, as skill develops, chunks of interaction and consequence are revealed to the operator, who then develops a new semi-skilled relationship. Initially the semi-skilled individual may find it difficult to explain his behaviour to the novice. Knowledge becomes implicit and situated so that the semi-skilled operator can only explain what is happening by reference to an explicit task and the system interface he uses. This is why complex systems require simulations and cannot be satisfactorily taught in the classroom environment, the problem is that this requires increasingly sophisticated world models, with increasingly complex problems that require distributed mission training to bring players together. Complex systems, addressing complex problems often need people to give the flexibility that a crude world model and human simulation cannot give.

Finally, the truly expert operator has compiled knowledge or skilled knowledge, as Rasmussen would probably describe it. Highly developed, over-learned skills are often associated with large amounts of implicit or unconscious knowledge about the system, the world that is being controlled and the relationships between the system

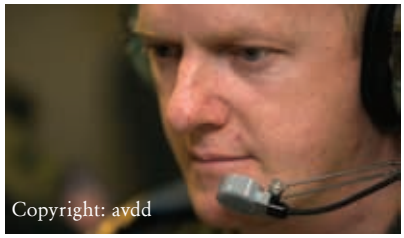
and the world. The key awareness that experienced operators develop is the understanding that any system mediates the world both in cause and effect. Thus, the representation of the world via the system has temporal, spatial and object based distortions that the expert user understands. For example, the Joint Tactical Information Distribution System has an update time that makes orientation of aircraft and flight path ambiguous for periods of time. Radar has limits, which make the estimation of opposing aircraft numbers difficult in certain instances as tracks coalesce. The assignment of forces to tasks by a command and control system to perform some tasks is easy to accomplish in the virtual world, but real-world constraints may limit that request. For example, the need to de-conflict aircraft with surface-to-surface missile launches may delay certain types of action or response. Then there are the unexpected problems that cause friction on even the modern battlefield, whether resulting from unserviceable systems or rules of engagement compromised by weather limiting response.

Interactions Within and Between Teams

Each of the skill levels represents a layer of understanding about the operation of the system, management of tasks and structuring of plans. These layers have additional knowledge that weaves across them to further complicate the process of command and control. Thus, inter-team knowledge is vital and this is observable in the simplest form at Tactical Leadership Program Exercises. The air warfare teams, as skilled as they are, frequently learn lessons about the use of the Airborne Early Warning E3-D and the E3-D crews learn lessons about fighter pilots. Simply embedding fighter controllers in the E3-D or getting lectures from E3-D crews on their capability do not adequately address the problem. It is often only through exercise, situating the cognition within the ongoing task that the 'aha' moment occurs. Underpinning some of this is a sense of the other team as well. The team members need to know each other well and be constituted to perform optimally in a demanding cognitive environment because not all teams or team members have the same skill level. The strengths and limitations of each team member are revealed by their actions in exercises and as with many military processes this learning is best achieved prior to engagement with the enemy. Indeed it is very unlikely that command and control teams are truly homogenous in any way. Thus, adjustments need to be made to make logic more explicit for novice team members and interaction can be collapsed down into short exchanges when the team is composed of more competent individuals who are very familiar with each other. This variation is critical in the evaluation of potentially new solutions because it can enhance or degrade the assessment of the new technology. Low-grade teams can seem to magically improve with technology and high-grade teams can degrade as they fight the system, rather than fight with the system.

Human Errors

American work on the failure to act properly within command teams, like those of the USS Stark[1] or the USS Vincennes[2] has triggered a long line of research indicating that the soft human factors issues are critical to command and control. It is not that the human is an inherent Achilles heel, but their needs and requirements must

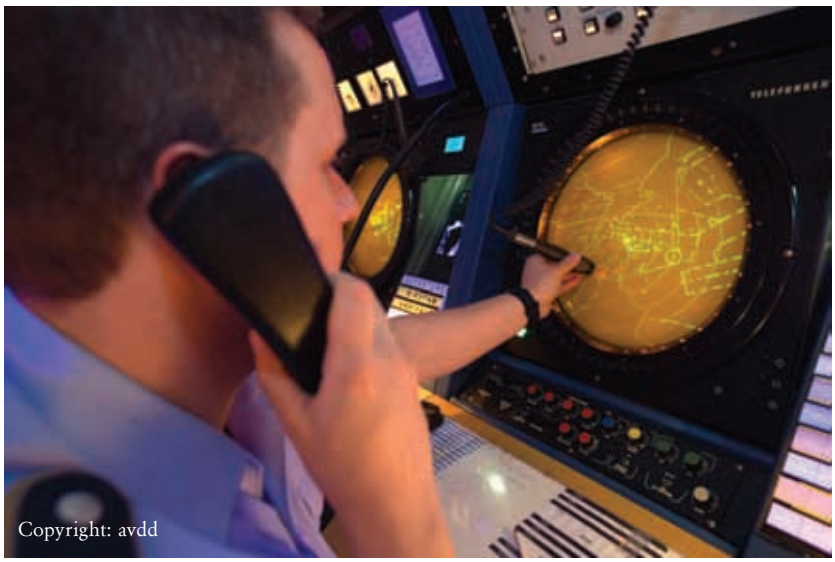


Human factors are critical in system design.

be addressed seriously in system development. It is very telling and disappointing that the recent development of Network Centric Warfare from the US had to have human issues retrofitted into the theory as an afterthought. Perhaps that oversight explains the issues of interoperability that often arise in multinational force actions because engineers and technical specialists assume that human issues are trivial and technological interoperability is the key to future performance improvements in command and control systems.

Sensemaking

If the future of command and control is about anything, it is about sensemaking in a shared knowledge environment and not simply about the sharing of information between people over long distances. Reachback is not a fantastic way to solve problems, as technology cannot mediate all of the relevant problems, it merely solves a political convenience where government wants to exercise control over operations by directly influencing senior command. For human beings sensemaking is best delivered by direct experience of the environment, why else would Napoleon ride around the battlefield and Rommel risk death in a Feissler Storch flying over the front. There are a plethora of examples in history where long range analysis driven by political direction has failed to deliver the desired results, most notably it has created friction amongst senior commanders, such as that in the Falklands war.



'... user(s) are not treated in a derisory manner nor is their flexibility hijacked to make up for failed achievement in the system design ...'

Perhaps the most successful and highly developed philosophy applied to modern command and control is that from Sweden, originally from the Rolf 2010 programme. The Scandinavian tradition of design emphasises the user, their needs and their perspective on the problem as the starting point for design. That philosophy is not intended to marginalise the benefits of technology but to acknowledge the reality that the user is the responsible element of the socio-technical system. The commander and his staff will take ultimate responsibility for any failures or errors in their actions via the command and control systems.

Thus, user(s) are not treated in a derisory manner nor is their flexibility hijacked to make up for failed achievement in the system design, as often happens when money or design outcomes fail to match expectations. How many systems have been delivered with the caveat that 'It was intended to do this automatically but as the operator has nothing left to do they can press the red button as required!' How many systems have been delivered with the caveat 'This screen here was meant to integrate the Recognized Air Picture with the Common Operating Picture to isolate inconsistencies but we could not get the bugs out of the system, so it is not fully automatic, but the user should be able to identify the problems when they arise.' Or the caveat, 'It is fully automatic but tends to produce lots of false alarms, that is not a problem though because the user can cancel them with this toggle button here.' These glitches in the system interface pull the user down to a superficial level of interaction with the command system and away from the big picture.

Thoughts on Knowledge

Working with knowledge is different from almost any other craft that we can observe. True there are some similarities and parallels that can be drawn with other human activities that have already succumbed to the power of the modern microchip and communications technologies. However, technology is largely about information and not about knowledge; knowledge like colour does not exist as an independent attribute outside the user. Knowledge is described by the relationship between newly received information and previously experienced events held in the long-term memory of the user. Colour is the interaction of light with the absorption and reflection characteristics of the surface, as interpreted by the human visual system. Both colour and command and control are multi-layered in their totality, described by interactions between domains. Knowledge in a command and control system is described within individuals but the command team needs to share their knowledge both within their group and with others. The expression and communication of knowledge needs to acknowledge the skill and wit of the recipient, as the brevity or length is determined by the shared implicit knowledge between individuals.

The most important issue is that unlike direct face-to-face communication, all C4ISTAR communication is mediated and transformed by the process of distribution such that knowledge of the transformational process is needed to unscramble the changes that occur as it is passed within the system and displayed by the system interface. There is a trend with modern computing power to make assumptions about the directness of modern communication and display, which are unwarranted. Indeed the idea that raw unprocessed information could be understood is the stuff of legend. Russell Crowe's character in *A Beautiful Mind* views the walls of flashing lights and reads an interpretation of the pattern because of his advanced mathematical intellect. The problem is that real systems measuring and mediating the real world are both incomplete and deliberately misleading because of the nature of warfare. The fog is electronic but, as has been suggested in *Future Warfare*, it has not been eliminated.

The Holy Grail of information superiority will never be fully

achieved because as sensor capture and computing power increase, the costs of verifying the sensor fusion process to amalgamate the information increases exponentially. Skynet worked because it was organic and distributed, but it was equally uncontrolled, as it needed to be self-organising. As yet, human achievements are woefully inadequate in developing such systems and even less so in predicting the emergent properties of such systems. It is fanciful to believe that true information superiority will be achieved comprehensively because there are always situations in which the opposing force can adapt their mode of operations to undermine the technology. This is the fundamental principle of asymmetric conflict because at the basic level a single person equipped with significant firepower can achieve devastating results. A four-man team, such as that used by Special Forces, can have a very high impact like the Beirut bombing of the US Marines facility. Omnipresent and omnipotent military action is not a realistic goal and that would be required to achieve the complimentary actions and outcomes to a totally information superior command and control system.

Conclusions for Air Power

If we consider air power, airborne command and control and related ground paraphernalia such as combined air operation centres, this can certainly be improved, but it must address the lessons above.

First, the expectations of what can be achieved must always be moderated by realistic appraisal of what can be sensed from the air. A satellite or an air-breathing platform performing surveillance cannot discriminate the individual insurgent from the non-insurgent with any great degree of certainty because it lacks critical information about the target object. Special forces and air forces in collaboration have so far achieved the best results, it is therefore surprising to see that the technology of coordination is still so rudimentary and does not integrate into the command and control networks with voice, data and imagery exchange across the net.

Second, the importance of training and experiential development of users needs to be considered in concert with challenging scenarios and simulations to push the envelope of users' expectations and capabilities. It is clear that so much of the capability in knowledge craft is bound to the situation and we see this with the narratives that users relate about their command and control experience. The way in which the stories are unpacked and the lessons identified clearly shows the real attributes of the system are in the relationship between the user and technology. This relationship is defined by experience of a dialogue with the system but it is enriched by the quality of the world events modelled. Crude taxonomies developed by some to describe the relationship create an impoverished understanding of this relationship by categorical shoehorning of diverse experience into a reduced set of descriptions. Even the dimensional approaches using time-sensitive targeting and pre-prepared Air Tasking Orders lack the subtlety to capture the intricacies of air warfare and the campaign management process.

Third, the meta-processes, which develop within experienced teams, and facilitate and enhance the command and control process, like a lens magnifying or minimising performance, need to be addressed. The total system performance in command and control is so much more than just the sum of parts. This is potentially only visible clearly in two instances; first, where things go wrong and ad-hoc management processes need to be absorbed into the command and control process, or second, when the expectations are not met and unknowns develop within the world image that cannot be resolved satisfactorily. Thus, where a stealth fighter is downed unexpectedly and a search and rescue mission is required for an aircraft that has had its airspace cleared, this represents a failure that requires ad-hoc action. In the second instance it might be the use of a novel surface to air missile system that uses infrared (IR), followed by integrated IR and radar process to track and kill friendly forces. The expected losses in a campaign might thus depart from that expected and time pressure requires the air war to continue with immediate effect.

The command and control system is there to manage resources as many other complex socio-technical systems are. However, there are peculiarities of the application domain – air warfare, and the variation in demands from dynamic ad-hoc to pre-planned, that make it especially challenging. Command and control in air warfare is an inherently open system with many known knowns, some known unknowns and some very tricky unknown unknowns. Any system design must embrace this and also embrace the need to serve the users. ■

Endnotes:

1. Wikipedia. [cited 15 Jan 2007]. Available from the Internet: http://en.wikipedia.org. 'USS Stark was an Oliver Hazard Perry class guided missile frigate that deployed to the middle east in 1987. Two Exocet antiship missiles fired from an Iraqi Mirage F1 fighter during the Iran-Iraq War struck the ship on May 17 1987. Shortly after being routinely challenged by the frigate, the fighter fired the two missiles. The frigate did not detect the missiles, and both struck without warning. The first penetrated the port-side hull; it failed to detonate, but spewed flaming rocket fuel in its path. The second entered at almost the same point, and left a 3-by-4-meter gash-then exploded in the crew quarters. Thirty-seven sailors were killed and twenty-one were injured.'

2. Wikipedia. [cited 15 Jan 2007]. Available from the Internet: http://en.wikipedia.org. 'USS Vincennes was a U.S. Navy Ticonderoga class AEGIS guided missile cruiser. In 1988, the ship mistakenly shot down Iran Air Flight 655 over the Persian Gulf killing all 290 people onboard.'

ISAF International Security Assistance Force Mission in Afghanistan: Air C4ISTAR Lessons Learned

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by General Gerhard W. Back (Retired), DEU AF

The success of NATO's International Security Assistance Force (ISAF) mission in Afghanistan is, and will continue to be, Commander Allied Joint Force Command (JFC) Brunssum's highest priority. As the ISAF mission has expanded into the southern and eastern regions of Afghanistan, Allied JFC Headquarters (HQ) Brunssum will do everything possible to ensure long-lasting operational success and provide the Afghan people the opportunity to shape a promising future. A key enabler to the success of our ISAF mission is Command, Control, Communications, Computers, Intelligence, Surveillance, Target Acquisition, and Reconnaissance (C4ISTAR). But just what is C4ISTAR, and how does it affect the ISAF mission?

'C4ISTAR' – What's in a Name?

A brief Internet search will quickly reveal that 'C4ISTAR' is an evolving acronym with a number of variations, including ISR, ISTAR, RSTA, and C5I (the fifth C standing for Collaboration).[1] No standard definition of C4ISTAR appears to exist. Depending on the context, C4ISTAR can refer to infrastructure, the role of particular military units, procedures used, or programmes such as NATO's Air Command and Control System.[2] C4ISTAR appears to be related to the concept of Network Centric Operations, an umbrella term which encompasses other concepts such as Network Centric Warfare (US), Network Enabled Capabilities (UK), Network Based Defence (Sweden), NATO Network Enabled Capabilities (NNEC), etc.[3] C4ISTAR also appears linked to the concepts of Information Superiority, Decision Superiority, and the Effects-Based Approach to Operations.[4]

NATO's use of the term C4ISTAR is similarly in transition. Although 'ISTAR' is defined in current NATO doctrine, 'C4ISTAR' is not.[5] The NATO Joint ISR (JISR) Concept – currently in development by HQ Supreme Allied Command Transformation (HQ SACT) – similarly makes no mention of C4ISTAR, although it does define ISTAR.[6] However, HQ SACT is working on a NATO C4ISTAR Roadmap, so the term C4ISTAR is being used within NATO (at least in some circles), but without formal definition.

It is vital to understand what C4ISTAR really means. C4ISTAR is not just another term synonymous with ISR; ISR is an 'intelligence (J2) community-centric' term focused on the enemy and the environment, whereas C4ISTAR is an inherently cross-functional concept that involves intelligence (J2), operations (J3), plans (J5), and communications and information systems (J6) staffs, as a minimum. By way of analogy: in war, a soldier's sensory system (eyes, ears, etc.) must send information about himself, his opponent, and the combat environment to his brain; his brain must then turn this 'raw data' into useful knowledge (actionable intelligence), come up with a plan, and send 'command' signals via the nervous system

The Intelligence Fusion Centre in support of NATO was offically opened 16 Oct 2006.

to the muscles, which then act (hopefully) in accordance with the brain's intent.[7] A soldier whose organs are able to work together efficiently and effectively will be able to stay inside the decision cycle or 'OODA [Observe-Orient-Decide-Act] loop' of his adversary, thus gaining a powerful advantage in combat.[8] Similarly, the 'ISTAR' portion of C4ISTAR relates to J2, while 'C4' relates to J3, J5, and J6. Thus C4ISTAR is 'network centric' because it links sensors, decision makers and 'shooters' via the network.[9] Properly implemented, C4ISTAR can improve combat mission effectiveness via improved information sharing, situational awareness, collaboration and decision-making.[10] It is this cross-functional aspect of C4ISTAR that gives it so much potential as a useful concept for NATO transformation. Therefore, the term C4ISTAR is broader than JISR in terms of cross-functional involvement and should be used by NATO instead of JISR in emerging doctrine.

Training and Manning

Because of the lack of C4ISTAR policy, doctrine, concepts of operations, Tactics, Techniques, and Procedures (TTPs), Standard Operating Procedures (SOPs), etc. no formal NATO C4ISTAR training programme or exercises existed to prepare personnel for their deployment to ISAF HQ. Fortunately, JFC HQ Brunssum and HQ ISAF staff foresaw many of the potential problems and managed to mitigate most of them. Many C4ISTAR-related processes, training programmes, SOPs, organizational structures, etc. were developed 'from scratch' in theatre, based on the previous experience of various staff members. Many of these initiatives appear to be working well. However, because each person brings their own national and service-centric experience to the fight, these 'ad hoc' solutions may vary from one deployment to the next, due to the lack of NATO standardization. Some techniques (related to targeting, for example) may still be based on Cold War doctrine that does not apply to an asymmetric threat environment; so the need for NATO standardization is vital.

In addition, ISAF expansion into the south and east of Afghanistan heralded the increase of combat operations, a dramatic increase in mission complexity, size and scope. JFC HQ Brunssum and HQ ISAF staff members are successfully exploiting Information Work Space, video-teleconferencing, and other technologies to allow them to work more productively, despite a significant manning shortfall in some areas. C4ISTAR has proven to be an absolute necessity for many operations to succeed, and the human factor is critical: it takes time to retrieve, process and exploit ISTAR data, turning it into actionable intelligence for commanders to use. A shortage of trained personnel can prevent the timely exploitation of this information, potentially leading to mission failure.[11]

ISTAR Assets

As with previous deployments, ISAF IX experienced a shortage of dedicated ISTAR assets under operational control of the Commander ISAF (COMISAF), again due to the inability/unwillingness of individual nations to fill the ISAF Combined Joint Statement of Requirements.[12] As a result, COMISAF's intelligence requirements were, and continue to be, difficult to satisfy in a timely manner. In an attempt to alleviate the situation, ISAF began sharing their intelligence requirements with the US Central Command (USCENTCOM); the close working relationship – and unwavering support – that developed with USCENTCOM yielded positive results, increasing the percentage of COMISAF intelligence requirements fulfilled. However, the overall need for dedicated ISAF ISTAR assets remains high, so I still hope that the requirement for fixed wing reconnaissance, for example, will be filled by nations owning those capabilities. (To be prepared for

future NATO operations JFC HQ Brunssum began working on a concept of operations for a NATO buy/lease option of a Full Motion Video Airborne Theatre ISR capability; the realisation of this concept, however, will take time depending on the approval by nations).

Culture

During the Cold War, many NATO nations were often reluctant to share intelligence information, keeping their national secrets 'close to the chest.' Recent experiences in allied/coalition warfare have shown, however, that improved information sharing among agencies, allies, and coalition partners is vital in order to prevail over our adversaries.[13] For example, USCENTCOM has made great strides in changing from a 'need to know' to a 'need to share' culture.[14] More work is needed throughout NATO to embrace this philosophical change in order for C4ISTAR to succeed.

Conclusion

NATO has a tremendous opportunity to seize the potential benefits C4ISTAR can offer. In order to reap these benefits, however, we must implement some dramatic changes in the way we do business. Relegating C4ISTAR to the intelligence (J2) community without getting the other stakeholders involved from the outset is a recipe for failure.

Numerous C4ISTAR-related initiatives exist (for example, Intelligence Fusion Centre, NNEC, Allied Command Operations Operational C2 Needs Integrated Project Team, etc.), but there appears to be no overall C4ISTAR 'owner' in charge of synchronizing these efforts throughout NATO. The NATO C4ISTAR Roadmap, currently in development by HQ SACT, appears to be a step in the right direction towards resolving this issue.

It is significant to note that the current NATO doctrine that mentions ISTAR is 'owned' by the J2 community. If future doctrine concerning C4ISTAR is similarly confined to the J2 arena, it is highly unlikely that other functional divisions (for example, J3, J5, or J6) will even be exposed to the C4ISTAR concept, let alone embrace it. If C4ISTAR is to succeed, it must be implemented in a cross-functional manner; this means that all divisions that are affected by C4ISTAR (primarily J2, J3, J5, and J6) need to be intimately familiar with the concept from its inception.[15]

Successful C4ISTAR implementation will require much more than transformational technology. We need to look at existing policy, doctrine, TTPs/SOPs, processes, training, organizational structures, culture, leadership, etc., making changes where appropriate.[16] Many processes are currently being developed and refined in theatre in close cooperation with JFC HQ Brunssum; there is much to learn from how they do business that HQ SACT could adopt within the NATO C4ISTAR Roadmap. Without these initiatives, the level of capability needed to support ISAF IX and its high operational tempo would simply not have been possible. At its heart, C4ISTAR is about people sharing information and working collaboratively – the human dimension remains paramount.[17]

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Joint Intelligence Surveillance Reconnaissance (JISR)

by Captain Steve Kenny, GBR N

It seems that Joint Intelligence Surveillance Reconnaissance (JISR) can be all things to all men depending on your perspective. Some see it as a service specific issue gravitating to manned and unmanned air vehicles; other communities see the fusion of Signals Intelligence and Electronic Intelligence as key, whilst a large community visualizes the sensor to shooter loop through time sensitive targeting. In truth it is all the above and much more. This article sets out to illustrate what Allied Command Transformation (ACT) is doing to bring some clarity to a seemingly very unclear picture.

Some History

Approximately two years ago the Assistant Secretary General, Defence Investment, ASG (DI), asked the NATO community to concentrate on bringing coherence to their JISR products or their work. ACT was still in its infancy at this stage and whilst some good work was accomplished, a truly coherent effort was not achievable mainly due to a lack of a coordinating effort, manpower and resources. With the right people now in post, ACT has been able to conduct a stock take of the NATO Military, Conference of National Armaments Directors (CNAD) and NATO Agency JISR efforts along with consortium efforts such as the Multi-Sensor Aerospace/Ground Joint ISR Interoperability Coalition (MAJIIC). A very large disparate community has been identified but the bad news is that their efforts are often undertaken in isolation of each other. At best we are broadly pulling in the same direction but certainly not in a synchronised way. Even today, despite our efforts, we uncover weekly yet another organization that has a JISR line of work that is both valid and useful, but not widely exposed.

ACT proposed to the Capabilities Steering Group, chaired by ASG (DI), in November 2006 that ACT bring this broad community together in one room and try to agree a way ahead. Within ACT, Major General Gijsbers heads up the ACT effort on behalf of General Smith, SACT, as this subject needs strong Flag Officer advocacy. That he also has reporting to him the Deputy Assistant Chief of Staff (DACOS) Intelligence, the DACOS C4 and the NATO Network Enabled Capability (NNEC) Integrated Capability Team Leader immediately brings powerful coherence to the ACT capability effort.

The JISR community met at Supreme Headquarters Allied Powers Europe in Mons on 31st January. At the meeting they agreed a Terms of Reference to frame their direction. They also agreed to the need for one definition and one name, and to work toward that. Lastly, they agreed to make available to ACT all their programmes of work along with the identification of their product deliverables, timelines for delivery, lines of authority, lines of financial authority and the customer base for each of their products.

With this information collected, analysis will be able to show areas of over-investment, under-investment or even more worrisome, areas of zero investment. From this, ACT will be able to propose back to the community a coherent programme under which are nested many, many projects. Each project will be assigned an agreed lead responsible for delivery. ACT's role will be to coordinate this effort, which should bring greater efficiency, savings and common sense. Three principles bind the group's actions:

1) Use Best Practice.
2) Do Not Re-invent The Wheel.
3) Ensure NNEC Compliance in all products.

As a great example of the first tenet, the MAJIIC community made available to NATO a large amount of their work to date from which the JISR community can draw on. Achieving a coherent programme will require some give and take from the stakeholders involved and some projects will have to adapt. Both the Military Committee and CNAD have endorsed this approach and agreed to help where necessary, as at times, issues will have to be elevated to that level.

What's in a Name?

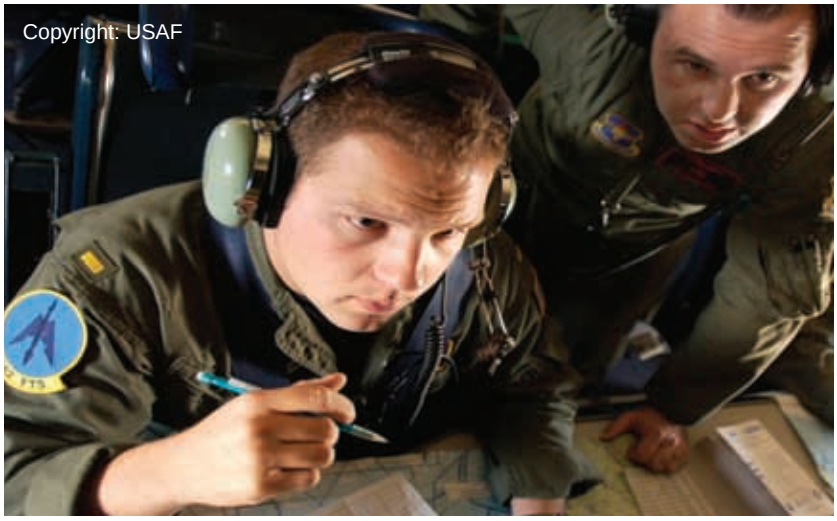
Everything. Mission creep is a well-known phenomenon within the military but it appears that in this area we are rapidly heading for acronym creep, acronym fatigue, or even alphabet soup. ISR, RSTA, ISTAR, C4ISR, C4ISTAR[1] are all relevant, but could fall under the general heading of JISR if the community agreed. All these titles often represent one or more of the sub-components of JISR and, perhaps in some cases, stove pipe approaches. We received a proposal, as I write, to make the title C4I2STAR! In truth, JISR

'JISR is marketable, digestible and simple.'

is all these and more, but at the strategic level, a simple understandable label is a pre-requisite to success. JISR is marketable, digestible and simple. JISR is not however just sensors; it is also humans, networks, databases, tools, ways of organizing and processes, command and control, communications and more. These will enable tasking, analysis, production, dissemination and ultimately decision-making. The definition that the group arrives at will be the key issue and not the name. My strong advice is keep it simple – JISR suits just fine if we all understand and agree what it means.

Chances of Success

The business approach of having one JISR Programme under which are nested several projects is well proven and ACT is designed to run this model. The key is to make sure that each project has a clearly identified project leader. The project must contain products that the warfighter wants (not what the producer feels he should produce), and a timeline indicating when these products will be delivered. A more efficient way may be to develop partnerships to deliver a product – for example: the Joint Air Power Competence Centre and the Command and Control Centre of Excellence could consider contributing the command and control section of the JISR concept. As another example, the CNAD JISR Coordination Group could take on the responsibility for identifying trial venues to the community and collecting trial requirements. The delivery of bite size products to the warfighter will be the key to success.



JISR is not just sensors; it is also humans, networks, processes and more.

Each project needs a clearly identified project leader.

The creation of a complicated process marketed as a solution would be disastrous.

Who is the Customer?

It seems a logical question but rarely can it be answered and, in the area of JISR when ACT scoped the initiatives, this one area caused concern. Following a meeting of the NATO Bi-Strategic Command Chiefs of Staff late last year, Supreme Headquarters Allied Powers Europe undertook to provide the NATO User Requirement for JISR, which is already available in draft form. This is a critical first step in this Programme and will be used to gauge the community's activities for relevance at each stage. Naturally, it will also help identify areas where we are over-producing or producing a product that neither the customer nor user requires. In some cases an easy remedy is to walk back the work to the identified customer and slightly adjust the product to his needs – a task ACT can coordinate. Second will be to produce a JISR concept that is agreed by NATO, here the community agreed to allow ACT to take the four current draft JISR concepts and combine them into one document. This is currently underway.

> 'The project must contain products that the warfighter wants (not what the producer feels he should produce) ...'

Conclusion

It seems that the JISR community in a very broad sense has decided on a course of action that should lead to the coherent delivery of a very much-needed capability. ACT is now in a position to take on the coordinating role and has internally re-organized to achieve this. Acronym fatigue is very real and a simple message will have greater effect if clearly defined and agreed. Keeping issues simple and product focused will free up a staffing bureaucracy. There may well be communities reading this who feel they are currently contributing much to NATO JISR and I would urge them to contact ACT if indeed this is the case. ■

Endnotes:

1. In these cases R stands for reconnaissance, S for surveillance, TA for Target Acquisition, I for Intelligence and C4 for Command Control, Communications and Computers.

How Air Power can overcome the Phenomenon of the Empty Battlefield

by Lieutenant General Hans-Joachim Schubert
Executive Director of the JAPCC

'Always arrive first to the empty battlefield to await the enemy at your leisure. After the battleground is occupied and you hurry to it, fighting is more difficult.' [1]

Sun Tzu

With reference to the Sun Tzu quote, in the context of the modern battlefield, it is necessary to achieve information superiority prior to any confrontation.

The Importance of Air Power on the 21st Century Battlefield

The recent conflicts in Afghanistan, Iraq and Lebanon reveal the complex nature of today's asymmetric warfare. Understanding and countering the enemy in an asymmetric environment is a challenge because the conventions that govern the law of armed conflict while applying to the Alliance do not apply to the adversary. The code that governs the way we view conflict is seen as a weakness to be exploited by our opponent, the irregular warrior. In the words of Henry Kissinger, speaking about the dilemma of military mission accomplishment in an asymmetric conflict '... the guerrilla wins if he does not lose. The conventional army loses if it does not win.'[2]

Two particular features of asymmetric warfare are the 'emptiness' of the battlefield, which translates into the enemy 'blending into' urban or rural populations and also the fragmentation of the battlespace. The first issue hinders the comprehensive collection of intelligence about the enemy who tries to balance his weaknesses and disadvantages using irregular means and methods. The second issue challenges classical military concepts and doctrine because of the lack of a recognized front or line that differentiates us from them.

This article looks at asymmetric conflicts to better understand the concepts of the empty battlefield. It discusses the effects that Air Power can achieve on the empty battlefield and it looks at the evolving characteristics of Air Power in responding to the asymmetric threat. In particular the article focuses on Intelligence Surveillance Target Acquisition Reconnaissance (ISTAR). Since the earliest use of Air Power, it remains the pre-eminent domain from which to accomplish the ISTAR mission that provides warfighters at all levels of

command with real and near-real time information to give them the fullest possible understanding of the adversary. In today's context of the empty battlefield, locating, tracking and understanding the adversary are the warfighter's greatest challenges.

Defining the Problem

There is no agreed definition of asymmetric warfare within the Alliance, and no formalized NATO doctrine on the subject.[3] However, the NATO Glossary of Terms and Definitions defines asymmetric threat as 'a threat emanating from the potential use of dissimilar means or methods to circumvent or negate an opponent's strengths while exploiting his weaknesses to obtain a disproportionate result.' But this is only half of the definition.

Asymmetric conflicts are characterised by non-state actors, independent or cooperating groups of insurgents or irregular warriors and low and high intensity engagements across a fragmented battlefield. The Enemy's centre of gravity is very difficult to define or counter. Command structures and hierarchy features often do not exist, and their strategic vision and operational behaviour is not predictable. Remotely controlled improvised explosive devices, kidnapping and assassination (the weapons of choice used against military and civilian targets in built up areas) prevent identification of positions held by adversaries. Furthermore, the use of the Internet for wide-area, even global communication, and for non-kinetic measures provides these insurgents with a powerful capability. Through the use of the Internet, the enemy can construct profiles on his target audience, use it as a Command and Control mechanism, and as a recruiting tool; he can steal information or manipulate data, send hidden messages, disrupt business, and spread propaganda. And, last but not least, the enemy can use civilian structures and urban terrain features to his benefit in order to conduct operations, where it is almost impossible to distinguish the enemy from the civilian populace.

These factors show how important the reduction of response times and pre-emptive action are as functions in modern warfare. It also shows the importance of understanding the culture within your area of operation and being able to perceive issues through your enemies' eyes. Information superiority and the capability to act swiftly are crucial factors for success against the irregular warrior.

Modern military forces need to balance their use of modern and effective weapons with the risk of collateral damage in an effort to protect our society against insurgents. Our military forces operate under a high degree of scrutiny from the media and the general public. Defence forces are still peacekeepers, but their field of employment has become the world rather than the defence of the home country: they must be aware that repercussions from any action abroad will affect public opinion at home. The transformation of NATO from a Europe centric defence alliance to a global security and stabilization provider must take these issues into account, considering political, economic, social and environmental factors.

Air Power's Role in the Modern Asymmetric Warfare Environment

The characteristic features of Air Power are the use of the third dimension, high flexibility, the conduct of operations over large distances of space and time, sustainability, and last but not least a direct and fast ability to engage targets. With the focus on the empty battlefield, modern Air Power has to deliver persistent ISTAR of an order of magnitude greater than before in order to avoid loss of contact on the fragmented battlefield. In order to be effective, Air Power needs optimized data collection and processing, streamlined command and control and finally the ability to deliver the appropriate response. In other words, Joint Air Power requires capabilities to observe through concrete or the ground. It must have capabilities to help provide for the generation of a common operating picture down to the lowest tactical level at any time and in any adverse environmental condition.

But there is also a need for timely decision making at the lowest level. Authorities may have to be moved down the chain of command, with a commensurate impact on operational and strategic decision-making. Finally, Air Power must have great effect with regards to lethality and high precision to avoid collateral damage; however, modern Air Power capabilities must also possess the means to influence the will and understanding of the enemy through non-kinetic means.

Evolving Capabilities for Operations in Asymmetric Conflicts

In order to achieve effects on the fragmented and empty battlefield, intelligence is critical. As we have already identified, persistence in time and space is a key factor, and therefore Air Power needs improved sensor technology and better procedures and processes to support operations in asymmetric

conflicts. Modern ISTAR assets must be able to deliver full motion video, moving target indicator, battlefield history documentation, and automated analysis support. To acquire the right mix of these assets is challenging.

Day and night capabilities must include identification criteria, dynamic targeting, and time sensitive targeting. To meet the time sensitive demands, a seamless link to weapons systems employing both kinetic and non-kinetic weapons is needed, which ensures the provision of an appropriate response when required.

To illustrate the challenge of the asymmetric battlefield, video footage from the recent Lebanon conflict shows insurgents firing anti-tank rockets at Israeli forces from the balcony of a civilian apartment building. In another clip, footage from a patrolling Israeli Unmanned Aircraft System captures insurgents firing a rocket from an agricultural area then fleeing the scene by motorcycle. The insurgents are followed to their destination consisting of a group of buildings, housing a known terrorist support operation. Within seconds the entire complex is destroyed. Persistent surveillance provided good situational awareness; good intelligence enhanced the commander's knowledge; while the targeting and weapon selection process conducted in a timely manner enabled the command and control process to make the decision to eliminate that threat.

Thus, there is also a need for continued dialogue regarding legal implications, especially concerns over collateral damage, the appropriateness of measures and means in correlation with the targets, and the decision between kinetic and non-kinetic effectors.

Capabilities for persistent observation, comprehensive detection, and time sensitive decision making under full situational awareness and with the appropriate reactive means are needed to overcome the phenomenon of the empty battlefield. Seamless Command and Control (C2) as a network-enabled capability must be responsive and collaborative to ensure success in this difficult environment. It must support joint connections and data feeds under rapidly changing circumstances, and for a fragmented battle space it is a *conditio sine qua non*.[4] Besides the ISTAR effort, Command and Control has to address many other areas like air space management, or combat and logistic support.

The Way Ahead

In order to predict the behaviour of the enemy, the Alliance needs capabilities allowing for multinational and multi-service cooperation and international cooperation among militaries, international governmental agencies and non-governmental organisations. Applying the appropriate reactions against terrorist or guerrilla actions demand adequate tools as well. Improved Air Power capabilities as an answer to the challenge of the empty battlefield need to address a network enabled intelligence cycle and an automatically assisted sensor to shooter link.

Initially, sensor capabilities and C2 interfaces need further development. As one of the key capabilities for situational coherence and comprehensiveness in rapidly changing situations, an automated common operational picture history analysis tool has to be developed.

In NATO's war against terror, we need to focus on the irregular warrior. Urgency of operations requires complete situational awareness and timely joint C2. Assets and capabilities must be compatible and integrated into a complete and coherent C2 constellation. Data, information, and intelligence must be releasable and capable of being shared amongst Allied Forces. Common tactics, techniques, and procedures as well as concepts and higher-level doctrine must be developed, institutionalized, and, in the end, coherently trained. The desired effect of this transformation process of Air Power is the implementation of a network enabled Command, Control, Communications, and Computer (C4) ISTAR – targeting/engagement loop.

The Key to Ensuring the Battlefield is No Longer Empty

In summary the emptiness of the battlefield will only be overcome with significant improvements to the C4 pillar and interoperability between all Intelligence and Information sources to achieve timely decision superiority. With the described capabilities, Air Power is the proper key to discover hidden threats and to ensure the battlefield is no longer empty, even when it remains fragmented. Therefore, it is our job, as leaders of NATO transformation, to tie Air Power to an interoperable, accessible, trustable, and persistent capability and to bring about the effects we need in the new battlespace to succeed. ■

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by Major Brett Cusker, USA AF

NATO Airborne Early Warning and Control Human Aspects of Platform Capability Change

NATO Airborne Early Warning and Control Force

The NATO Airborne Early Warning and Control (NAEW&C) Force consists of Airborne Early Warning E-3 AWACS aircraft from two Components, the E-3A Component at Geilenkirchen NATO Air Base, Germany, and the E-3D Component at Royal Air Force Waddington. The E-3A aircraft at Geilenkirchen were purchased 25 years ago to provide gap filling radar coverage during the height of the cold war.

Force Evolution

From the beginning additional roles and missions were added, starting with the addition of 'Control' to both our capabilities and name. The NAEW&C Force has undergone an undeniably successful history of platform modernisation in order to keep pace with, and take a leadership role when necessary, in the ever-changing world of Command and Control (C2).

The NAEW&C Force continually evaluates operational requirements, analyses battle management tasks from operational experience, and refines its modernisation programs in order to introduce, maintain and sustain the graduated combat support capability required across the broad spectrum of C2. Our people have made this track record one of considerable success.

Technology has necessitated some of our modernisation initiatives, but more importantly, the evolution of C2 concepts and the subsequent changing demands on C2 assets have modified and changed the operational tasking of NAEW since the Force was formed in 1980. As a result, revised or wholly new roles and missions have demanded an aggressive requirement-driven modernisation process for the NAEW fleet. A detailed chronology of these changes is highlighted in Figure 1. It graphically shows the transformation and force evolution of our fleet over time from a purely surveillance platform to an Air Battle Management C2 platform capable of many missions.

Current NAEW&C Force Roles and Missions

The Supreme Allied Commander Europe employs the NAEW&C Force to support the NATO

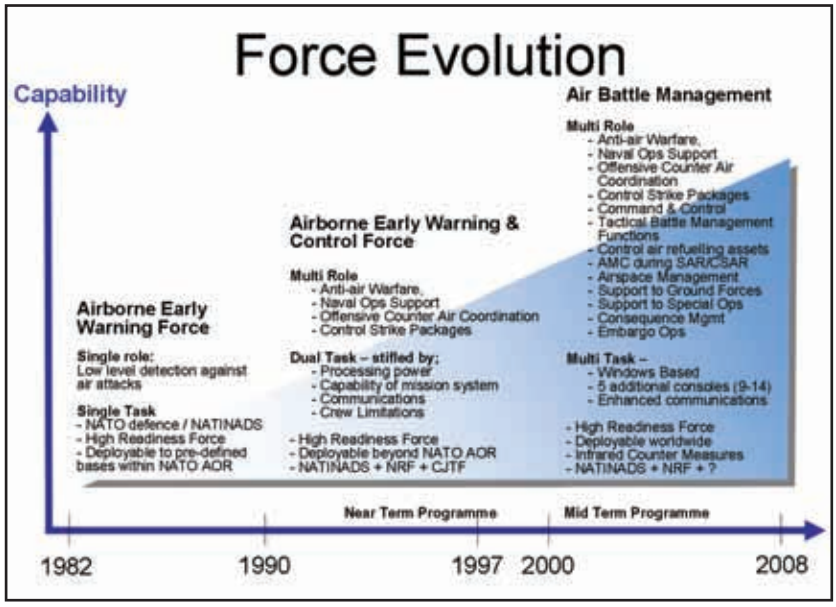


Figure 1

Integrated Air Defence System and to support the NATO Response Force (NRF) in every contingency. Therefore, the Commander, NAEW&C Force Command is to provide an AEW&C capability that is trained and equipped to participate in NATO-approved operations worldwide and is available at graduated levels of readiness, to support Joint Force or NRF commanders.

As a key node in the C2 hub, the NAEW&C Force is charged with effective Air Battle Management and control of assigned assets.

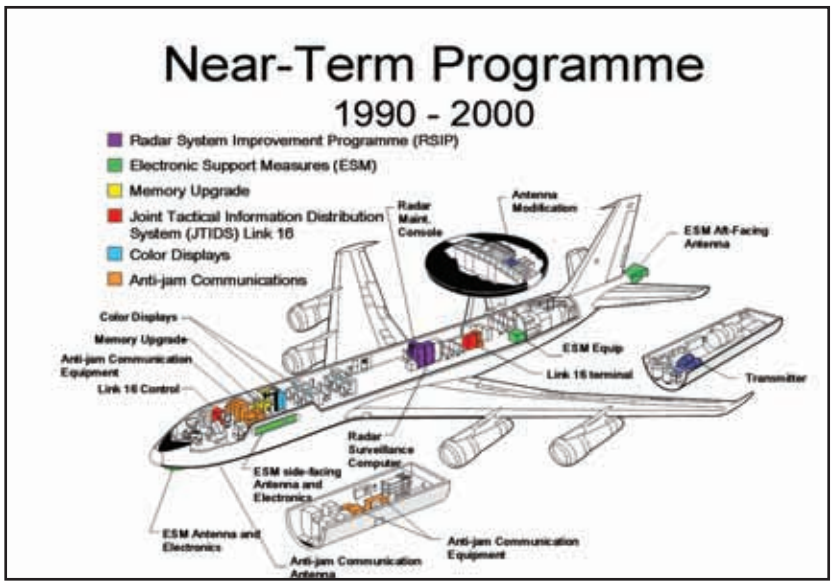


Figure 2

NAEW Capability Enhancements

As depicted in Figure 2, the NAEW&C Force significantly modified the E-3A fleet throughout the 1990's in deference to the operational taskings identified in Figure 1.

Under our most recent modernisation programme, called NATO Mid-Term (NMT) (Figure 3), operational requirements on the Force Evolution Timeline (Figure 1) necessitated more improvements to the platform in nine significant areas. From the cockpit to the mission crew, from the flight line to depot, and from the aircraft mission computing system to the software support environment, the NMT programme has brought with it sweeping changes to our operating, maintenance and support procedures; procedures that had more or less been in effect for 25 years.

The NAEW Platform is Changing – are the people?

The following is this author's personal impression of the human impact resulting from the highly ambitious NMT project. To answer the question directly, NAEW&C Force personnel are changing in deference to the new platform and our evolving C2 role.

There are many constraints when dealing with change; however, accepting minor change can (sometimes) be easy. Significant change is never so easy, especially for large organisations, as is the case when modernisation programmes turn 'normal' procedures and processes upside down, and create a wholly new 'normal' environment. In this context, it is not an overstatement to say that the NMT programme has introduced revolutionary change to our systems and imposed them on our people.

In the military environment, military personnel and civilians in support of military operations realise that change is inevitable. The NMT retrofit has introduced change on a grand scale, so the resulting analysis of the different human-technical interfaces with the new NMT system is complicated. On one hand, there are changes that include decreased system barriers to operator tasks thanks to a much more user-friendly man-machine interface. For example, a multi-sensor integrated tracking and identification system has significantly reduced operator workload. On the other, NMT has introduced a two-level maintenance concept of support that does not require 'back shop' work (we only 'pull and replace'). Finally, the increased use of Commercial Off-The-Shelf (COTS) technology for software and hardware systems has introduced radically new concepts into an environment that has operated in much the same way for over 25 years. NMT's use of COTS systems and technology has made significant changes to our business practices necessary. To summarise our challenge, the following quote is offered: 'An organisation's processes are embodied by its personnel. A decision that business processes will be reengineered to accommodate a commercial system is actually a decision that all of the organisation's people will adjust their daily activities. Countless bitter experiences have shown that people do not change simply because an edict is made, but through education, training, persuasion, motivation, and leadership.'[1] This statement perfectly describes the current state of affairs in the Force Command Headquarters and at the E-3A Component.

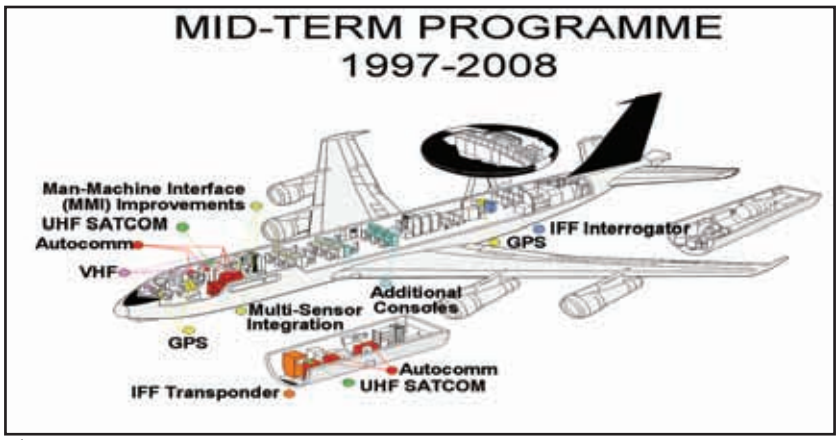


Figure 3

So, how are we doing in light of this challenge, and what has made the difference for our Force? The highly capable, energetic people who make up the NAEW&C Force are identifying, evolving and resolving NMT introduced constraints and meeting the challenge of NMT for two primary reasons. First, they have no other choice. Our fleet is being modernised, for reasons identified earlier in this article, and very soon the only version of the E-3A we will operate will be sporting the NMT retrofit configuration. The second and more important, organisational pride of mission and identity as a high quality, multi-nationally manned airborne command and control force, capable of executing any C2 task our new system will support, is a strong motivator. Everyone likes to be a part of a winning team, and to be a part of one as historically significant as the NAEW&C Force brings with it the individual desire to see our partnership succeed. Individual dedication to mission accomplishment of our force has made the great social 'experiment' of taking people from 15 different nations and bringing them together in one Command for the sole purpose of providing NATO its own expeditionary airborne C2 capability a daily reality. Only within NATO and only with the like-minded, dedicated spirit of our personnel has the NAEW&C Force realised the successful completion of every assigned task our force has ever executed. The introduction of NMT is proving to be no different.

Despite our successes, our transformation to NMT has not been an easy one. In fact, it has been, and in some areas continues to be, arduous. For example, the detailed development of procedures for the efficient use and support of the NMT weapons system and platform support has proven challenging. The challenge for our people has been to define the starting points for most of our new processes with only the essential amount of difference training being given to our own trainers, who have in-turn been tasked with further development of available training material and the creation of new 'best practices.'

'Today, thanks to the continued effort and dedication of our people, the NAEW&C Force is poised to remain the most capable battle management platform in the world.'

Finally, it is this author's assessment that people more readily accept the challenge of change when provided with high quality training, equipment and an appreciation for the strategic vision or influences that created the conditions for change in the first place. With these things, a personal commitment to make the new system as refined as the old is possible, and in the NAEW&C Force's case, a certainty!

Command and Control Capability Implications

Weapons systems can be optimised over time, just as the legacy fleet at the E-3A Component has been, but at a certain point, growth and refinement cease to be an option. Crews become as efficient as systems allowed, and our personnel had nearly maximised the efficiencies possible with our old legacy system.

As described, in order to accommodate new mission tasks and provide a growth potential, the NMT programme was introduced. The Force operational challenge now is to benchmark the legacy level of service and capability, and surpass it with our new system capabilities as fast as possible in order to institutionalise the new 'normal.' In doing so, we will unlock the full potential of the new system. To this end, sooner or later, people have realised that they must be part of the solution for 'normalisation' of the new system at every level. Today, thanks to the continued effort and dedication of our people, the NAEW&C Force is poised to remain the most capable battle management platform in the world. ■

Endnote:

1. Moya, Major Mario. 'Quotations from Chairman David.' A Little Red Book of Truths to Enlighten and Guide on the Long march Toward the COTS Revolution. Carnegie Mellon University, 1998.

THE HUMAN SIDE OF TRANSFORMATION

by Air Commodore Porter, RAF

Whilst this article draws extensively on the emerging ideas of the United Kingdom Development, Concepts and Doctrine Centre, the views expressed are those of the author and do not necessarily reflect an official position.

Some History

The British Army introduced the concept of massed tanks to the battlefield at Cambrai in November 1917, thus heralding the arrival of one of the transformational instruments of industrial warfare. Less than a year later, this first phase of tank warfare arguably culminated with the use of 634 tanks at Amiens. Following the breakthrough of the enemy lines, the British concept of operations envisaged unleashing horse cavalry into the German rear thus contributing to the long cherished 'knockout blow.' For this, two Divisions of cavalry had been hoarded through four desperate years of the Great War. In the event, despite some isolated successes, horse cavalry proved no match for automatic fire and, notably, 16 primitive armoured cars, which were restricted to metalled roads, did more damage than the entire British Cavalry Corps!

Amiens also marked a genuinely serious attempt to integrate Air Power into the Battle Plan. Air was used to aid Operational Security – heavy aircraft flew up and down the Front Line to hide the approach of armour, carried out diversionary raids to mislead the enemy on the point of attack, provided Offensive and Defensive Counter Air (and, thus, Air Control), and finally attacked ground troops in what would evolve into Air Interdiction. Later in the battle, when the enemy was either retreating in disarray or bringing forward reserves, practically all the Royal Air Force's offensive effort was switched from attacking troops in the open to attacking the bridges that were essential for both activities. A lack of precision meant that hardly a bridge was hit and, when one was, the lack of decisive weaponry ensured any damage was inconsequential.

On both land and in the air, the Battle of Amiens gave us two valuable insights into the consequences of poor conceptual thinking. The first, demonstrated a concept born of the past, which did not capitalise on the opportunities

offered by transformational change; the maxim 'the only thing more difficult than getting the military to adopt a new idea, is getting it to drop an old one' comes to mind. The second, on the other hand, highlights the dangers of taking theory beyond the realms of the technically feasible at any given time.

Transformation Today

I mention the above, and I could have chosen from several similar examples in the air, on the land or at sea, to demonstrate the difficulty in placing transformational advance in an appropriate conceptual context. We should be in no doubt that Network Enabled Capability represents precisely that kind of advance. We must ensure that the ready flow of the information age product is harnessed effectively to our benefit and is neither limited by yesterday's thinking and practice nor exposed by reaching for goals beyond our means. This article will not dwell on the technical changes that we are undertaking, or are about to undertake, but on the challenges we face in the human dimension in embracing such change.

Conceptual Thinking

First, a conceptual framework is necessary to take such transformation forward. In the United Kingdom, we have framed this around 3 basic ideas. First, we believe that the complexity of modern conflict will only be resolved through a holistic approach that seeks to coordinate national diplomatic, economic and military efforts with those of other nations and agencies to reach lasting outcomes – we term it the Comprehensive Approach. Second, and flowing naturally from the Comprehensive Approach, the United Kingdom (UK) seeks to orchestrate its military activities through Effects Based thinking, where activities are carried out to deliver effects that create conditions, which lead decisively to acceptable lasting outcomes. Of note, this approach is geared more towards a way of thinking than the idea of absolute causality where doing x is mechanically determined to have y effect. In other words, whilst activities are undertaken to achieve effects, we aim to develop leaders, who are intuitively aware of the effects of their actions, both intended and unintended, and adapt accordingly in pursuit of the Commander's Intent. Finally, the UK seeks to orchestrate these activities within the Joint Action construct depicted in Figure 1.

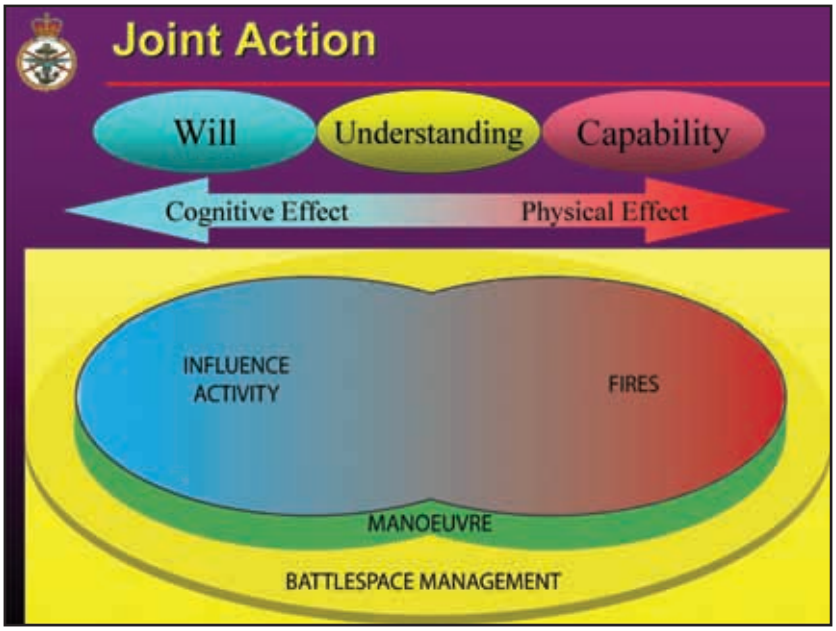


Figure 1 - Elements of the Joint Action construct

In essence, Battlespace Management and Manoeuvre (the latter in the physical, virtual and intellectual senses) are the enablers that allow the military to bring cognitive and physical effectors to bear. In a model where the holistic rather than purely military effort is crucial, there will be an increasing impact from those activities that produce cognitive effect through influencing an opponent's will and understanding in addition to the more traditional focus on reducing his capability and capacity.

Cultural Change

So what does this mean to the airman? Arguably, an effects based approach has always been the goal of Air Power, but just like the bridges at Amiens, the understanding that underpins such an approach has, hitherto, been something of a chimera.[1] That said, the conceptual bases described above anticipates that Network Enabling should assist the analysis, information flow and shared awareness necessary to make such an approach a reality.

From a human perspective, however, it will demand significant cultural change. First, the inevitability that (with only rare exceptions) the realisation of effects will be a Joint endeavour, set at the Joint level, will continue to be reinforced. Airmen must, therefore, be nurtured in the Joint process and be encouraged to not only understand the role, attributes and limitations of Air Power in that process, but how to argue its case with conviction. Second, given that few activities in the air do not have, at least, the potential to deliver strategic

or operational effect, an airman's intuition for effect, both intended and unintended, must be developed throughout his career. This will not only aid the application of effect in a tactical sense, but also encourage the airman at all levels of subordinate command to sense opportunities to take forward the Joint Commander's Intent wherever and whenever they arise.

Given that the history of delivering kinetic effect is well documented and understood, airmen will need to focus increasingly on how their environment can be used to deliver influence. Progress here may vary from identifying equipment, which might be fitted to apply influence – sirens fitted to the Stuka was, perhaps, an early example – through to the sophistication that is likely to be necessary in measuring how any given activity is contributing to the realisation of effect. For example, how will we know when the advantages of 'Shows of Force' on intimidating an irregular opponent are being outweighed by the dissatisfaction amongst a local populace caused by the constant disruption of their everyday lives? Whilst it might be obvious to the military observer with all the facts, we will need to take the necessary steps to ensure our actions are understood appropriately elsewhere. This could lead us to a new assessment of activities in the future, including polling and media coverage surveys, if we are to fully understand the impact our actions have in the wider sense.

Structural Change

Developing our people this way will also require structural change; traditionally, the early career of an airman has been focused almost entirely on the tactical, and the mastery of aviation that inevitably entails. An effects based approach will demand a richer and broader understanding of conflicts practically from the outset, and the structure of our training regimes will need to respond accordingly. But that is not the only area that will require change. Exponents of a network enabled tomorrow routinely refer to the ability of commanders and their staffs to pull information rather than rely on the push process so prevalent today. Given the volume of data and information likely to be available, such a process shift would appear to be entirely reasonable. It does, however, also beg a number of questions. In particular, will our practice of relatively short staccato operational tours pass the test of time? My experience as a UK Air Component Commander was largely in an information push environment – had it been more pull, I could not have been posted from an unrelated appointment to the role, would have required greater familiarisation and, to deliver optimal effect, would have needed to undertake a significantly longer tour. Addressing any (but preferably all) of these issues would have a profound effect on the structure of most air forces, but it is a journey on which we must embark if the full effect of network enabling is to be realized.

> 'Airmen must, therefore, be nurtured in the Joint process and be encouraged to not only understand the role, attributes and limitations of Air Power in that process, but how to argue its case with conviction'.

Similarly, can the air forces of tomorrow sustain Reserve structures similar to today? Just as technological change undermined the value of the conscript, will the continuity and rich understanding required by a high-tech tomorrow have a similar impact on the employment of Reserve Forces? On the other hand, the complexity of contemporary conflict may mean that only reservists nurtured in other fields of employment can develop the rich understanding of context to fulfil certain specialist niche roles. The impact of the media on influence activity and the fast moving dimension of cyberspace come to mind here.

Conclusion

This brief article does not purport to provide a comprehensive solution to how we address the human side of Network Enabled operations. Rather, it seeks to highlight the fact that technological advance will not provide transformation in isolation. The human dimension must be given equal weighting in terms of developing a conceptually valid model to embrace technological change, preparing the mindset of our people to operate instinctively within that model, and embracing rather than resisting any structural reorganisation that such changes demand. To do otherwise is to risk using our network enabled tomorrow to provide little more than the electronic equivalent of 'punching holes for horses'! ■

Endnote:

1. The Oxford Concise Dictionary defines a chimera as a 'fantastic or gross product of the imagination.'

Copyright: Luftwaffe

Networked Security in the German Forces

by Lieutenant Colonel Doctor Michael Romba, DEU AF
and Colonel Ralph Thiele, DEU AF

In October 2006 the German government published its White Paper 2006 on Security Policy and the Future of the Bundeswehr.[1] In the last 12 years since the previous paper was issued, Germany has taken on a much more active international role. Today's Bundeswehr has some 8,000 soldiers participating in 11 international operations mainly in the Balkans, the Mediterranean Sea, Africa and Afghanistan. There is no better illustration for the fundamental change of Germany's security and defence policy than the fact that contributions to the international fight against terrorism have today become a key task of the German Bundeswehr.

The altered security environment has led to a paradigm change in the way to define security needs. Peace, security and prosperity are more interconnected than ever. Nations need to cooperate with other nations and organisations to prevent the decline of any state. There is a growing demand to contribute in time and effectively to peace and security, democracy and prosperity, development and the rule of law. Close cooperation and coordination among international organisations – particularly between the United Nations, the European Union and NATO – is of utmost importance with regard to their respective roles in crisis prevention and management.

Obviously, former military concepts and capabilities no longer meet the new challenges to security. In the past, military components fought more or less independently of each other – under a command and control structure that was joint in nature only at a comparatively high level. Unity of effort was predominantly achieved through coordination and de-confliction. A sequential planning cycle aimed at attrition. Targets were attacked more or less indiscriminately. Collateral damage was rather the rule than the exception. In contrast, today and in future a much stronger integration of effort, services and agencies is needed. Of course this affects air forces as well. They need to adjust to operate as part of a joint, interagency, and multinational team. This understanding drives the Luftwaffe's Flight Plan for Transformation.

The new challenges demand better and different capabilities to guarantee security and stability. 'Asymmetrical' threats by their very nature aim at the vulnerability of critical infrastructure and entire societies. A dramatically increased complexity in combination with strikingly reduced reaction times delivers a clear message:

Today's asymmetric environment challenges secuirty forces.

internationally orchestrated, interagency-based, network enabled capabilities are the answer to the new asymmetric security challenges. This requires a government networking policy which is geared towards strengthening interagency leadership and which builds on the notion of network enabled, effects-based, and capability driven security management.

The concept of 'Networked Security' as addressed in the White Paper has become the Government's conceptual response to the nature of the altered security situation. It is the overall framework for the future conduct of German security policy and rests on a comprehensive understanding of security aimed at preventing crises, combating them once they have escalated, mitigating their impacts, and providing stabilisation in their aftermath. Networked security emphasises the need for harmonised interagency action in order to provide integrated effects that build on the smooth interplay between military and non-military instruments of power. With this approach Germany follows NATO in advancing an effects-based approach to operations, envisaged by the 2004 Strategic Vision of NATO's strategic military commanders and the NATO's Heads of State and Government 2006 Comprehensive Political Guidance.[2]

Transforming Defence Using Collaborative Networking

Building lasting peace will only be possible when military capabilities are embedded into a grand strategy, an 'overall package' of governmental and/or international measures. This has been clearly illustrated in the Balkans, Afghanistan, and Iraq. Military contributions need to be well harmonised with other governmental or international instruments. The application of military, diplomatic, and economic power in an effects-based approach to operations requires comprehensive concepts.

Consequently, the armed forces can no longer focus primarily on traditional combat operations, but need to become more flexible as part of a collaborative interagency-driven environment. This will enable them to deal with the whole spectrum of asymmetric challenges. The measures they can take to counter these challenges range from de-conflicting joint operations to integrated and even interdependent operations – the motto is: 'mass effects rather than forces.' Some stabilisation operations have seen a shift from combat tasks to policing tasks. Capabilities for interagency and joint planning are required as well as command and coordination capabilities, which ensure that the most appropriate means are employed.

How can the military be transformed for the critical and complex business of post-conflict stabilisation, to cope with lawlessness, destruction of civilian infrastructure, or attacks on coalition forces? International conflict prevention and crisis management, including the fight against international terrorism, will dictate the structure and have a decisive influence on the capabilities, command and control systems, availability and equipment of armed forces. The structure of the armed forces needs to be consistently adjusted to keep up with operational demands. We need to look at improving operational readiness across the entire task spectrum but within a stronger interagency approach.

The past decade has underlined that air power's inherent properties – speed, range, and flexibility – are very supportive to key enablers of networking such as sensors,

information and communication technology. Capitalising on these strengths is an obligation of the Luftwaffe – particularly whilst facing the asymmetrical challenges posed to NATO and its partners. The ability to conduct Network Enabled Operations based on respective capabilities will be an absolute prerequisite to play a successful part in multinational conflict prevention and crisis management. Network Enabled Capabilities are the core element of transforming armed forces as they significantly enhance the military capability profile. From a technical perspective they are mainly based on information processing means and communication technologies that have revolutionised commercial business. Leveraging these technologies for security purposes has not only altered the relationship between the military services and within the defence administration, but also significantly affected the relationships between the military and government, non-government agencies, supporting institutions and industry.

Command and control, communications and computers, surveillance and systems automation capabilities have increased by orders of magnitude in the past decade. Integration and coordination form the nexus of Network Enabled Capabilities. The network gives security forces the ability to better understand a situation, and it allows dispersed personnel to simultaneously and accurately evaluate and respond to each situation. The network improves communications, coordination, and collaboration to create greater operational efficiencies. Networked solutions provide the Luftwaffe with the essential technological capabilities of system engineering, installation, integration, operations, and maintenance. These will help the Luftwaffe reach an unprecedented level of synchronisation of security forces and supporting measures. Shortening the decision cycle will help our own forces to operate faster and more efficiently as compared to the adversary's decision cycle with respect to quality, quantity, and utilisation of dynamic mission-critical information.

Command and control under network enabled conditions guarantees a broad-scale, effective, and efficient 'management of the battle space.' This is particularly true for stabilisation operations. Today's often asymmetric and challenging security environment calls for dramatically increased transparency. Nevertheless, our own forces also have to be able to cope with information black spots, which are characterised by their very low information density. To deal with that situation, flexibility, improvisation and mission-oriented decentralisation are needed. Flexible mobile systems must constantly adjust themselves to rapidly changing situations and move data rather than units. People and sensors identify and report what can be detected. Software-based decision support, modelling and simulation dramatically improve time and decision quality requirements, fill information gaps and facilitate rapid and adequate decision-making.

> '... it is essential to take account of the knowledge requirements of all stakeholders in the broadened spectrum.'

The use of networks reduces the significance of the location of sensors, decision makers and effectors. It leads to successful team cooperation and integration in a diversified environment. Virtual organisations bring together the participating governmental and non-governmental actors, with weapon systems and other instruments of power, sensors and decision makers for a specific task. Once the task has been completed, these resources are available for new tasks. Virtual organisations support a comprehensive and shortened command and control process that enables forces to increase the operations tempo, which is the key element when it comes to obtaining a competitive advantage on the battlefield.

Effects Based Approach to Operations

Given the multi-faceted character of current security challenges, an effects based approach has become the key philosophy. This approach involves the comprehensive, harmonised and therefore efficient application of all instruments of joint, multinational and interagency-based power – including military and non-military instruments – to create effects and actions that will help to achieve the desired outcomes. The Effects-Based Approach to Operations (EBAO) is closely related to the concept of network-enabled capabilities. It is the emerging NATO concept for dealing with all aspects of security operations. This approach includes an enhanced situational awareness, timely operational planning and decision-making, an improved use of modern means of command and control, sensor fusion of multiple sources, and the coordinated application of all instruments of power.

Although elements of EBAO have already been used in the past, a much more comprehensive framework

for integrating all elements of the military – as well as multinational and governmental agencies – into a coherent campaign philosophy can be achieved. Legacy methods focus on the destruction of targets whilst EBAO moves beyond narrow tactical viewpoints. The challenge for the military planner will be to use superior knowledge to apply force at the right place and time to achieve specific operational and strategic effects. EBAO promotes greater planning agility; it is less plodding and more adaptive to the achievement of specific effects.

These features become visible at the tactical, the operational, the strategic and the political level through a Common Relevant Operational Picture. Cross-functional information sources and services like meteorological and geodetic data, intelligence and open-source information will feed an information pool that holds all available data and information for operations. At the tactical and operational levels, functional services select the various products from networked databases with regard to clearly selected criteria and route them to a Role-based Operational Picture that displays all relevant information for a given mission on demand. By linking military leaders and decision makers with respective units and weapon systems, the available information and knowledge can be used for battle management, command, control, communications and computers, intelligence, surveillance, and reconnaissance, and engagement missions. The capability to conduct a system of systems analysis helps to collect, store and display information and assessments needed at the strategic and the political level for their respective awareness, and also provides the necessary information for the tactical and the operational levels.

Ongoing operations in ISAF.

An effects-based approach to operations requires a new quality of emerging knowledge concerning the target to be addressed. To create this knowledge, data and information need to be collected and analysed using holistic means. Results have to be adequately incorporated into the decision cycle. All of this leads to a profound and broad knowledge base that enables planners to include all aspects of an adversary system in our own planning and decision-making processes. The inclusion of relevant expert knowledge must be ensured. Providing relevant insights requires intensified cooperation with academic disciplines in terms of social, cultural, and regional studies – in particular those disciplines which are not part of the normal intelligence process. In addition, there is a serious need to professionally manage open sources. In this context, it is essential to take account of the knowledge requirements of all stakeholders in the broadened spectrum. Today, the primary hurdle is the question of how to collect, analyse and disseminate intelligence data – at an interagency level within the respective governments, at an allied and NGO level.[3]

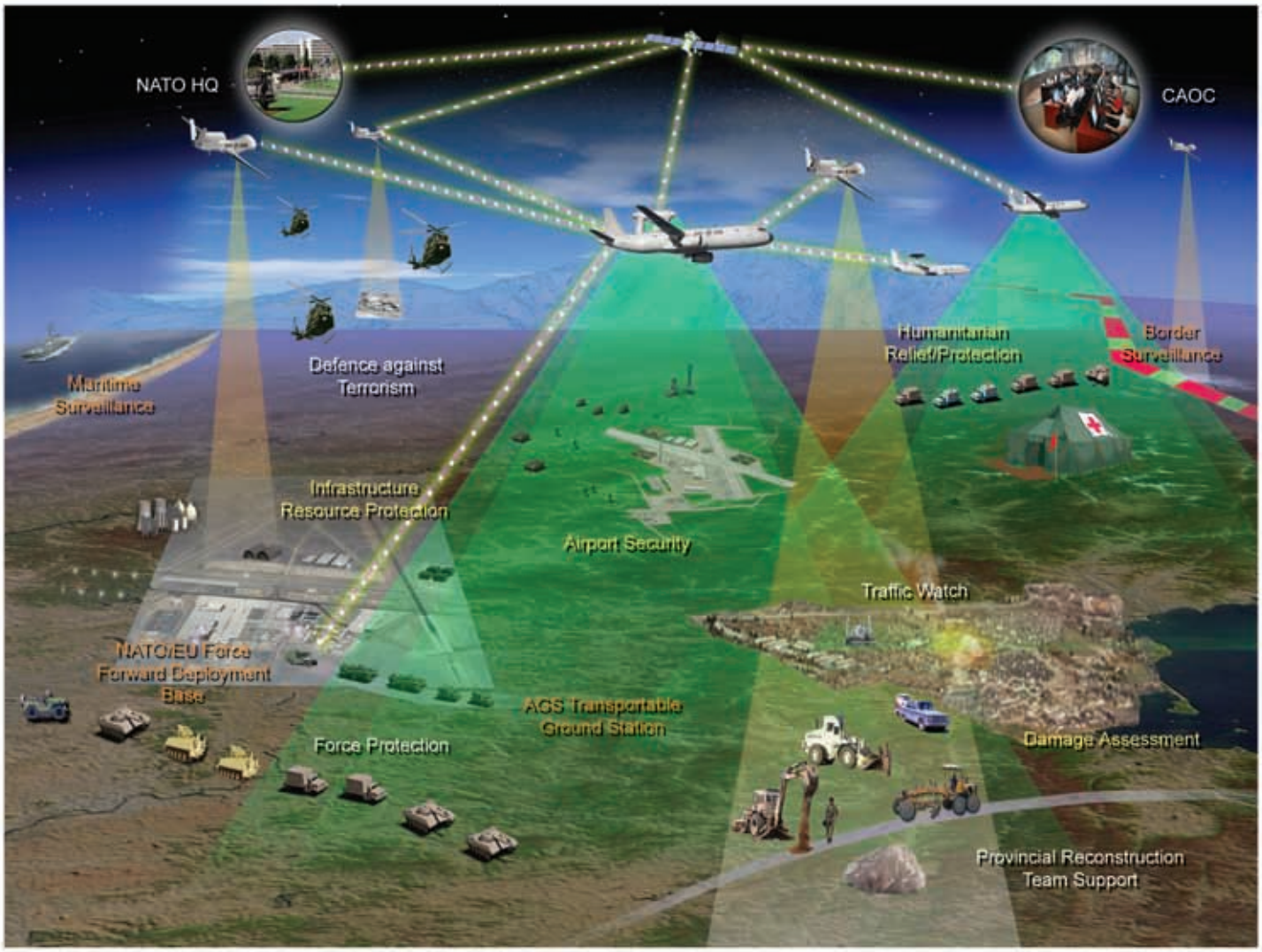
Today's Luftwaffe is facing numerous challenges in achieving the critical capabilities necessary for the vision of networked security as laid out in the White Paper. The Luftwaffe provides substantial capabilities in air superiority, precision engagement, rapid and global mobility, information superiority, and combat support. In doing so, the Luftwaffe makes an important contribution to the broadened joint, interagency, and multinational mission spectrum of the 21st century. ■

This article has been revised from its original version. To view the entire article, 'The Role of Air Power in Networked Security,' refer to the online edition of the JAPCC Journal at http://www.japcc.de.

Endnotes:

1. Bundeswehr, White Paper 2006 on German Security Policy and the Future of the Bundeswehr. Berlin: Federal Ministry of Defence, 2006 [cited 18 December 2006]. Available from the Internet: http://www.weissbuch.de/download/White_Paper_2006.pdf.
2. NATO, Strategic Vision: The Military Challenge. Mons/Norfolk: SACEUR/SACT, 2004, para 25. Comprehensive Political Guidance endorsed by NATO Heads of State and Government on 29 November 2006, para 17.
3. Heiko Borchert, 'Die unterentwickelte Beziehung: Zur Zusammenarbeit von Wirtschaft und Nachrichtendiensten,' in: Heiko Borchert (editor), 'Verstehen, dass die Welt sich geändert hat,' 2005, pp. 113-121.

NATO AGS - EYES IN THE SKY



Having a complete, timely and accurate ground surveillance picture is crucial for assuring the peace throughout the world.

To face the threats of the 21st Century, NATO forces need a system that provides them with a complete picture of the situation on the ground with wide area, all-weather 24 hours surveillance.

Industry of both sides of the Atlantic is providing NATO with an AGS capability that will support the large variety of military and civil-military missions, such as

CRISIS MANAGEMENT
Peace-Keeping and Peace-Enforcing

HUMANITARIAN MISSIONS
Search & Rescue and Disaster Relief

STABILISATION
Demilitarisation, Force Protection and Nation Building Activities

SECURITY
Border Surveillance and Infrastructure Protection

DEFENCE AGAINST TERRORISM

The NATO AGS mixed fleet of manned and unmanned assets will be a critical enabler for the NATO's Response Force (NRF) and a key building block for NATO Network Enabled Capability (NNEC) Operations. It will also ensure interoperability within the EU Battle-Groups as well as with national and NATO assets. Thus the Alliance and Europe are getting more than just airborne ground surveillance. They are getting eyes in the sky not only for their own joint transatlantic security and defence but also for the security in the world.

A NEW AGE of C4ISR

Copyright: IAI

by Lieutenant Colonel (Reserve) Nir Lapidot, Israeli AF

The New Operational Challenge

When we look at recent conflicts - generally known as asymmetric warfare - there is a clear change from combat in wide-open spaces, against high-signature military targets such as armoured vehicles, extensive military infrastructure, surface to air missile sites and radar systems. Now the battlefield is more likely to be a built-up environment where we conduct urban warfare against low-signature guerrilla forces deeply embedded within the civilian surroundings and who will for example, without hesitation, exploit the innocent civilian population as human shields.

In this asymmetric battlespace the targets are much smaller than ones searched for in the past, they are much more dynamic and their exposure time is minimal, often measured in only seconds. The difficulty we now face is the ability to differentiate between opposing forces and innocent bystanders and this, coupled with high public sensitivity and interest, requires additional sensors and battle management awareness in order to avoid targeting the wrong objective. The urban environment is usually very limited in space, characterized by built-up areas, and so the scale of air power that can be effectively and safely operated in such an arena is relatively minimal.

Technology Development and its Influence on C4ISR Systems[1]

In recent years, several technological advancements have occurred that could significantly influence the design of modern C4ISR systems:

The Proliferation of Unmanned Aircraft. Unmanned systems are capable of producing real-time video imagery and downlinking it to a Ground Control Station (GCS). In the example where the video imagery is presented in the Command and Control (C2) centres (in addition to the GCS), the Unmanned Aircraft System provides the decision makers with 'hands on' involvement in the C4ISR mission execution, almost as if they were part of the Unmanned Aerial Vehicle (UAV) operating team. In some cases, this could include direct control of the sensors mounted on the UAV (when supported by the appropriate C4I system).[2]

Software Development. New software disciplines and standards permit relatively simple interfacing of different C4I systems and sharing of information between them.

Net-Centric Warfare (NCW) Concepts and Technologies. Given the appropriate net-centric connectivity, every accurate sensor tracking a target may actually become another sensor sight, regardless of the geographic location of the sensor, the weapon operators or their organizational structure. In other words, it is now technologically feasible to combine and operate ad-hoc 'mission formation' compounds of joint forces - space, aerial, ground and maritime platforms and systems - as if they were all on the same platform and controlled by the same crew. For example, the Israel Aircraft Industries (IAI) Twister system, as shown in Figure 1, provides a multi-mission joint operations control centre that fully exploits this concept. System features include:

'It is now technologically feasible to combine and operate ad-hoc 'mission formation' compounds of joint forces - space, aerial, ground and maritime platforms ..'

Internet Search Engines. New advanced data mining technologies and information visualization methodologies enable users to find the necessary information immediately in the flood of data that is available on the network.

Communication Networks. New technologies enable the transportation of broadband information such as real-time video imagery, voice, chat, instant messaging and other data through the network. This capability significantly improves the ability to share information rapidly between the field units and the C2 elements.

Weapon Accuracy. As weapon accuracy improves with new technologies in homing and navigation, the sensor accuracy and the C4ISR systems capabilities must comply with the required pinpoint accuracy of the various weapon systems that can be employed.

Effects-Based Warfare. Given an efficient mission management capability, the proliferation of sensors in the battlefield provides the means to conduct a reliable and thorough Battle Damage Assessment for each target attacked taking into account not only the physical damage, but also the battle effects derived from it.

'C4ISR systems also play a complementary part in the decision-making process, where the human factor is often the weak link ...'

3D Visualization. New capabilities in the field of 3D visualization, derived from advanced simulation technologies, enable the enhancement of every 2D situational picture into a much more 3D intuitive display, thereby significantly improving situation awareness.

The Human Factor as a Bottleneck in C2 Procedures

C4ISR systems are designed to help the user clearly understand the situation in their area of interest, to assist in the decision making process, in a relevant time-scale, and ultimately to send unequivocal orders in a suitable format to subordinates or colleagues. C4ISR systems also play a complementary part in the decision-making process, where the human factor is often the weak link, due to the following cognitive and technical limitations:

Dispersed Information. The required information needed for decision-making is spread across several different C4ISR systems that do not always interface. For instance, friendly forces may be presented on one system, whereas opposing forces (targets and threats) may be presented on another. In the majority of cases, relevant complementary information is verbally reported by radio, and the integration of the 'complete' situational awareness picture is an analytical skill undertaken by the decision maker and his team.

Figure 1 - The IAI Twister Multi-Mission Joint Operations Control Center

Figure 2 - IAI Twister Situation Displays

Skill Level. Large numbers of C4ISR systems require a high degree of individual skill in order to operate them optimally and to produce the relevant information.

Information Overload. Information flooding of the decision makers exposes the user to a large quantity of information, well beyond his normal 'information absorption' capacity. Therefore, in some cases, decisions may be made based on a partial, an incomplete or a distorted situational awareness picture.

Command Paralysis. The lack of a complete and continuous situational awareness picture may even cause decision makers, in some instances, to avoid combat actions and/or appropriate decision making orders, in order to avoid committing operational blunders.

Inappropriate Communications Media. Communication between decision makers and field commanders is often indirect and based on an inappropriate media. In many cases messages are delivered based on digital formats or verbal communication through mediators and liaison officers. This method of communication takes time and may cause misunderstandings.

Human Factors Considerations in C4ISR System Design

As a goal, a perfect C4ISR system should present the relevant information simply, and in a way that enables the immediate understanding of the situation, with almost no previous training. Since C4ISR systems are usually designed to serve more than one type of user, it is recommended that the following design principles be applied:

Advanced Visualization Tools. Tools may include 3D situation display, advanced mapping tools, colour codes, etc. An example of information visualization techniques is presented in Figure 2, based on the IAI Twister 2D, 3D and video situation display.

Familiar User Interface. A familiar user interface such as Microsoft Windows, Drag & Drop, mouse operation, etc, simplifies the system operation logic and shortens the training time.

Advanced Filtering Mechanism. Such a mechanism should be used to present only relevant information at each stage since every irrelevant piece of information may cause the user to lose focus. Similarly,

presenting UAV video imagery without applying filtering may divert the attention of users from doing what should be their primary job, to what is being displayed on the more attractive plasma-screen visual displays.

Flexible Definition of Area of Interest. This is an important feature that enables the user to zoom in and out and present the best possible resolution of each situational awareness picture according to the operational scenario. A commander of a joint operation may simultaneously be interested in the air situation picture and the ground picture where his forces are operating in close combat with opposing forces.

Automatic Decision Support Mechanisms. Such mechanisms can display pop up warning flags to the user, indicating a specific event previously defined, which has now occurred. This mechanism will help the user identify events he is supposed to react to, and will recommend the appropriate action for him to take. The decision support mechanism is especially crucial whenever there is high flow of information, when the appearance rate of events is high, or when there is a need for an immediate response from the user.

Advanced Collaboration Tools. These tools enable the passage of messages and orders in suitable formats. This can save time and reduce errors, especially with sensitive procedures such as targeting a weapon platform to a time critical target.

'Understanding C4ISR cognitive limitations is an essential condition for managing modern, dynamic, asymmetric warfare.'

Flexible Configuration Tools. Configuration tools can enable the user to configure the console of the C4ISR system according to his personal preferences and priorities thus creating a familiar work environment.

Information Availability and Accessibility. This frees the user from the common tendency to present everything all the time. Whatever information may be needed, the user will have access to it immediately.

Report Production. Report production is an important feature that helps the user identify trends in combat that cannot be seen by an instant glance at the screens. The user configures reports with information in different formats, which may bring new insights regarding situational awareness, trends and most importantly, any recommended actions that should be taken.

Skill Development Support Tools. Skill in operating a C4ISR system or using it as a decision making tool requires training in suitable scenarios that are often difficult to carry out due to complexity and cost. Therefore, the user's skill should be based on virtual training, which requires an inherent and dynamic simulation capability embedded within the C4ISR system.

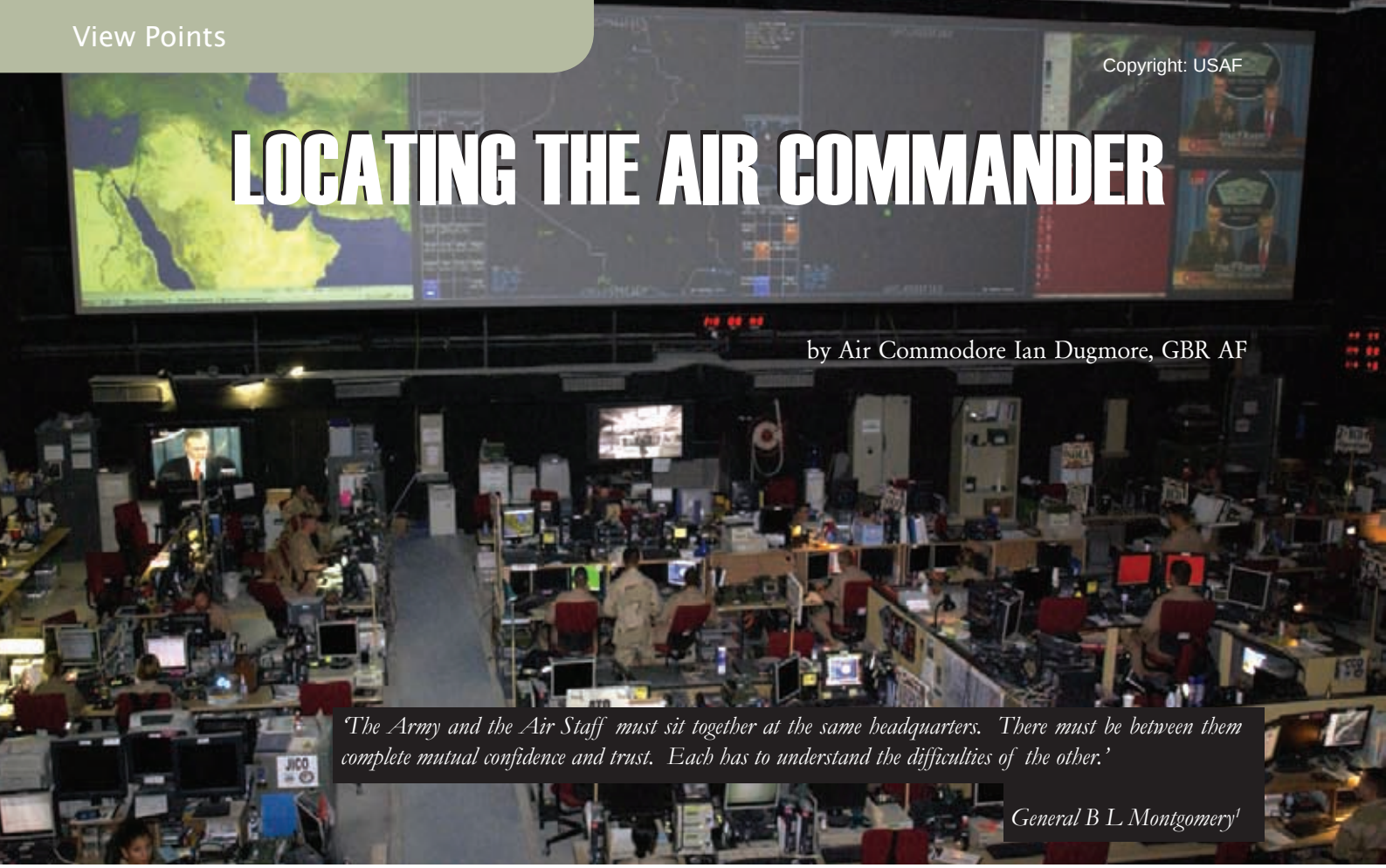
Summary

C4ISR systems are developing as part of a rapidly evolving process, which is dictated by new operational challenges as well as new technological advances and capabilities. The modern C4ISR systems flood the user with information to the extent that the operator may become the bottleneck in the operational process. Understanding C4ISR cognitive limitations is an essential condition for managing modern, dynamic, asymmetric warfare. ■

'C4ISR systems are developing as part of a rapidly evolving process ...'

Endnotes:

1. C4ISR is Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
2. C4I is Command, Control, Communications, Computers, and Intelligence



LOCATING THE AIR COMMANDER

by Air Commodore Ian Dugmore, GBR AF

'The Army and the Air Staff must sit together at the same headquarters. There must be between them complete mutual confidence and trust. Each has to understand the difficulties of the other.'

General B L Montgomery[1]

Air Commodore Ian Dugmore wrote the following article with inputs from JAPCC specialist staff. Air Commodore Dugmore was Assistant Director Transformation in the JAPCC until recently when he took up post as the Director of the US Central Command Air Forces (CENTAF) Combined Air Operations Centre (CAOC) in Al Udied, Qatar. We hope that he will be able to expand upon his experiences in that post in a future issue of the JAPCC Journal.

A journal with the theme of C4ISR must consider Air Command and Control (C2). The air environment is one in which technology and technological developments are key factors in achieving an advantage over adversaries and the delivery of efficient and timely effects. Based on recent air operations, it can be argued that C4ISR developments, the pursuit of decision superiority, and the fixation of air C2 as a process are leading airmen to ignore some fundamental principles of C2, including the location of the air commander. This article considers the responsibilities of the Air Component Commander (ACC) in the C2 of a joint operation and where the ACC might best position himself in order to fulfil those responsibilities.

Airmen have long believed that freedom from friction means that the control of Air Power must be centralised if it is to be concentrated when and where needed. As early as 1916 the German Air Service (*Luftstreikraefte*) controlled not only all aircraft, but also ground based air defence, civil defence and aircraft production. However in the Second World War all the warring nations struggled to some degree with unified air command and control. In the 1930s Germany and the USSR developed the doctrine to collocate air commanders with army corps commanders in order to use Air Power as a key enabler in the operational and tactical level air/land battle. The interwar French Air Force was organised on a regional basis subordinate to the Regional Army Commander. In contrast, the Royal Air Force and the United States Air Force were organised along functional lines, whilst Germany and Russia organised their air forces for manoeuvre warfare. The Royal Air Force was organised in a deliberately different fashion to the Royal Navy and British Army, to emphasise its independence, with strategic bomber and fighter commands, and with 'Army Co-operation' as a side show. Much has been written about the Allies' hard-won lessons to achieve unity of command for air/land operations in the Second World War. According to Peach, and notwithstanding Montgomery's quote above, this was rarely achieved.[2] Peach goes on to argue that after the war the US remained wedded to a functional structure, separating strategic from tactical air/land operations, as did NATO in Europe. For NATO strategic meant nuclear. For example, the Operation DESERT STORM air operation was in the main a

conventional air/land approach rather than the strategic paralysis attack proposed by John Warden's Checkmate team. Airmen continued to struggle, therefore, with the operational level, and organising for and implementing strategy to task or what we would now call effects-based operations in a coherent way across all levels of warfare.

NATO doctrine now requires that the C2 of Air Power should follow the principles of Unity of Command, Centralised Planning and De-centralised Execution, and Strategy to Task organisation.[3] Air Power was a decisive element in both Operations DELIBERATE FORCE and ALLIED FORCE. In both operations the air commander positioned himself close to the tactical action at the CAOC. At the strategic level NATO maintained its cohesion, at the tactical level the operation was a success. However, at the operational level, operational art was challenged to overcome strategic interference, national differences in targeting, and effective planning based on Battle Damage Assessment.[4] Hence NATO doctrine requires that the Combined Joint Forces Air Component Commander (CJFACC) 'functions at the operational level in his role as senior air advisor to the COMCJTF [Commander Combined Joint Task Force] ...' The CJFACC's central involvement in the air apportionment process and his ability to provide highly responsive forces in a crisis dictate that normally his optimum site is collocated with the COMCJTF. Collocation allows the ACC and his staff to influence the COMCJTF and his staff, (and also any Land and Maritime Component Command staffs) and vice versa. In more emotive terms, forward visibility of air planning staffs reminds the other services of the importance of Air Power and, for example, that the air superiority which allows them freedom to manoeuvre, has to be won and maintained. Equally, the nature of air support and the relative detachment of the airman, lend themselves to the accusation that airmen fail to understand the circumstances of the battlefield soldier, the risk that he or she is facing and the real nature of the other components' need for Air.

'The CJFACC's central involvement in the air apportionment process and his ability to provide highly responsive forces in a crisis dictate that normally his optimum site is collocated with the COMCJTF.'

Opening of the new CAOC2 facility at Uedem Germany.

It is suggested that when Air is in a supporting role, only if the ACC lives and works 'cheek by jowl' with the supported commander, accompanies him on his visits into the field and attends the same conferences and meetings, will he fully understand the nature of the operation he is supporting. The ACC's understanding of the air environment, its capabilities and limitations, will open up all manner of opportunities for initiative, innovation and flexibility.

This presents the ACC with a dilemma of divided loyalties and priorities. On the one hand, the ACC needs to fight physically alongside the Joint Force Commander (JFC) (or supported commander).[5] On the other hand, he has a duty to lead his Air Component planning team in order to produce the most effective air plans to accomplish the JFC's stated mission objectives.[6]

The simple answer to this dilemma is, of course, to collocate the whole Air Headquarters (HQ) with the deployed JFC HQ but this concept is generally impracticable due to increased footprint, costs, security and force protection issues. At the height of ALLIED FORCE the 5th Allied Tactical Air Force (5ATAF) CAOC at Vicenza comprised 1400 personnel, planning and conducting 900 sorties a day. It is likely, therefore, that Air HQs and CAOCs will remain geographically separate from the area of operations and increased reliance will be placed upon communications and data transfer between separate HQs. Where, then should the ACC locate for best Air Effect?

Reachback has in part resolved this issue. By positioning the ACC and a small supporting staff forward with the JFC, in theory, the ACC can advise the JFC directly and command his Air HQ indirectly through sophisticated communications means. However, reachback has its limitations. Experience on Exercises STRONG RESOLVE and ALLIED ACTION indicates that today's available bandwidths cannot match Commanders' data transfer requirements. That said, the information exchange requirements of the Commander are not well understood. The ACC does not need full motion video and all of the real time intelligence feeds. He simply needs to be able to communicate the Air Operations Directive each day from his forward position to the rearwards CAOC, and to receive the effects based debrief of what his previous sorties have achieved. There is no need for a massive communications pipe to support this level of data transfer. Reachback must be designed based on Commanders' requirements.

> 'It is vitally important that airmen retain the confidence of the land and maritime components, and that air is not marginalised through the geographical remoteness of its commanders.'

In simple doctrinal terms, the JFC will produce his overall Campaign Plan at the start of a Campaign.[7] During the Campaign he will convene regular Joint Coordination Boards (JCB) to issue Joint Coordination Orders, as well as Joint Targeting Working Groups to define Joint Prioritised Target Lists and so on. The JFC's staff for all these boards will comprise permanent specialists from all active components to inform the JFC's decision making. The output from these boards will be fed to the Component Commanders as directives to accomplish the JFC's stated effects.

This coordination is not as simple as it might seem since services have different battle rhythms, operational tempos, and planning cycles. In land operations combat troops move forward and then slow down to allow for regrouping and re-supplying of the forces. In air operations, the essence is a continuous high tempo for a prolonged timeframe. In Operation ALLIED FORCE, NATO air assets, although dependent on political constraints as well as weather, operated at a high and nearly continuous tempo for over 78 days. Furthermore, air and ground operations' planning cycles are dissimilar. The ACC develops the Air Tasking Order (ATO) that manages all theatre air assets based on a 72 hours time cycle. Although the ACC updates the ATO daily, planning begins 72 hours in advance of each day's operation. Historically, the ATO has left room for operational flexibility during execution, including the ability to respond to immediate and time-sensitive targets. Flexibility occurs through scheduling sorties that have no designated targets. Aircraft take off and report to a specific area or controller for directions. The Land Component Commander develops the operations order (OPORD) in which he defines overall land-force objectives, describes the enemy threat, assigns missions, allocates forces to the various corps, and provides guidance applicable to the immediate battle area. Rarely does this occur 72 hours in advance.

In that context, based on the work of the JCB, the JFC will already

have permanently in place on his planning staff skilled air staff officers who will be capable of providing the specialist air advice needed to inform the JFC's campaign planning when the ACC cannot be present in person. There is a clear need for these individuals to be well known to the ACC and to work closely to his agenda. Similarly, a reliable and trusted Deputy ACC could provide the leadership of the Air Component during absences of the ACC from the Air HQ. On this basis, there must be scope for the ACC to divide his time between the Joint and the Air HQs such that he were physically present at the HQ that had the greater need at the appropriate time. For example, in a 'traditional' conflict like the 1991 Gulf War, the ACC would need to be predominantly beside the JFC during the initial overall campaign planning and then up to the point where sufficient control of the air had been established to permit the manoeuvre of land and maritime forces. Thereafter, he could afford to spend more time in his Air HQ.

In sum, Air Power has had decisive effect in recent operations. However, we must strive to optimise Air C2 arrangements, in order to ensure the best use of Air Power at all levels of warfare. It is vitally important that airmen retain the confidence of the land and maritime components, and that air is not marginalised through the geographical remoteness of its commanders. The marginalisation of the air component will do long-term harm to our standing among the other components and, particularly, the politicians and public. The location of the ACC is a key element in providing the best possible support and in shaping these perceptions. Although Air Power for Operation ALLIED FORCE successfully orchestrated a very large and complicated air war along doctrinal basis and there were no aircrew combat losses in 38,004 sorties, it also demonstrated clearly that Air C2 from a CAOC was not the right answer. However, by delegating his authority both to air planners on the JFC staff and to the Deputy ACC in the Air HQ, and carefully apportioning his time between the JFC HQ and the Air HQ at times when the need for his presence is greatest, the ACC can fulfil both his responsibilities to advise and influence the Joint Plan and to command the Air HQ. ■

Air, land and maritime forces operate in a joint environment.

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Dispelling the Non-Traditional ISR Myth

by Major Matthew Smith, USA AF

Background

In the months leading up to Operation IRAQI FREEDOM (OIF) the United States Air Force (USAF) was looking for additional means to gain greater fidelity on potential targets within southern Iraq. During the unfolding of Operation SOUTHERN FOCUS, the effort by United States Central Command to better map air defences and other sites in the Iraqi southern no-fly zone, it was suggested that Litening pod equipped F-16s could replace U-2 reconnaissance aircraft on days where a low cloud deck could foil the U-2's imagery capability.[1] The use of non-designated Intelligence Surveillance Reconnaissance (ISR) aircraft in this way became known as Non-Traditional ISR or NTISR.

When OIF commenced in March 2003, NTISR took on special importance in the Western Iraq Theatre of Operations. Bombers, as well as fighter aircraft were used to support the Special Operations Forces looking for SCUDs. Aircraft such as F-16s and A-10s equipped with Litening pods along with GR7s, F-15Es, and B-1s were used methodically to search kill boxes and other designated areas for SCUDs, other dynamic targets and time sensitive targets.

NTISR was an efficient use of limited resources at this point, because the traditional ISR platforms were heavily tasked and fighters were available. Therefore, the use of targeting pods and organic air-to-ground radars in a non-traditional manner defined the NTISR role.

The widely recognized shortage of ISTAR (Intelligence Surveillance Target Acquisition Reconnaissance) capabilities across the Alliance demands that we steer towards the use of target pod equipped aircraft as a viable means to enhance our collection plan requirements. We continue to refer to this capability as NTISR; however, this is an old way of thinking. NTISR must be re-designated Pod Intelligence (PODINT), as I believe it should be referred to, and moreover be considered an equal part of ISTAR. Lastly, NATO must embrace this mission by accepting the challenge to upgrade their fleet with next generation technology, supporting peripherals, and proper force development to ensure theatre demands are met and the warfighter is supported to the maximum extent. But first we need to characterise NTISR.

NTISR and ISTAR Defined

There is no definition for NTISR. However, I believe that it can be defined as the employment of a source not normally used for ISR as part of an integrated intelligence collection plan developed at the operational level that is both pre-planned and ad hoc to achieve an operational effect. NTISR could employ many different modes of operation. It could include utilizing a high-resolution, active

electronically scanned array radar, as well as passive collection, such as a radar-warning receiver collecting and recording emissions as a by-product of battlespace presence. NTISR should not be confused with tactical reconnaissance, a traditional ISR mission that uses sensors designed for intelligence collection.

Allied Joint Publication (AJP)-2, Allied Joint Intelligence, Counter Intelligence and Security Doctrine, defines ISTAR as an 'Operations-intelligence activity that integrates and synchronizes the planning and operation of sensors and assets, and the processing, exploitation, targeting and dissemination systems in direct support of current and future operations. ISTAR links systems and sensors to cue manoeuvre and offensive strike assets, with particular emphasis on the timely passage of critical and targeting information....'

All Intelligence sources need to be considered in the application of ISTAR as an integral part of the Intelligence Cycle.[2] Human Intelligence (HUMINT), Psychological Operations, Civil Military Cooperation, troops on the ground, Non-Governmental Organizations, open sources, and media, are all examples of Intelligence collection means that can provide an answer to an intelligence/information requirement.

It could be argued that the AJP-2 definition of ISTAR more than adequately encompasses NTISR. So, why debate about NTISR? Because:

1) NATO lacks ISTAR assets,
2) NATO nations have available fighter assets, and
3) NATO can satisfy ISTAR requirements using fighters equipped for the ISTAR role.

NTISR is not unprecedented within NATO. A solid precedent has been set but there are concerns and considerations, which will be discussed later in this article.

Targeting Pod Utility: Recent Examples

Beginning in March 2003, the OIF mission focused mainly on delivering a kinetic effect against the enemy. In the last three to four years, although the kinetic option is still needed, non-kinetic options have emerged as the best means, in certain instances, of achieving desired effects. The employment of airpower in the ISTAR role increases our situational awareness through better intelligence, thereby improving information operations. Thus, the use of advanced targeting pods has emerged as an important mission set in both Iraq and Afghanistan.

'The employment of airpower in the ISTAR role increases our situational awareness through better intelligence, thereby improving information operations.'

Most recently, the UK has successfully employed its GR4s in a NTISR role and is developing enhanced Tactics, Techniques, and Procedures (TTPs) in its missions to support coalition troops. According to Jane's Defence Weekly, 'US and UK aircraft operating over Iraq are using their electro-optical targeting pods to improve situation awareness for ground troops and to detect insurgent threats. The changing nature of the counter-insurgency campaign has forced coalition air forces in Iraq to evolve their operations and push non-kinetic effects.'[3]

During International Security Assistance Force (ISAF) operations in Afghanistan, 'Dutch and Belgian F-16s agreed to accept "airborne re-roles" for ISTAR missions using their LANTIRN targeting pods, despite the fact that this was not part of their declared ISAF mission. The Dutch F-16s were very useful because of their downlink capability within the PRISM system to an improvised ground station within the TAOC [Tactical Air Operations Centre].'[4] Clearly, NATO could benefit from adapting the role of air assets to support the ISTAR role more fully.

Benefits for NATO

At the Joint ISR Integrated Capability Development Team (JISR-ICDT) meeting at Supreme Headquarters Allied Powers Europe in late January 2007, ISAF's Theatre Collection, Coordination and Intelligence Requirements Management Coordinator reiterated that ISTAR remains a challenge for ISAF.[5] So, what benefit would NATO gain in incorporating the use of targeting pod-equipped aircraft within the traditional ISTAR realm? Firstly, the use of NTISR would maximise NATO's limited air and space ISTAR resources. Likewise, NTISR would enhance our ability to directly support ground forces by delivering the information they require on the battlefield instantaneously. Often, the aircraft utilized in this role would be fighter aircraft with weapons on board, enabling them not only to support the warfighter on the ground non-kinetically but also, if the situation dictated, they could deliver precision weaponry against the target. Then, that same aircraft could immediately provide

a Battle Damage Assessment (BDA) to paint an accurate post-strike picture. Intelligence analysts have done this before, particularly in Operations DELIBERATE FORGE and ALLIED FORCE but in a post-strike manner. However, today these technological capabilities and the ability to make instantaneous and precise BDA are needed. Similarly, this would be an additional method that directly contributes to the Intel Collection Plan using tactical air assets. Even so, these benefits will only be realised if we can overcome certain considerations and challenges.

Considerations and Challenges for NATO

Standards of material, such as targeting pods, sensor viewing technology and personnel training are critical. The latest generation targeting pods predominantly include the Litening III, designed by RAFAEL, and Sniper XR and Pantera targeting pods, both designed by Lockheed Martin. The capabilities of these latest generation pods far exceed those of the LANTIRN and early generation Litening pods still in service with many NATO nations. Capability differences must be considered.

Sensor viewing technology is enhancing the utilization of targeting pod-equipped aircraft in this role. However, this technology varies from nation to nation, much like the pods themselves. The USAF uses the Remotely Operated Video Enhanced Receiver (ROVER), which provides ground troops with pod/camera images from nearby aircraft and UAVs, thus enabling a responsive intelligence preparation of the battlespace. ROVER operators are then able to integrate collected material with other positioning and targeting software. Currently, most NATO nations do not own this capability and, like almost all other ISTAR, NATO operations must rely on nations to bring this to the fight, as is the case in ISAF today.

NATO agencies will undoubtedly also need to address the establishment of training TTPs for ISTAR assets that employ targeting pods. As mentioned earlier, some NATO nations have already had great success. In OIF, the use of targeting pod equipped aircraft proved critical to the success of the operations in the west. However, this was successful because solid TTPs were thought through and designed, personnel were then trained in these procedures extensively, and lastly the rules of engagement and Command and Control structure enabled quick striking of high-priority targets.

> 'In OIF, the use of targeting pod equipped aircraft proved critical to the success of the operations in the west.'

Way Ahead

The first priority is to give this specific capability/mission a name because NTISR is not adequate. Within NATO, we should refer to this valuable capability as PODINT - Pod Intelligence. HUMINT is described as a category of intelligence collected and provided by human sources.[6] PODINT would be described as a category of intelligence collected and provided by aircraft equipped with targeting pods. No longer would this mission be separate or excluded from the Intelligence Collection Plan. Further, as targeting pod technology improves, the ability to provide the exact information required by the commander or warfighter will far exceed today's capabilities.

The next logical step would be the acquisition by NATO nations of the next generation targeting pods and supporting peripherals such as ROVER. If nations do not accept this course of action then the answer may be common funded targeting pods and ROVER-like technology, which is utilized in NATO Response Force exercises and pre-theatre deployment exercises such as BOLD AVENGER. These, however, cannot be a capability which resides solely in theatre. In order to perfect PODINT, it must be practiced in challenging but realistic scenarios resulting in the development of sound TTPs that translate to operational requirements in theatre.

NATO needs to embrace this new capability. The precedent has been set. PODINT, when trained with the right equipment, resulting in sound TTPs, and then practiced as part of a joint exercise, can have enormous benefits. Taking this course of action will positively and directly impact the warfighter in theatre today. ■

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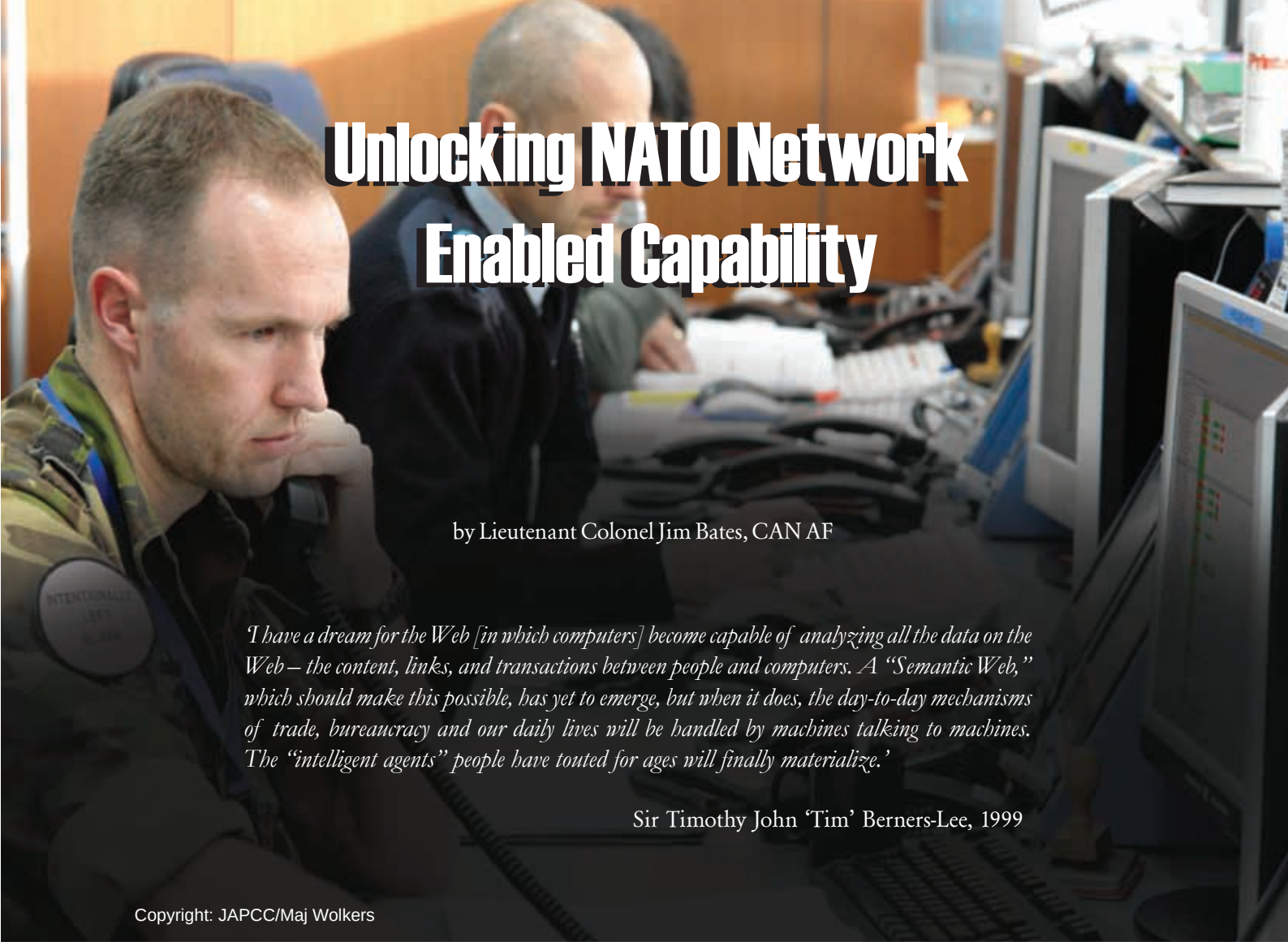

Unlocking NATO Network Enabled Capability

by Lieutenant Colonel Jim Bates, CAN AF

'I have a dream for the Web [in which computers] become capable of analyzing all the data on the Web – the content, links, and transactions between people and computers. A "Semantic Web," which should make this possible, has yet to emerge, but when it does, the day-to-day mechanisms of trade, bureaucracy and our daily lives will be handled by machines talking to machines. The "intelligent agents" people have touted for ages will finally materialize.'

Sir Timothy John 'Tim' Berners-Lee, 1999

Information is Power

We have all heard the adage 'knowledge is power.' Of course to acquire knowledge you need quality information from which to develop that knowledge. So really information is power and the increased access to information is changing the way we manage and conduct our operations.[1] Now imagine the flow of information from literally thousands of sensors in the battlespace; sensors that are located above and below the ground and sea, in the air and space, not to mention cyberspace, are capable of delivering large amounts of information that will flood our capacity and inhibit our ability to understand the situation. Our desire to acquire perfect information in order to provide complete situational awareness can have the opposite effect of overwhelming the decision maker, effectively drowning him/her in information.

To stay afloat and leverage quality information needed to understand our situation requires an approach to interoperability that focuses on data.[2] Information is based on data in some format, which underpins knowledge and understanding. Data interoperability is key to unlocking NATO Network Enabled Capability (NNEC). We have all read the sales pitch that NNEC will deliver the 'seamless exchange of information between users and between applications connected in multiple fashions across domains.'[3] It is sometimes hard to imagine that we will ever achieve seamless information exchange based on the information disorder we have today, but to do so we need to sort out the data first. Achieving seamless information exchange that leads to knowledge sharing depends on data interoperability, and data interoperability depends on adherence to a standard.

Adherence to a standard will move us closer to NNEC and it will move us closer to the Semantic Web that Tim Berners-Lee, the inventor of the World Wide Web, envisioned.

Adherence to Commercial Standards

NATO's Information Management Policy recognizes that a key enabler for sharing information

```
...
OPSUP/ACTTYP:ASW//
AIROP/020200Z/6/IT/FTR/F16/TN:123/
LM:4130N01000E/
CRS:160/SPD:700KPH/ALT:12000FT//
OPSUP/ACTTYP:DCA//
...
```

Figure 1 – Excerpt of an Air Tasking Order in AdatP-3 format.[6]

in a network enabled environment is for all data standards to be compliant with the international commercial standard eXtensible Mark-up Language (XML). 'The data and message standardisation community have conducted major efforts in making tactical data link standards (Link 16, Link 11, etc.) and Message Text Formats (AdatP-3) compliant with XML.'[4] So what does all this mean? Let us step back to make sense of all this and then take a look at where the commercial data standards will take us next.

Interoperable Air Tasking Order

Numerous standards for the electronic exchange of military information have been created within NATO. For example, the Air Tasking Order (ATO) that we generate using the Integrated Command and Control (ICC) system at the Combined Air Operation Centre adheres to the Allied Data Protocol Number 3 (AdatP-3) standard. Part of an ATO message developed in AdatP-3 is illustrated in Figure 1. Because of work done by the standardization community in NATO, the ATO generated by ICC can be machine-read and processed by the Theatre Battle Management Core System, the US equivalent to ICC. Both systems are interoperable at the data level because of adherence to a data standard. '[Standards] are key to interoperability between national and NATO systems.'[5]

Exchanging an ATO message between disparate systems is one thing; however, making it universally readable to any system is a different matter. This is where XML comes in. XML is a metalanguage, or more plainly, it is a language used to make statements about other languages. It is a commercial data standard used to describe other document types, most commonly text documents, though not restricted to that. XML has gained near-universal acceptance throughout Internet usage for such things as search engines. It is a subset of the Standard Generalized Markup Language, commonly used for sharing machine-readable documents in large government and aerospace projects. Mapping our earlier ATO message (in AdatP-3 format) to XML would now look like the message in Figure 2.

'Adherence to a standard will move us closer to NNEC and it will move us closer to the Semantic Web that Tim Berners-Lee, the inventor of the World Wide Web, envisioned.'

In XML, the ATO can be handled using affordable commercial off-the-shelf tools for message generation and processing. 'These tools can also offer new capabilities, e.g. for reporting, search and retrieval, which have been difficult or impossible to implement in traditional military message processing systems.'[8] In XML we can share information across different information systems, particularly those connected via the Internet, including classified information with Public Key Infrastructure encryption on our desktop computer. Successful trials have demonstrated excellent potential and affordability of XML-based message processing systems.[9]

```
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<quantity> 6 </quantity>
<country> IT </country>
<subject_type> FTR </subject_type>
<aircraft_type> F16 </aircraft_type>
<track_number> 123</track_number>
<course> 160 </course>
<speed unit="kph"> 700 </speed>
<altitude unit="feet"> 12000 </altitude>
...
</air_operations>
```

Figure 2 – Excerpt of an Air Tasking Order in XML format.[7]

Another example where XML is proving its worth is in the lab of the Multi-Sensor Aerospace/ Ground Joint ISR Interoperability Coalition (MAJIIC) simulation experiment. Primary sensor products used in MAJIIC include Electro-Optic, Infrared, Synthetic Aperture Radar, Ground Moving Target Indicator, and Electronic Support Measures images and video. These are often huge files that are difficult to move across networks of limited bandwidth. Finding what we need in the maze of information is slow and painful. MAJIIC's solution to this problem is to tag the sensor products with metadata (much like a library filing system) compliant to the XML standard. The metadata includes essential parameters such as information source, description, intended use, and security classification level, so that users can quickly find exactly what they need using search techniques rather than wading through mountains of information.

Compliance to the international commercial XML standard is a key enabler for sharing information in a network enabled environment. The NATO Consultation, Command, and Control (C3) Board has issued the C3 System Interoperability Directive that acknowledges the full benefit of XML and directs NATO programme sponsors of systems in which mark-up languages are defined, to use the NATO XML Registry. The registry, as described by 'NATO Guidance on XML Registration and Namespace Management,'[10] provides sponsors the standard details. In due course we will realize the benefits of better-managed information through adherence to the XML standard.

Semantic Web

So where will commercial standards take us next? Sights are set on the Semantic Web that Tim Berners-Lee talked about in 1999. According to the US Defense Advanced Research Projects Agency and the World Wide Web Consortium, the Web Ontology Language, known as OWL, is the data standard that will move us closer to the Semantic Web.[11] This is supported by a study conducted by the World Bank on enterprise search capabilities that concluded, '... semantic search technology is the best way to access information in the organization.'[12] Within the Semantic Web, information is given explicit meaning making it easier for machines to automatically process and integrate information available on the Web. The idea is to create a methodology to tag and arrange information that allows it to be automatically catalogued and shared to meet an individual user's requirements.[13]

'Web Ontology Language, known as OWL, is the data standard that will move us closer to the Semantic Web.'

OWL became an approved international commercial standard in 2004. OWL is written in XML, so we are on the right track in NATO, although OWL is a much richer language that provides a common way to process the content of web information (instead of displaying it). Designed to be read by computer applications (instead of humans), OWL can be used to explicitly represent the meaning of terms in vocabularies and the relationships between those terms. This representation of terms and their interrelationships is called an ontology as illustrated in the following example: the word 'airport' has an interrelationship to other terms such as name, location, longitude, latitude, elevation, various codes, and so forth. Having the machine recognize terms and interpret relationships, as in the airport example, is the objective of the OWL standard that goes beyond earlier languages, such as XML, in its ability to represent machine interpretable content on the Web. Realizing the Semantic Web through adherence to the XML and OWL standards will take us that much closer to a true network enabled capability.

Conclusion

Adherence to data standards is a key enabler of information sharing in a network enabled environment and it is essential for all standards to be compliant with the international commercial standard XML. The next step on our journey to NNEC is acceptance of the OWL standard that will move us closer to the Semantic Web.

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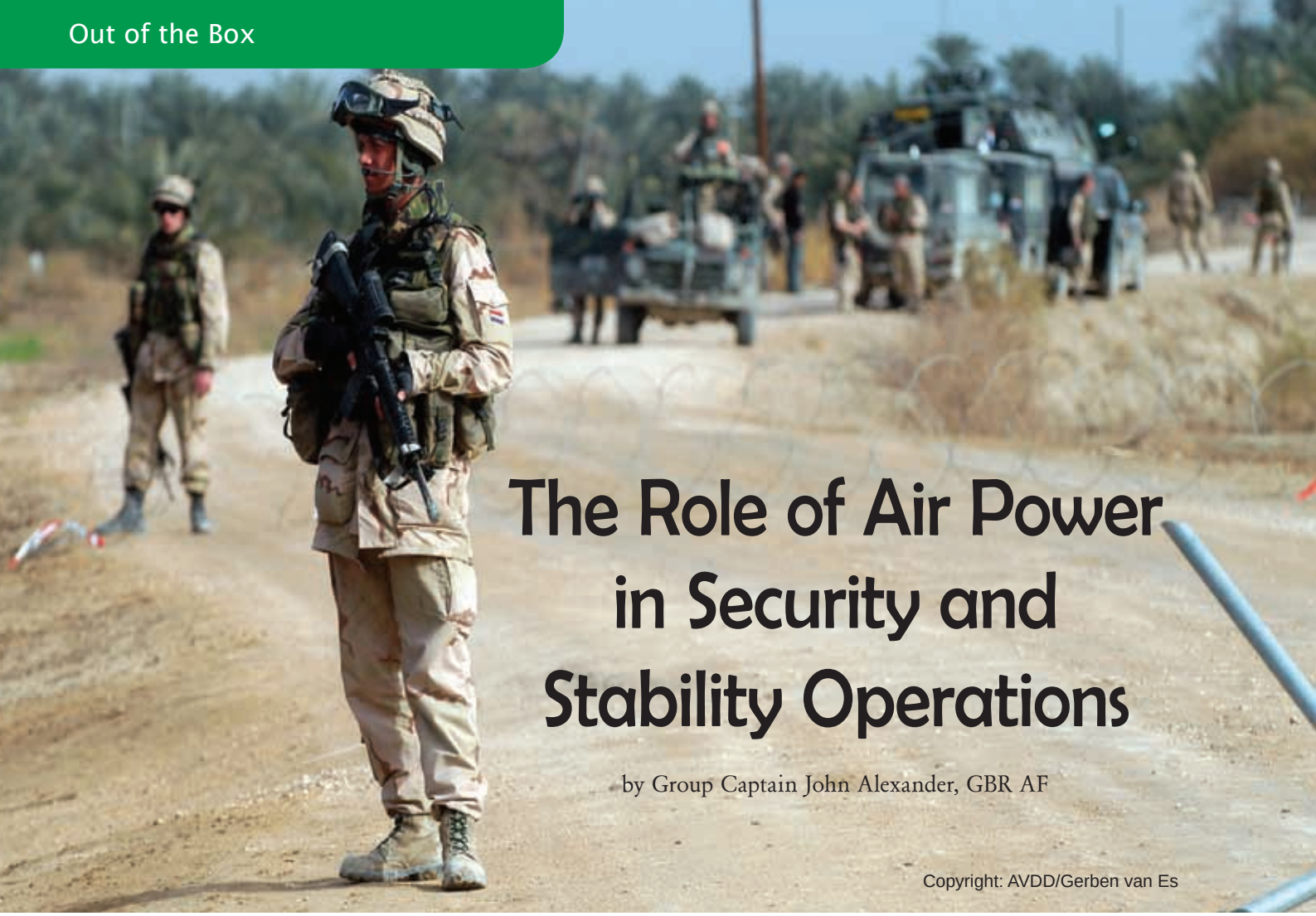

The Role of Air Power in Security and Stability Operations

by Group Captain John Alexander, GBR AF

War no longer exists. So states Rupert Smith in his recent book *The Utility of Force: The Art of Warfare in the Modern World*.[1] He argues the age of 'Interstate Industrial War' is over and has been replaced by 'War Amongst the Peoples.' Smith's contention is that there has been a radical shift in the very paradigm of war. The essential difference is that military force is no longer used to decide political disputes but instead to set the conditions in which the strategic result is achieved – an apt description perhaps of NATO-led security and stability operations in Afghanistan. Yet the use of air power is, in the main, a creation of 'Interstate Industrial War' and has come to epitomise it. At the strategic level during the Second World War air power prevented the invasion of Britain in 1940, the Allied strategic bombing offensive aimed to destroy Germany's capacity to fight, and the air delivery of atomic bombs led directly to Japan's surrender. Air power's importance on the battlefield was exemplified by the coalition Air Land battle of the Gulf War of 1991 and the 'shock and awe' operation against Iraq in 2003. But how does NATO air power adapt to this changing paradigm? And what should be the role of air power in security and stability operations that range from peacekeeping to counterinsurgency or intervention in regional conflict, as shown in Figure 1? The answer to these questions will be the theme of the next edition of the JAPCC Journal and of the Annual JAPCC Conference in Kleve on 16-18 October 2007. By way of introduction this short article aims to consider the nature of 'War Amongst the Peoples' and the challenges faced by Western armed forces adapting to such conflict, and to briefly consider possible roles for air power.

> 'In guerrilla-type wars the revolutionary or insurgent side gains its strength from their leaders, the terrorist or guerrilla and also the people.'

Smith lists certain trends that make up the paradigm of 'War Amongst the People.' The ends for which we fight are changing from hard objectives that decide a political outcome to those of establishing conditions in which the outcome may be decided. Fighting is amongst the people, not on a field of battle, from which civilians

have fled. The conflict may seem timeless and unending. Western generals have to fight to preserve and protect their force, rather than risking all. New uses are found for weapons and organizations designed for industrial war. Finally the sides are non-state comprising some form of multinational grouping against a non-state party or parties.[2] In such guerrilla (literally small war) warfare, the basic tactic is to ambush and raid, to avoid being drawn into action to hold ground – in other words to engage in only tactical operations. The guerrilla depends upon (some of) the people for physical and moral support. Indeed he hides amongst the people. Revolutionaries, like communist movements, have added to these basic tactics to achieve political effect by provoking over-reaction, the use of propaganda, and eroding will. According to Clausewitz, a state's power is derived from the 'remarkable trinity' of the government, the armed forces and the people. In guerrilla-type wars the revolutionary or insurgent side gains its strength from their leaders, the terrorist or guerrilla

'Airpower in the strike role, using precision, can be of great value in counterinsurgency operations...'

and also the people. Both sides are competing for the will of the same people.[3]

Although such small wars were the prevalent form of warfare of the Twentieth Century and are likely to remain so for the foreseeable future, Western armed forces, normally configured to conventional warfare, have in the main struggled to adapt to counterinsurgency operations. Counterinsurgency is fashionable again: more has been written on it in the last four years than in the last four decades. The term 'classical counterinsurgency' has been used to describe the theory of counterrevolutionary warfare developed in response to the so-called wars of national liberation from 1945 to around 1980. The key theorists of 'classic counterinsurgency' – including Galula, Thompson, Kitson, Mao Zedong – have been re-examined. Nagl's *Learning to Eat Soup with a Knife*[4] - the title phrase was used by Lawrence of Arabia to describe the messy and time-consuming nature of defeating insurgents - focuses on the ability of armies to adapt

'... what should be the role of air power in security and stability operations that range from peacekeeping to counterinsurgency or intervention in regional conflict ... ?'

Figure 1. Spectrum of conflict[13]

to counterinsurgency. Nagl argues that the British Army in Malaya was adaptive enough – because of its small war tradition as a colonial police force - to defeat a communist insurgency, while the US Army, with its focus on destroying enemy armies, clung to a failing doctrine of force in Vietnam. Nevertheless it took several years for the British to get it right in Malaya, and the lessons learned were then not applied successfully in Cyprus against EOKA or as early as they could have been in Northern Ireland.[5] Also we must be wary of the changing nature of contemporary insurgencies. They may not be seeking to overthrow the state, they may lack a coherent strategy in the classical sense, and they may be engaged in criminal activity. There may be numerous competing insurgencies in one theatre. The counterinsurgent may have initiated the conflict through invasion and represent the forces of revolutionary change. Insurgent tactics, based on exploiting the propaganda effects of urban bombing, may invalidate some classical tactics and make others, like patrolling, at times counterproductive.[6]

'NATO doctrine, where appropriate, should consider the use of airpower throughout the spectrum of conflict.'

The US Army and Marine Corps has adapted by issuing revised counterinsurgency doctrine, and it is no coincidence that the doctrine's author, Gen Petraeus, has been appointed commander of the Multinational Force in Iraq.[7] Based on lessons learned from previous counterinsurgencies and contemporary operations, he acknowledges that counterinsurgency operations generally have been neglected in American military doctrine and national security policies since the Vietnam War. The manual is designed to reverse that trend, and to 'merge traditional approaches to counterinsurgency with the realities of a new international arena...'[8] Key tenets are that history shows that tactics successful against conventional enemies may fail when countering insurgencies. Militaries trained to win large conventional wars are not automatically prepared to win small, unconventional ones. Manoeuvre and massive firepower may be of limited utility or even counterproductive. In counterinsurgency the side that adapts more quickly usually wins, and therefore successful counterinsurgent forces need to be adaptive learning

A soldier on patrol in the streets of Iraq.

The A-10 is a vital air assest in the counterinsurgency campaign.

organisations. Successful counterinsurgency operations require an understanding of, and close co-ordination with many subjects, including governance, economic development, public adminstration and the rule of law. Counterinsurgency campaigns are long, often against a barbaric enemy and success is difficult to measure.

So how does air power contribute to such operations? It is probably true to say high intensity warfare dominates the study of air power.[9] Some maintain that air forces have been reluctant to address the realities of counterinsurgency war.[10] But Western air forces have a long history of engagement in small wars. Indeed the success of the policy of air control in Iraq helped convince the British Government that the fledgling Royal Air Force should remain in being as an independent force in the 1920s.[11] Many of the lessons identified through the use of air power in previous small wars and counterinsurgencies remain valid today.[12] Airpower in the strike role, using precision, can be of great value in counterinsurgency operations, especially if the enemy concentrates as a force or can be isolated as in Falluja in November 2004. However, civilian casualties will turn the people against the counterinsurgent forces, and will be used by the insurgents for propaganda effect. Airpower has an important role to play in intelligence collection, in conjunction with human intelligence. Airpower can provide intelligence, surveillance and reconnaissance when insurgents operate in remote areas, it can provide tactical overwatch and add to route and convoy protection. Airpower Information Operation capabilities can conduct and support influence operations such as Psychological Operations, Presence, Posture and Profile, Deception and Operations Security. Airlift has long proven its worth to counterinsurgency operations. Airpower's role in Civil-Military Cooperation must be a consideration. Air Command and Control (C2) must be integrated in the joint C2 structure and at all levels in all operations. We must not be tempted to treat security and stability operations differently. The need to develop host nation airpower capabilities must be considered – especially as developing capable air forces will normally take longer that developing land forces. NATO doctrine, where appropriate, should consider the use of airpower throughout the spectrum of conflict. The successful use of low-tech aircraft such as the A-1 Skyraider in Vietnam or the Strikemaster in Dhofar may warrant further investigation. We need to balance a warrior ethos with a less kinetic approach and routinely anticipate the influence effects of our kinetic and non-kinetic activity. Finally we need to be adaptive in a joint and combined context.

This is not to suggest that the choice is between war fighting or peacekeeping. Capabilities based on war fighting will give us the ability to contribute to other types of operation – the reverse is probably not true. But we need to have thought through how to use air power to support security and stability-type operations, within a comprehensive approach using political, economic, humanitarian as well as military lines of operation, in order to support current and foreseeable operations. This then is the theme of the next JAPCC Journal and of the October 2007 JAPCC Conference. ■

Endnotes:

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NEWS

JAPCC Conference 2006

by Colonel Dan Lewandowski, USA AF

The theme of the Joint Air Power Competence Centre (JAPCC) 2006 Conference was *The Transformation of Joint Air and Space Power – The Exploitation of Unmanned Aerospace Capabilities (UAC) in the Alliance*. Over 200 of the most senior air and space power leaders from joint military, industry as well as academic backgrounds attended, drawn from 23 different nations, including Partnership-for-Peace nations.

Key Note Address

During this year's keynote address, the Supreme Allied Commander Transformation, General Lance L. Smith, examined today's complex conflict environment and that which NATO can expect to encounter in the foreseeable future. Traditional threats remain but, from the warfighter's perspective, 9/11 has changed the threats and the requirements. Technology, capabilities and the environment have also moved on. NATO must adapt to meet these challenges and transform to meet both traditional and contemporary types of warfare. New technologies provide increased situational awareness and speed of decision-making. Yet more work will be needed to share knowledge with all allied forces, and to develop interoperability, common tactics, techniques and procedures.

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Panel discussion at the 2006 JAPCC Conference.

Senior Airman Address

The Director of the JAPCC, General William T. Hobbins, described the proliferation of UAC since the turn of the century and detailed the major UAC challenges facing NATO. Firstly, airspace management and, in particular, developing the technology which will enable Unmanned Aerial Vehicles (UAVs) to fly in non-segregated airspace is of paramount importance. Secondly, command and control issues associated with national force offerings deploying to operational theatres, but remaining under national control, remain unresolved. Thirdly, there are complexities in integrating UAC into operations and interoperability within national assets. Finally, the force development, or preparation of Unmanned Aircraft Systems (UAS) and operators to bring them up to full operational capability, represents a new and unique training challenge. General Hobbins closed his remarks by asking conference delegates to rigorously review the JAPCC Flight Plan for UAS, in order to create the best possible plan to maximize the implementation of UAS capabilities in NATO.

Panel Discussions

The first of four expert panels discussed UAC in operations today, including Israeli lessons learned from the 2006 conflict in Lebanon and United States Predator operations in Afghanistan and Iraq. Speakers commented on the increasing capabilities of and threats to UAS, as well as the recent shoot downs of unmanned aircraft.

The second panel comprised three representatives from industry and two from NATO agencies, drawn together to discuss future developments of UAS. They concluded that NATO should plan for possibilities including:

a. The use of UAS as airborne communications relays.
b. 'Geostationary' sensor platforms in the stratosphere.
c. Micro unmanned systems.
d. The ability for UAS to remain airborne for 12-18 months.
e. The increased use of UAS in urban operations.

The third exclusively military panel with members drawn from Euro Control and NATO member nations focused on Joint

UAC perspectives and challenges. All were in agreement that the problems facing the development of UAC are largely common to all three Services and a joint approach to their resolution was likely to be the most productive. The panel discussed challenges ranging from bandwidth and radio frequency allocations to the rules and capabilities needed for UAVs to fly in the same airspace as manned aircraft. A United States representative commented that a national project to create a general concept of operations for UAS was believed to be the first of its kind and could serve as a useful foundation for a NATO concept of UAS operations.

The final panel reviewed existing national roadmaps and the NATO Flight Plan for UAS. Existing roadmaps tend to emphasize the larger UAVs and the missions of reconnaissance, surveillance and target acquisition. However, UAS are part of the much larger command, control, intelligence, surveillance, and reconnaissance architecture, in which there is a need to integrate all such assets into a highly complex and networked environment, which can be accessed by all users.

The JAPCC Conference gathered together senior Air Power personalities to discuss ways in which NATO can take the lead in resolving the challenges facing the development of military UAC now and over the forthcoming 15 years. Thanks to the many inputs received during and after the conference, the JAPCC Flight Plan was successfully published in early 2007.

Lt Gen Schubert, Executive Director JAPCC, opens the new JAPCC Conference Centre.

JAPCC Conference 2007

The JAPCC will hold its third Air and Space Power Conference 16 to 18 October 2007 in Kleve, Germany. The Conference will offer a high-level forum to discuss, 'The Role of Joint Air Power in Expeditionary Security and Stability Operations.' NATO's leading role in ISAF and its continuing role in the Balkans has led the Organisation to adapt itself to the requirements of conducting a range of Non-Article 5 Crisis Response Operations. Based upon the NATO Transformational Goals, the conference will focus on expeditionary capabilities derived from operational requirements in the fields of doctrine, organisation, training, material, leadership development, personnel, facilities and interoperability.

The conference will consider traditional kinetic air power effects used in an unconventional environment and the role of air power in achieving non-kinetic effects such as information operations and civil military cooperation. The conference is a unique opportunity for direct networking with key proponents of the military, academic, commercial and non-governmental domains.

Registration forms are available on the JAPCC homepage, under Events.

JAPCC Air Forum

An Air Forum was held at Kalkar on 22 March 2007 with the aim to develop NATO Force Protection (FP) doctrine for air forces. ISAF operations have identified that there is no NATO doctrine for the protection of airfields. In order to reduce the risk to air operations from Kandahar airfield, and to protect the base which acts as the HQ RC(S), APOD and support unit, the UK has deployed a specialist airfield FP wing HQ and infantry (field) squadron. The UK is now working bilaterally with NATO nations and other ISAF nations in order to develop interoperable doctrine, training and other capabilities.

The development of FP Doctrine for Air Forces is an endorsed JAPCC project for 2007. The JAPCC has, in accordance with AAP-47, proposed to ACT and the JWC that a doctrine gap exists and that this doctrine should be developed as a priority.

The purpose of NATO FP doctrine for air operations is to provide a guidance framework for FP planning and execution

of operations at the tactical level. In so doing, it aims to maximise the effectiveness and integration of force elements and provides a reference for their standardisation, evaluation and training. There has been a long standing requirement for Survive-to-Operate doctrine, as identified by the Military Committee Air Standardisation Board in undertaking Study 7157 – Doctrine on Survive-to-Operate, as preliminary work, prior to commissioning the draft ATP- 3.3.4.8.

As a result of the Air Forum the proposal has been submitted to the Military Committee Air Standardization Board.

NATO Implements Air-to-Air Refuelling Manual

The JAPCC and the USAF Air Mobility Command recently completed a year long cooperative effort to produce a manual that all NATO tanker and receiver crews, and most non-NATO crews, will use worldwide for training and operations. The implementation of the new ATP-56(B) manual has been recognized as the biggest development in the Air-to-Air Refuelling (AAR) world in decades. The previous NATO AAR manual around since the early 1990's was not universally used. This revision has updated the information, streamlined the format, and most importantly reconciled differences between the Alliance manual and US procedures. Thousands of US aircrew members will throw out the old 'dash three' procedures, and start using the new ATP-56(B) for national, bilateral and Alliance operations. Non-NATO AAR nations have also indicated that they will use this manual.

ATP-56(B) includes procedures and specifications of 24 tanker aircraft and more than 75 receiver aircraft types. The new manual also has placeholders for rotary and tilt-rotor operations. The rotary section is already in development, projected to go to the nations for approval in mid 2007.

JAPCC has led the effort to secure support and ratification by the Alliance AAR nations. ATP-56(B) implementation is a key element in the JAPCC Enhancing NATO AAR Interoperability Project which includes work on an Alliance AAR concept, AAR doctrine, equipment STANAGs, and a vision of the future of AAR in the Alliance.

Panel on Air Defence Drafting Groups 1 & 2

The JAPCC hosted the monthly meeting of the Panel on Air Defence (PAD) Drafting Groups 1 and 2 (DG1 & DG2) on 6-8 March 2007. The DGs are currently charged with re-writing the NATO Air Defence Capstone and Policy documents, with the aim to provide overarching direction and guidance for the development of all elements of NATO AD in a Joint approach and the relevant air power aspects. These documents will be presented to the NATO Air Defence Committee (NADC) for approval in October this year. ■

'The implementation of the new ATP-56(B) manual has been recognized as the biggest development in the Air-to-Air Refuelling (AAR) world in decades.'

Biographies

General Tom Hobbins is Director JAPCC Kalkar Germany, Commander, U.S. Air Forces in Europe; Commander, Allied Component Command - Air Ramstein; and Air Component Commander, U.S. European Command, Ramstein Air Base, Germany. Gen Hobbins entered the Air Force in Dec 1969 as a graduate of Officer Training School. He has commanded two tactical fighter wings and a composite air group. He has served as the Director of Plans and Operations for U.S. Forces Japan, Director of Plans and Policy for U.S. Atlantic Command, and Director of Operations for U.S. Air Forces in Europe. As the USAFE Director of Operations, Gen Hobbins was responsible for the planning, beddown and execution of combat forces in Europe for Operation ALLIED FORCE. As 12th Air Force Commander, Gen Hobbins deployed the 12th Air Force's AOC to Southwest Asia as Operations ENDURING FREEDOM and IRAQI FREEDOM's alternate AOC. A command pilot, Gen Hobbins has flown more than 4,275 flying hrs, primarily in fighter aircraft.

Lieutenant General Hans-Joachim Schubert holds a triple-hatted position at Kalkar, Germany as Commander German Air Force Air Operations Command (GAFAOC),CommanderCombined Air Operations Centre 2 and Executive Director Joint Air Power Competence Centre (JAPCC). He joined the German Air Force in 1967 and trained on Ground Based Air Defence systems. He has held various national and international positions: staff officer Air Operations within the Plans and Policy Branch, German MOD; SAM Branch head at HQ 2nd Allied Tactical Air Force (2ATAF); senior instructor for air warfare at the Armed Forces Command and Staff College; Commander SAM HAWK Group 31; Branch Chief Ground Based Air Defence at German Air Force Command; Branch Chief Air Defence Operations, German MOD; Chief of Staff at German Air Force Command; Commander 2nd GE Air Division; deputy Commander, German Air Force Command. He attended the German General Staff Officers' Course and the Joint Warfare Course at the Armed Forces Command and Staff College as well as the Combined Force Air Component Commanders Course at Maxwell Air University. Lt Gen Schubert has been awarded the gold Cross of Honour of the German Armed Forces.

Air Commodore Garfield Porter joined the RAF in 1978. He has served as squadron navigator, flight and squadron Commander on the RAF's Nimrod Maritime Patrol Aircraft. 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 completion of the RAF Staff College course in 1993, he served in the Directorate of Air Plans and Programmes, Ministry of Defence and in doctrine and concepts. He assumed command of RAF Kinloss in Aug 02 and completed an operational tour as the UK Air Component Commander Middle East. He joins the JAPCC as Assistant Director Transformation from his post as Director Air and Space in the UK's Development, Concepts and Doctrine Centre.

Group Captain John Alexander is JAPCC Chief Combat Service Support. 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.

Biographies

General Gerhard W. Back was Commander, Allied Joint Force Command Headquarters Brunssum, until his retirement in March 2007. Gen Back joined the German Air Force in 1965. After commanding the Tactical Air Reconnaissance Wing 51 in Bremgarten, he served as the Chief of Plans and Operations for the Air Force Tactical Command in Cologne, followed by command of the Air Transport Command in Münster. He commanded both the Air Force Tactical Command North and Combined Air Operations Centre 2 while also serving as Director of the Reaction Forces Air Staff. Following his tour as the Chief of Air Staff, Gen Back assumed his appointment as Commander Allied Joint Force Command Brunssum. Gen Back inter alia holds the Cross of the Order of Merit of Federal Republic of Germany (First Class). He has flown more than 3,500 hours, primarily in fighter aircraft.

Air Commodore Ian Dugmore attended the RAF College Cranwell from 1976 to 1977 after which he went on to fly Phantoms and the Tornado. As a Flight Commander on No XV Squadron at RAF Laarbruch he was awarded the Queen's Commendation for Valuable Service in the Air. Following completion of the RAF Staff College in 1990, he was posted to the EuroFighter office in the Ministry of Defence. In 1995 he became the Squadron Commander of No 617 Squadron, 'The Dambusters' and in 1998 he took up an appointment in Saudi Arabia as Commander of British Forces on Operation BOLTON. He was Station Commander at RAF Marham and in April 2001 he moved to Headquarters Strike Command to organize the RAF contribution to operations in Afghanistan and Iraq. Air Commodore Dugmore was Assistant Director Transformation in the JAPCC until March 2007 when he took up post as the Director of the CENTAF CAOC in Al Udied, Qatar.

Colonel Ralph D. Thiele is Director Special Projects at the German Air Force Office in Cologne. He has been directly involved in numerous national and NATO strategic issues while serving as executive officer to the Bundeswehr Vice Chief of Defence Staff, Military Assistant to the Supreme Allied Commander Europe, in the Planning and Policy Staff of the German Minister of Defence, as Chief of Staff NATO Defence College, as Commander of the Bundeswehr Transformation Centre and as Director of Faculty at the Führungsakademie der Bundeswehr.

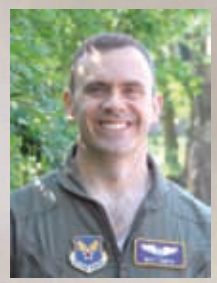
Captain Steve Kenny joined the Royal Navy in 1984 after qualifying in the Merchant Marine as a deck officer. An Above Water Warfare Specialist, he commanded the destroyer HMS NEWCASTLE. Assigned to the US Naval War College, Captain Kenny graduated with highest distinction with an MA in US National Security, Policy and Strategy and stayed on the faculty to lecture post-graduate studies and write on Transformation issues. Appointed to the British Embassy in Washington DC, he was the lead on US transformation, tracking the process and facilitating cooperation between the UK and US. Currently DACOS Intelligence, in Headquaters Supreme Allied Command Transformation, he is charged with driving interoperability, standards and change through best practice.

Doctor Malcolm James Cook is a research psychologist who has worked in industry and in academia on problems related to knowledge management. He started in 1991 by proposing projects on cooperative problems solving and technology assisted problem solving in military environments as part of the UK MOD Pathfinder programme. He has continued that research activity examining command and control teams, developing analytic schemes and performance metrics for command teams, evaluating technology and solutions, as well as developing innovative solutions to Battlespace management issues. He is particularly interested in the difference that expertise and technology familiarity have in influencing outcomes in sensemaking tasks during crises.

Colonel Dan Lewandowski is the JAPCC Combat Air Branch Head. 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

Lieutenant Colonel (Reserve) Nir Lapidot is a Reserve fighter and UAV pilot in the Israeli air force. He gained his wings in 1980 and since then he has flown 4500 hours and served in various command roles. During the last 3 years of his 23 years of military service he was involved in the major development project of IDF, for which he was decorated by the President and Ministry Of Defense with the highest decoration for national security. Nir is graduate of the Air Command and Staff College, USAF Air University year 1991. He holds an M.A in business management from Tel Aviv University. Today he works in IAI (Israeli Aerospace Industry)- Magnet division as a UAV specialist. His responsibility is defining the Twister operational requirements.



Major Matt Smith is a member of the JAPCC C4ISTAR Branch. His operational experience spans three weapon systems and includes combat experience in Operations Allied Force, Enduring Freedom, and Iraqi Freedom. In his most recent operational assignment, he served as the Wing Weapons Officer at the 552 Air Control Wing, Tinker AFB, OK. Major Smith is a senior Air Battle Manager and distinguished graduate of the USAF Weapons School. He is also a graduate of the Joint Advanced Warfighting School where he received a masters degrees in Joint Campaign Planning and Strategy. He arrived in Kalkar in the summer of 2005 and serves as the JAPCC subject matter expert on AWACS.

Major Brett Cusker graduated from Montana State University in 1991 and was commissioned through the Air Force Reserve Officers Training Corps program. Major Cusker attended the U.S. Air Force Squadron Officers' School and Air Command and Staff College in residence. He is a Senior Air Battle Manager and has held Evaluator and Instructor qualifications as a Weapons Controller, Fighter Allocator and Air Surveillance Officer in both AWACS and Air Defense weapons systems. He is currently serving as the NATO Airborne Early Warning and Control, Force Command, Aircrew Training Officer.

Lieutenant Colonel Ralf Korus joined the German Army Air Defence branch in 1978. He graduated from Munich Military University as a business economist and has spent most of his service dealing with air defence at different command levels. In October 2006 he joined JAPCC after serving as the Air Defence Staff Officer at the HQ 1(GE/NL) Corps. Working in the C4ISTAR Branch, he is responsible for airspace control and land related topics.

Lieutenant Colonel Jim Bates joined the Canadian Forces Communications and Electronics Branch in 1986. He commanded telecommunications squadrons at 4 Wing in Cold Lake Alberta and at the Fighter Group/Canadian NORAD Region Headquarters in 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.

Lieutenant Colonel Doctor Michael Romba is Assistant Branch Chief, Air Staff III 1, at the German Ministry of Defence. He holds a Masters Degree in Informatics and received his Doctor of Philosophy in 2000 at the German Armed Forces University in Munich where he had two tours as a Research Assistant from 1994 to 1997 and as commanding officer in charge of a Student Department Group of the Electrical Engineering Department from 2000 to 2001. He served at the GAF Air Materiel Office as Head of 'Displays & Controls' in the Eurofighter Project from 1993 to 1994 and as Analyst/Programmer at the Integrated System Support Centre of NACOSA from 1998 to 2000. Lt Col Dr. Romba attended the 46th General Staff Course at the German Armed Forces Command and Staff College from 2001 to 2003 followed by an assignment as Staff Officer for C2 Conceptual & Future Developments at the German Air Force Office.

Letters to the Editor

C4ISTAR the Human Dimension

The article entitled 'C4ISTAR the Human Dimension,' which appeared in JAPCC Journal Edition 4 implies that the only missing factors in solving NATO's current ISTAR void are lack of leadership, teamwork, enthusiasm and positive attitude. I disagree with the authors and I am convinced of the opposite.

Based on my experience I have to conclude that, contrary to what the authors write in their article, the stage is not set within NATO. NATO currently does not own any ISTAR capability, nor does it ever effectively have operational control (OPCON) of a robust ISTAR capability. That some member-states are developing or already have such a capability available does not mean that NATO has had access to that capability, either in exercise or operational situations. Even within the ISAF operation, no genuine ISTAR is available under NATO OPCON in support of the intelligence collection effort. A wide variety of unmanned aerial vehicles, signals intelligence, tactical reconnaissance, and human intelligence assets are deployed in-theatre but most are retained under national control and both tasking and exploitation are carried out nationally. Finished intelligence products are only provided to NATO indirectly via cumbersome lines of communications. There are similarly significant ISTAR shortfalls in the NATO Response Force 7 and 8 Combined Joint Statement of Requirements. Even if NATO did have OPCON of an ISTAR capability, it does not possess the software, infrastructure or trained personnel to use it effectively.

What NATO can bring to the table is leadership, teamwork, enthusiasm and positive attitude and fortunately this is what I have been experiencing over the last couple of years while dealing with NATO ISTAR. It is the unrelenting commitment of many people at all levels of our organisation who realise that with the modern challenges NATO faces,

> 'It is the unrelenting commitment of many people, who realise that ISTAR is unmistakably one of the most important prerequisites for success.'

ISTAR is unmistakably one of the most important prerequisites for success. Above all, it is the leadership, teamwork, enthusiasm and positive attitude that drive NATO projects such as Alliance Ground Surveillance and Trial Quest 07. It is still the human factor that makes a difference to the ISAF ISTAR challenge. And it will be the dedication of many NATO ISTAR specialists within the SACT led Joint Intelligence Surveillance Reconnaissance Integrated Capability Development Team that will establish the much-needed co-ordination between the vast array of JISR programs, projects and work strands. In short, leadership, teamwork, enthusiasm and positive attitude are currently the only real decisive factors within NATO that drive the ISTAR quest.

Marc P. Exterkate
Lieutenant Colonel Royal Netherlands Air Force
CC-Air HQ Ramstein, Branch Chief A2-IPX (Plans and Requirements)

NATO Support to Pakistan in Response to the Earthquake

An article in Edition 4, 'NATO Support to Pakistan in Response to the Earthquake,' did not mention the contribution of the Hellenic Air Force's C-130 Hercules tactical airlift aircraft. The Hellenic aircraft's participation consisted of the transportation of 32,000 lbs of Hellenic National humanitarian aid (food and clothes) on October 12th, 2005. Also, as part of NRF-5 starting on October 18th, 2005 up to November 25th, 2005, it carried out 61 missions (sorties) and a total of 227 flight hours, airlifting 244,880 lbs of humanitarian aid (food, clothes, tents and medical supplies).

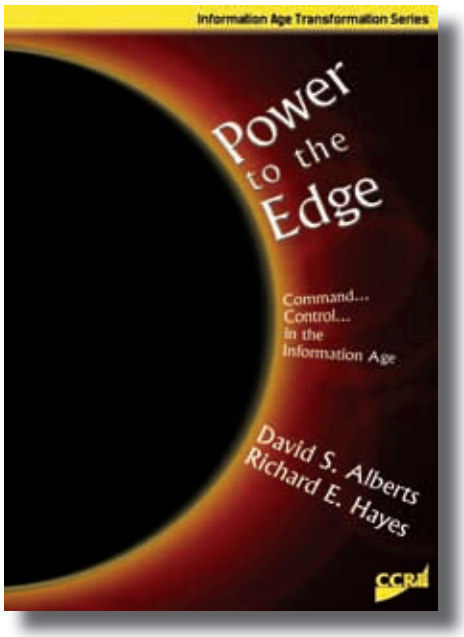
Lieutenant General Triantafyllidis Grigorios
Hellenic National Defence General Staff Evolution Centre

Response from the Editor

The JAPCC was delighted to receive feedback like this on the issues raised in the Journal. As a result, this new section entitled Letters to the Editor has been added. Limitations of space dictate that it will not always be possible to publish letters in full but such letters will be posted on the JAPCC website. The articles in this current edition address the ISTAR issues raised by Lieutenant Colonel Exterkate more fully than the previous edition's 'Out of the Box' article. The JAPCC appreciated Lieutenant General Triantafyllidis Grigorios' comment and is pleased to publish this correction.

Book Review

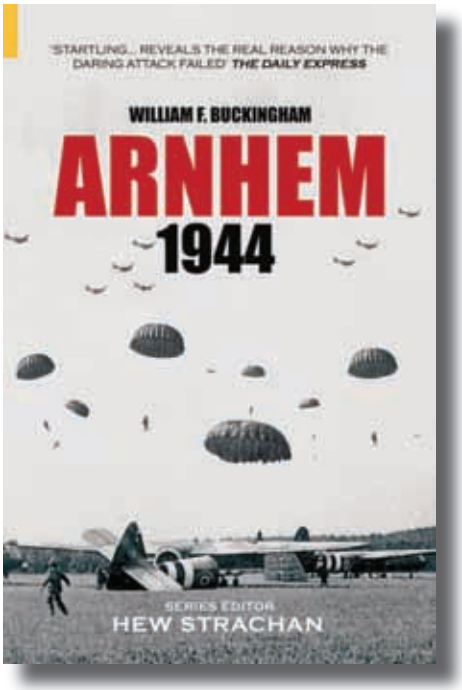
Power to the Edge: Command and Control in the Information Age
By David S. Alberts and Richard E. Hayes
Available free online through the Command and Control Research Program (CCRP) within the Office of the US Assistant Secretary of Defence.



'Agility will prove to be the most important single characteristic of military forces in the 21st Century [the Information Age],' according to Alberts and Hayes who look at principles used in developing policy and making decisions regarding programme investments in C4ISR from a US perspective. Power to the Edge: Command and Control in the Information Age, which builds on previous works in the three-volume Information Age Anthology, emphasises the principle of empowering individuals at the edge of the organization through expanded access to information; in Industrial Age speak we call these individuals the front line workers. In today's battlespace environment, where there are no identifiable lines that separate friend from foe, 'moving power from the centre to the edge and achieving control indirectly, rather than directly,' is seen as a fundamental command and control (C2) tenet due to the speed and complexity of fragmented operations. The thinking about C2 has been shaped by fog and friction, which in turn has advanced ISR efforts to minimize the 'fog of war.' 'Agile C2 is gradually becoming a reality.'

Reviewed by Jim Bates, Lieutenant Colonel, Canadian Forces

Arnhem 1944
By William F. Buckingham
Tempus Publishing
Shroud, Gloucestershire, 2005



Arnhem 1944 describes Operation Market Garden, conducted in September 1944. This ambitious operation was planned as the final push to defeat the German Western Front and to finish WW II by the end of 1944. The intent was to seize the bridges over the Dutch watercourses; relieve the paratroopers within 48 hours and finally to reach Germany. Despite the courage displayed on both sides, Operation Market Garden remains an example of how operational planning can go wrong. Poor intelligence preparation, an underestimation of some German forces, while overestimating German air defences, independent service planning vice joint planning, and insufficient air transport all combined with poor communications resulted in the Allied paratroopers carrying the burden. The author questions whether the paratroopers were in fact capable of conducting division sized attacks, since they had never exercised or trained in this manner. What then can we learn from Operation Market Garden? Planning cannot be separated; it must be joint. Intelligence has to be gathered and assessed correctly. The allocation of resources must be in line with the final goals. Interoperability has to be maintained and forced. Finally, there can be no dispute over who is the supported and supporting commander. A single service cannot win a modern war: it must follow a joint approach.

Reviewed by Ralf Korus, Lieutenant Colonel, German Army

ALENIA AERONAUTICA: 21ST CENTURY TECHNOLOGIES FOR UAVS

Unmanned air vehicles are one of the main aerospace developments for the future, for both combat (UCAV) and reconnaissance (URAV) applications. Alenia is deeply involved in this field both through internal activities and with the participation to leading European programmes. With its Sky-X unmanned aircraft technology demonstrator, the first in its class flown in Europe, Alenia Aeronautica is gathering unprecedented know-how to consolidate dual use technologies in the field and is a key partner in the European Neuron program to design, build and test the first full scale European UCAV demonstrator. Alenia Aeronautica: committed to delivering innovative solutions.

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