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The Journal of the JAPCC

Edition 8

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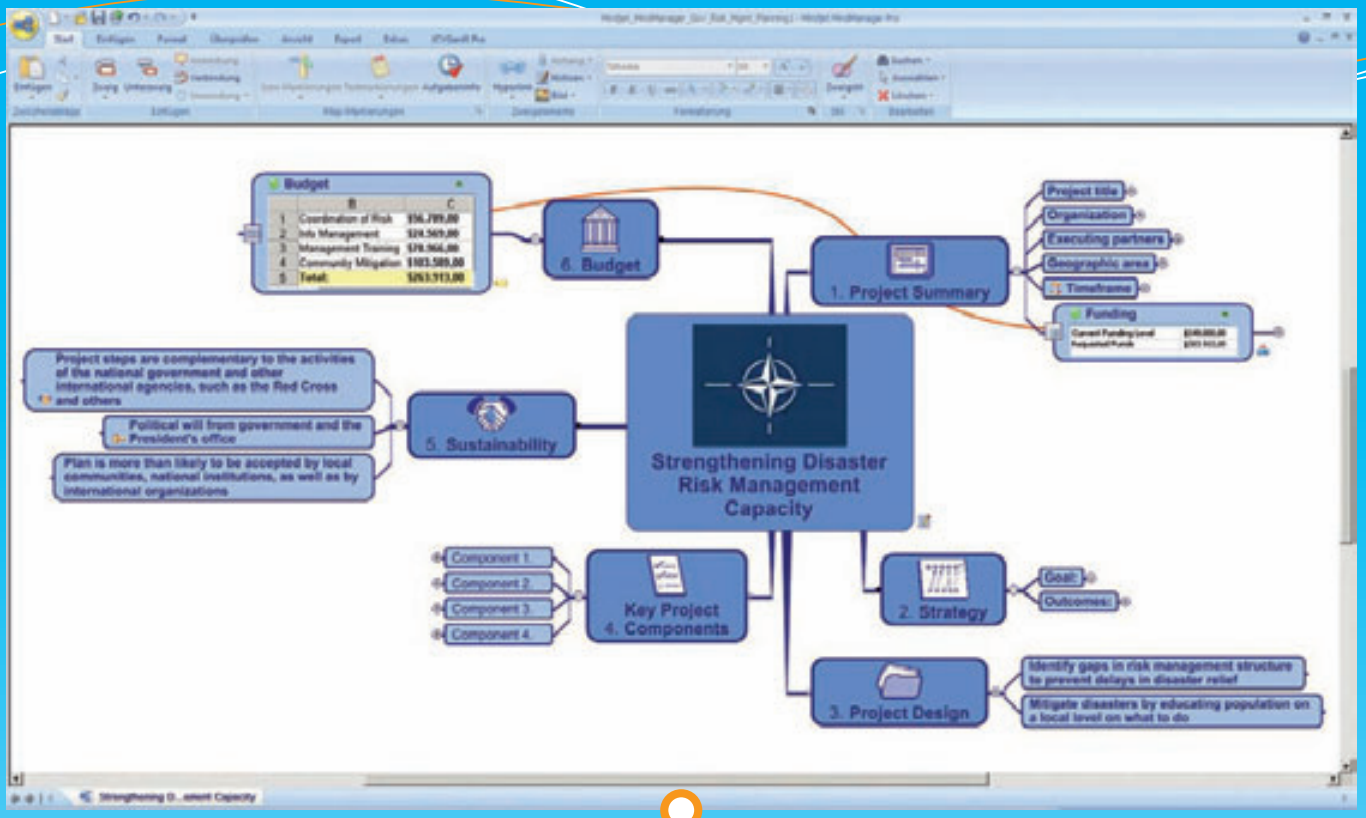

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Editorial

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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 articles@japcc.de

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Air Power is the most difficult of military force to measure or even to express in precise terms. The problem is compounded by the fact that aviation tends to attract adventurous souls, physically adept, mentally alert and pragmatically rather than philosophically inclined.

Sir Winston Churchill – 1948.

When we declared 'Open Season' for this edition of the Journal, I was mindful that the words above might come back to haunt us. Indeed, the wide range of articles in this 8th Edition of the JAPCC Journal clearly emphasises that the optimal exploitation of Air (and Space) Power continues to be a profound challenge. That said, there has been no shortage of Air-minded colleagues, who are willing to pick up the gauntlet and describe how the future of our environment might unfurl. In the event, we have received more articles than ever and, even after expanding the size of the Journal, we have had to push some submissions back to the next edition.

So on this occasion, Sir Winston was only half right!

Interestingly, ISTAR continues to be at the forefront of Air Power thinking and has resulted in 3 different, but complementary, articles on a subject where the way forward in a network enabled world is still emerging. Elsewhere, we are pleased to include Special Ops, Maritime and Logistical perspectives, as well as an intriguing insight into the potential that Stratospheric Air Platforms might offer. I would also make especial mention of Lt Gen Watt's candid interview on the future of the Canadian Air Force, which once again adds to our understanding of the Air Chief perspective.

Since the last edition, we have also been busy at the JAPCC and have taken this opportunity to provide you with abridged versions of some of our products, specifically: NATO Future Joint Air & Space Power, Air Power and Countering Irregular Warfare and the JAPCC NATO Space Operations Assessment. All these papers represent our view rather than an Alliance position and are intentionally geared to foster debate. To that end, we would genuinely welcome your comments in helping us take our thoughts forward.

Finally, I would commend to you the 'Out of the Box' article on Cyberspace Warfare. You may, or may not, agree that the activity belongs within the Air & Space Power domain, but either way I'm sure you will agree that it is an important topic, which will increasingly demand a place at the Warfighter's table! It also nicely heralds our theme for the coming year, including the next Journal and our 2009 Conference: NATO at 60 – Future Challenges for Air and Space Power.

Garfield Porter
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The Journal of the JAPCC

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The Journal of the JAPCC is the professional publication of NATO's Joint Air Power Competence Centre aiming to serve as a forum for the presentation and stimulation of innovative thinking on NATO Air Power related issues such as doctrine, strategy, force structure and readiness The views and opinions expressed or implied in *The Journal of the JAPCC* are those of the authors and should not be construed as carrying the official sanction of NATO

Transformation & Capabilities

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Time for Action!

JAPCC's NATO Space Operations Assessment

General Roger Brady, USAF
Director of the JAPCC

Major Tom Single, USAF
JAPCC Space SME

Kabul, Afghanistan…early evening. A soldier, in one of the Provincial Reconstruction Teams, has spent many weeks on the ground building relationships in the local village and has picked up a piece of intelligence. A local tribal leader has informed him that a sought after, high-value individual will hold a meeting at a nearby farmhouse tomorrow. He passes on this small piece of intelligence and coalition teams move decisively into action. The information is confirmed by a second source. A Special Forces unit, with helicopter and air support, is available but they are new to the area of operations. The recently arrived commander running the ISAF Joint Operations Centre watches his coalition warfighters working in a well practiced routine. He notices an American nearby and asks what his job is. The officer responds that he is the Space Liaison Officer assigned to the Air Coordination Element.

'NATO's own approach to Space is piecemeal, a bottom-up effort with no overarching structure or direction.'

Great! Then he asks: 'we've got to move on this immediately, how can Space help me right now?'

In JAPCC Journal Edition 6, the article 'Space Support to Security and Stability Operations' described the space capabilities that can be used for great effect in the scenario above. However, in Edition 7, the article 'What is NATO's Position on Space?' highlighted some of the challenges facing NATO with regard to Space. Realizing the importance of Space to NATO, Allied Command Transformation (ACT) requested support from the JAPCC in late 2007 to assess NATO's space operations. By the end of May 2008, the JAPCC delivered the NATO Space Operations Assessment to ACT. This is NATO's call to action to address Space.

NATO Space Ops Assessment

The NATO Space Operations Assessment focuses our attention on the importance of space to current operations and to transformational ambitions. Its aim is to inform and influence commanders and policy makers about NATO's vital space interests, about capability gaps, and to offer recommendations to address those gaps.

There are 14 member nations operating satellites and pursuing their own national space priorities, sometimes in parallel, but often on divergent paths. NATO's approach to Space is piecemeal, a bottom-up effort with no overarching structure or direction.

NATO has an opportunity to shape the Alliance's future space capabilities and the Space Operations Assessment offers a basis to guide the way forward.

Launch of the first NATO communications satellite, 20 March 1970, at Cape Kennedy.

The Assessment includes valuable input from 33 stakeholder organizations that participated in a Space Workshop hosted by the JAPCC in April 2008, thereby creating momentum for a NATO space initiative.

The NATO Space Operations Assessment identifies 21 gaps and associated recommendations on key areas such as space governance, force development, training, concept development and experimentation, standards and interoperability. There are short and long-term recommendations, but all are designed to strengthen NATO's capability as an expeditionary and network-enabled force.

Space is 'Ordinary'

Many Alliance nations are operating their own satellites and ALL of those nations rely strategically, militarily and commercially upon information and services from Space.

NATO began flying its own communication satellites in 1970…38 years ago! Once available to only a few nations, those "highly classified state secret" capabilities and products are now widely available from commercial space service companies. Space has become quite ordinary and it's time to break the paradigm that space capabilities are veiled in secrecy, are strategic in nature or are too politically sensitive to discuss in an Alliance forum. The Nations have not asked NATO to address Space, but as responsible military leaders, we need to recognize that Space is just another mission area and it's long past time to develop Space Power. Space-based capabilities and services are so important to today's operations that NATO cannot afford not to address this mission area.

Space is a Critical Enabler

Space is vital to expeditionary and out of area operations. In performing its core missions, NATO's operations are entirely dependent on space, possibly even non-functional without space support, yet NATO has no holistic approach to space operations. Globalization demands space capability as a requisite enabler of NATO's transformation as an expeditionary, network-enabled force.

Space provides those joint enabling capabilities that we've become reliant upon for global situational awareness, decision superiority and precision engagement. Consequently, the US military often refers to Operation Desert Storm in 1991 as the 'first Space war' because almost every aspect of operations was dependent to some extent on support from space-based systems. Today, NATO is faced with its 'first Space war' in Afghanistan. We must focus on how to use space assets to enhance our capability and to generate desired effects. This requires a well thought out approach.

Deliberate Planning & Governance

Defence systems take many years to develop, test and field. Our warfighters need space capabilities to achieve effects and we need to deliver space systems and services to meet their needs. As such, NATO must assure access to, and make better use of, the space domain.

To date, there is little governance addressing the Space domain. There is no holistic approach for Space; systems are addressed in functional areas, even though most space systems support more than one mission or functional area. Therefore, a NATO Space Policy is very much needed to define the political direction for the use of Space capabilities by the Alliance.

Figure 1. Holistic approach to Space Capabilities and Effects.

> 'NATO's operations are entirely dependent on space, possibly even non-functional without space support, yet NATO has no holistic approach to space operations.'

From this starting point, a Military Space Strategy can be developed. These strategic level documents are needed to develop sound concepts, plans and space system requirements. Governance and well thought out deliberate planning will ensure for years to come that the Alliance has the Space capabilities needed to meet its mission objectives. Fig 1 (above) depicts such an approach for delivering space-based capabilities and effects to the warfighter.

Need for Cooperation

No nation can go it alone. There are more requirements for Space capabilities than resources. However, there are already a lot of space capabilities available to NATO. Nations, as well as commercial space service companies, have the existing capability to provide much of what NATO may need for communications, ISR and other mission areas. Moreover, there are emerging mission areas, such as the need to assure and protect our space capabilities, the need to improve space situational awareness and the need to begin conducting coalition space operations. Furthermore, the development of small satellite technology offers the opportunity for many more nations to become involved in the space business.

In order to best utilize existing capabilities, to reduce duplication of effort on future systems and to ensure interoperability of space services and products, there must be increased cooperation on Space between the Nations, between NATO and other organizations, and amongst NATO organizations.

NATO must engage with the nations, EU, European Space Agency and the European Defence Agency to define security and defence requirements for existing and planned space systems.

The Road Ahead

Although the development of a NATO Space Policy is considered critical, it would be a long-term effort. There are, however, a few immediate actions that would pay great dividends for NATO transformation. In particular, quick wins could be realized by putting more emphasis on space in exercises and incorporating space expertise into the NATO Command Structure.

NATO must have an appropriate number of Space specialists assigned to its Command Structure organizations. This should include the Strategic Command HQs, the Joint Force Commands, and the Joint Warfare Centre as a minimum. There should also be a strategic level effort to champion the development of Space Power by advocating a Space Policy and Strategy. Additionally, NATO nations should immediately begin incorporating space activities into national training and exercises.

In the future, a NATO Space Operations Coordination Centre may be needed to integrate NATO and national space capabilities and to provide a single point of contact for NATO space matters, to include support to the warfighter in the field. NATO must also determine its requirements for space situational awareness and its need to protect space capabilities and services. Oversight is also required for space research and technology.

'Today, NATO is faced with its first Space war...'

Today, NATO is faced with its 'first Space war'; there are consequences and risks if NATO does not begin to address space operations. Historically, space systems have been politically sensitive and considered a national strategic asset, but times are changing. Space is not the mystery it once was and is now affordable to many NATO nations. Most importantly, lest we forget, NATO has airmen, soldiers and sailors conducting combat operations around the world in remote, austere conditions. Military planners and operators are desperate for more space capabilities to achieve desired effects, but do not have the programmes, doctrine and training required.

As the Alliance has developed Land, Sea and Air Power, it is long past time to develop Space Power. The JAPCC has targeted its crosshairs on Space with the NATO Space Operations Assessment. NATO…it's now time for action!

'Space assets are integrated into the fight and are poised to further assist.' Lt Col Gary Hawthorne, USAF, HQ ISAF Space LNO.

Very High Altitude Reconnaissance

No longer Science Fiction

By Carl-Otto Schartenberg, COS-Systems

Until quite recently, any thought of using High Altitude Airships (HAA) as surveillance platforms was probably dismissed as science fiction. In the last few years, a range of novel technological solutions, combined with a renewed determination to address the challenges that remain, has meant that HAA may now be a serious alternative to the satellite.

An unmanned stratospheric sensor and relay platform (SSRP) in a geostationary position could provide a multi-mission capability, which cannot be achieved by other platforms. Such a SSRP would operate autonomously at an altitude of around 20 km, it would have an endurance of 12 to 18 months and it would be capable of carrying and operating a user defined mix of different sensors & effectors (payload > 5 tonnes). The SSRP could also be used as a combat net radio relay station, as a replacement for satellite radio and as a Link 16 node for tactical data links.

Platform Design Challenges

Today's conventional airship technology dates back to the last century, but the carrier gas management of the modern HAA is much more complex and requires a different design due to the very great lift changes between sea level and mission altitude.

The effectiveness of the lift (buoyancy) reduces as the density of the ambient air decreases with increasing altitude. Stratospheric platforms operate at altitudes between 17 and 21 km. While the displaced air at sea level has a weight of 1.1-1.4 kg per m^3, at an altitude of 20 km the weight is reduced to 0.1 kg per m^3, i.e. to a level of just 8 per cent. This requires enormous construction sizes (a length of 250 m is not uncommon) and a completely different flight concept to that of conventional, low altitude airships. In order to achieve constant lift at all altitudes, the carrier gas must be capable of expanding with increasing altitude.

In traditional airships, gas bags (ballonets) are placed inside the envelope. During climb, the heavy air is deflated from the ballonets and replaced by the expanding lighter carrier gas.

This pressure regulation concept is not practical for stratospheric platforms, since 90 per cent of the airship body would need to be filled with ballast gas at lift-off. Consequently, a detailed system analysis, conducted by COS-Systems for the German Federal Ministry of Defence (Air Staff II 3), led to a pressure regulation concept with a completely new design.

Most concepts from the last 20 years have been based on 'Lighter than Air' technology, using the lifting gas (hydrogen or helium) not only for buoyancy but also for form stabilization by pressurizing the hull. However, the system architecture design of a SSRP is largely determined by the impact of environmental conditions on propulsion requirements.

'Altogether these UAS capabilities could boost Intelligence, Surveillance & Reconnaissance (ISR) to an extent where the SSRP itself will become a development platform for worldwide research leading to further technological progress far exceeding the capabilities available today.'

Since the wind speed is raised to the third power in the calculation of propulsion requirements, this determines the construction size required for accommodating a user-defined, pre-specified payload. Therefore, it is necessary to examine the wind speed in relation to geographic latitude and season.

The evaluation of weather data has shown that SSRP operations are only practicable in geographic latitudes of less than 60° due to heavy storms and long arctic nights in the polar regions. The maximum wind speed, which must be continuously compensated for station keeping, is 17 m/s. Station keeping will be achieved by the use of electrically powered motors. Fortunately, during the past 15 years, there has been considerable progress in the field of electric propulsion.

The overall system is determined significantly by the performance parameters of the energy storage device because the required on-station time can only be provided by solar-electrical energy supply systems. Recent improvements in the development of Lithium batteries have enabled them to provide energy storage systems with the required performance characteristics and simplified handling.

The propulsion system must facilitate effectiveness throughout the full density spectrum of the atmosphere, near ground as well as in the stratosphere. It is possible to adapt the propulsive power to ground pressure (8.5 times the electric performance of the propulsion system) without significantly affecting the overall size of the SSRP by extending the surface for solar cells. During the stratospheric flight phase, Telemetry, Tracking & Command is similar to satellite control.

The Solution A Hybrid Concept

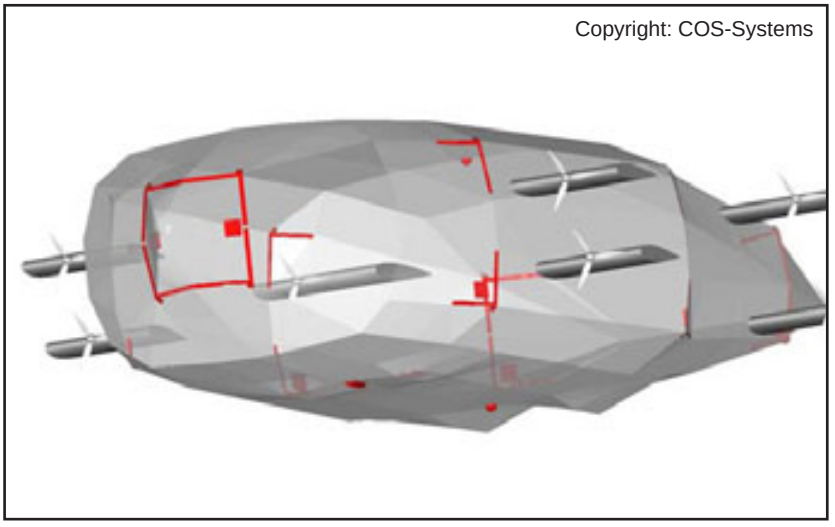
System analysis resulted in a hybrid concept combining aerostatic buoyancy with aerodynamic lift as a 'Heavier than Air' Platform unlike an airship. The separation of gas cells and envelope allows a non-pressurized system design with a stiff lifting body formed into

a rigid diamond shape structure, fixed wings, and multiple propulsion motors. This concept also facilitates the integration of envelope (outer hull) and thin-film solar cells because the gas cells do not need to be penetrated by hundreds of electrical cables, which would result in leakage problems within a pressurized system. The overall concept was analyzed in great detail and evaluated via a 6 degree of freedom Simulation (calculating forces and moments over 3 axes) to prove the physical flight behavior throughout the full mission scenario, including controls that were implemented in accordance with NATO Standards (STANAG 4586) via High Level Architecture (HLA) network interfaces.

Payload Design Parameters

Payload integration is a major design driver for the development of the body geometry and demanded a prismatic structure. Consequently, a Multi-Radar integration concept was developed resulting in 88 phased array antennas of which 24 antennas are transmitting, while 64 antennas are receiving, thereby providing 360° coverage out to a range of 1000 km.

Besides airspace surveillance, the radar system serves the need for Ground Moving Target Indication (GMTI) and Change Detection by means of a Synthetic Aperture Radar (SAR), located underneath the SSRP. Altogether these UAS capabilities could boost Intelligence, Surveillance & Reconnaissance (ISR) to an extent where the SSRP itself will become a development platform for worldwide research leading to further technological progress far exceeding the capabilities available today.



SSRP Multi-Radar Integration Concept with 88 phased array antennas.

Persistent Surveillance

Continuous day and night operations are based on regenerative technologies, self propellant systems, and autonomous mode including auto calibration capability and remote software support. The question remains what to do with all the data released from the SSRP. Autonomous on board data processing requires new concepts.

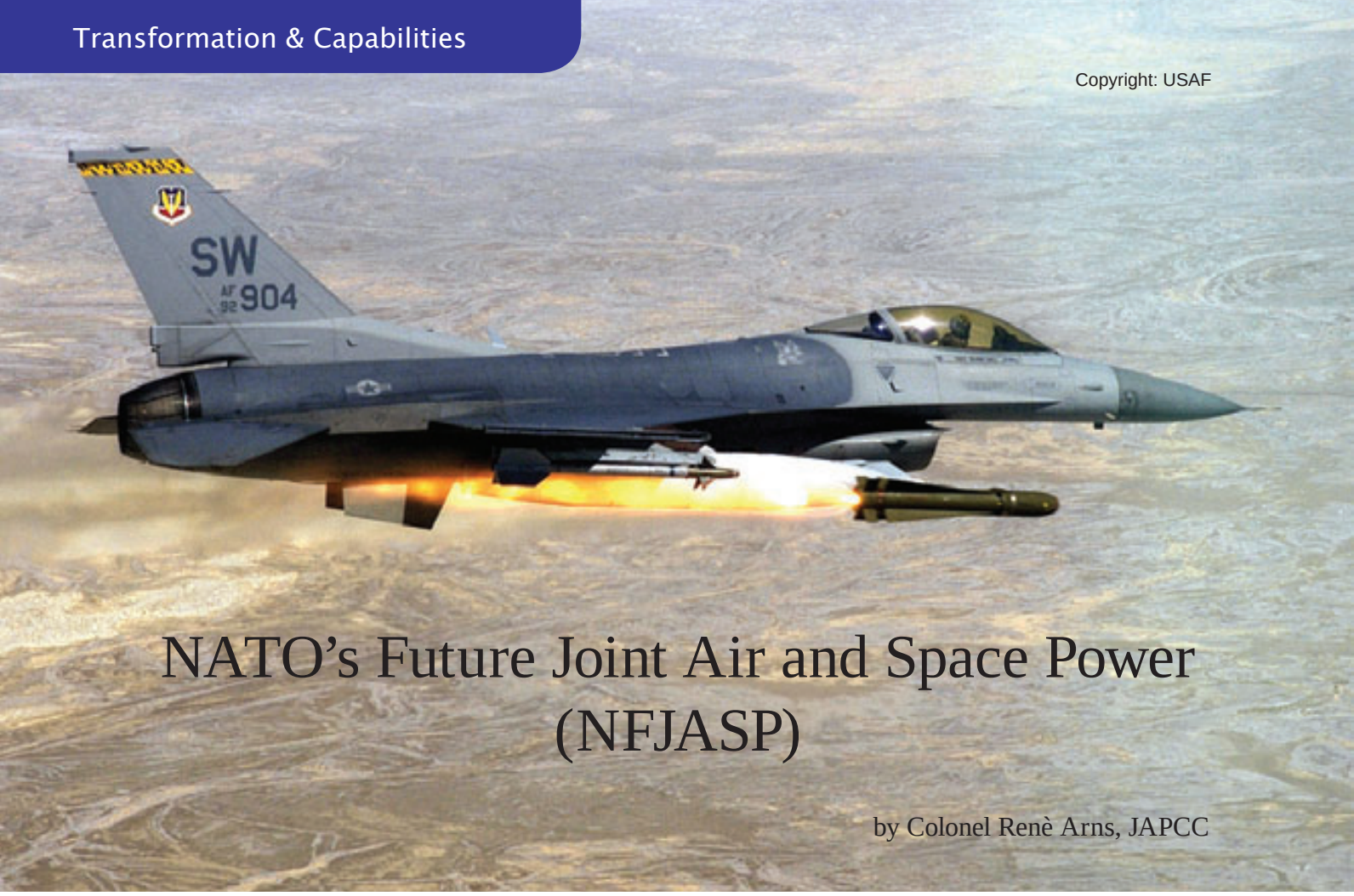
> '...low operating costs [of SSRPs] provide the opportunity to make an efficient and effective contribution to Joint and Combined operations, as well as reducing the demands on valuable satellites and conventional platforms.'

Today's data processing, especially SAR processing, is done at the ground stations for good reasons. The processing depends on many parameters, which are achieved through extended test phases.

Much of today's radar operator's intelligence has to be cast into algorithms capable of providing equally qualified results directly to the commanders. Any change detection or movement on the ground or in Air & Space has to be identified as a particular alert case. Apart from Communications and Data Relay, Surveillance and Battle Management, the SSRP could be the ideal platform to support Precise Target Location and Designation (SAR-GMTI), Digital Mapping, and Early Warning (EW). Furthermore, onboard Optronic EW Sensors could detect the launch of a tactical Ballistic Missile (TBM) at a distance of 1000 km.

Conclusion

The SSRP could provide operational commanders with a high-end, persistent ISR and communication relay platform. Moreover, low operating costs should provide the opportunity to make an efficient and effective contribution to Joint and Combined operations, as well as reducing the demands on valuable satellites and conventional platforms. Without doubt, there is a debate to be had in this exciting developmental area. ■



NATO's Future Joint Air and Space Power (NFJASP)

by Colonel Renè Arns, JAPCC

The core mission of the JAPCC is to enable NATO's effective and efficient use of Joint Air and Space (A&S) Power. In this endeavour, we recently completed a long term study into the likely future of A&S Power over the forthcoming 20 years. This article summarises that study and focuses particularly on a proposed new model for A&S Command, as well as highlighting steps which should be taken now to embrace emerging A&S technologies.

The Future Joint Military Environment

Multiple political, economic, demographic, and technological factors combine to create the complex Strategic Environment in which military forces operate today and will continue to be challenged for the foreseeable future. The resolution of conflict within such an environment will require military forces to coordinate their actions with those of interwoven political, diplomatic, economic and civil influencers.[1] This 'Comprehensive Approach' should determine the objectives that need to be accomplished by Joint Military Forces to help realise the desired end state. Joint Military Forces of the future must be capable of successfully prosecuting a broad spectrum of operations from major force on force territorial conflict under Article V of the NATO Charter to Peace Support Operations (PSO) and Humanitarian Relief. These operations will include prevention measures to pre-empt a potential crisis or to coerce or deter a potential adversary, engagement operations, including the application of armed force as necessary, and rehabilitation operations following the failure of any state or any form of conflict when it is necessary to re-establish stable conditions. (See Figure 1.)

'...future military operations will be conditioned by ongoing Transformation initiatives, which place particular emphasis on the ability to conduct Expeditionary Operations...'

As well as changes to the security environment, future military operations will be conditioned by ongoing transformation initiatives, which place particular emphasis on the ability to conduct Expeditionary Operations (EO) in a comprehensive, effects-based manner often within a complex and amorphous[2] battlespace, whilst optimising the benefits that network enabling has to offer.

A&S Contribution to Future Operations

A&S operations can be categorised according to the amount of coordination required with the other environments. In Joint Enabling Operations,[3] A&S actions need to be coordinated with the other components in order to support them to accomplish tasks specific to their respective environments. Conversely; in Control of the Air and, possibly to a lesser extent, Control of Space operations, A&S commanders are fighting for control of their own environment and the onus shifts on to Land and Maritime to co-ordinate with and support Air in accomplishing this fundamental task. Finally, in Deep Persistent Operations (DPO) A&S will be directly prosecuting the Joint Commander's Deep Battle and may be operating out of sight and reach of the other components; therefore, in DPO minimum coordination between A&S and the other components is necessary. In sum, A&S activities span supporting through supported towards almost independent actions.

Joint Enabling Operations. A&S Power's capabilities in Joint Operations have evolved significantly over the last 2 decades. For example, new A&S-based sensors and networks have the capability to provide a picture of the battlefield that would have been science fiction 20 years ago; today's precision bombing can minimise unwanted collateral damage. Yet these capabilities are only useful if Surface Component Commanders know they exist, understand their potential and are willing to cross Service lines to tap into them. Air Commanders and planners returning from ongoing operations in Iraq and Afghanistan repeatedly report that they have been excluded from the planning of joint operations with the result that opportunities are missed, A&S Power is marginalised and/or used well below its full capability. Moreover, real differences exist between the lengths of Land, Maritime and A&S Components' planning cycles, which lead inevitably to a perceived mismatch in responsiveness. There is no right and wrong in this and all Components should synchronise their planning cycles to achieve optimum effect. All Component Commanders must be represented as EQUAL PARTNERS in this genuinely Joint planning process. In the true Joint arena, combatants from all Components need to be **joint warriors first and environmental specialists second.**

'All Component Commanders must be represented as EQUAL PARTNERS in this genuinely Joint planning process.'

Control of Air and Space. Control of the Air will be a prime responsibility of the Air Component Commander (ACC); its achievement and maintenance for the benefit of all 3 components may represent a massive draw on the A&S resources of all Services. Both China and the United States have recently demonstrated their ability to shoot down an orbiting satellite from the surface. Unfettered access to Space for ballistic missiles, precision, navigation, timing, (PNT) and ISR purposes can, therefore, no longer be assumed. The means by which friendly forces will establish and maintain the required degree of Control of Space needs to be addressed as a matter of urgency.

DPO. DPO include not only strategic attack but also actions to collect information and exert influence beyond the immediate battle. A&S is the predominant player in DPO, literally reaching areas, which, due

Figure 1.

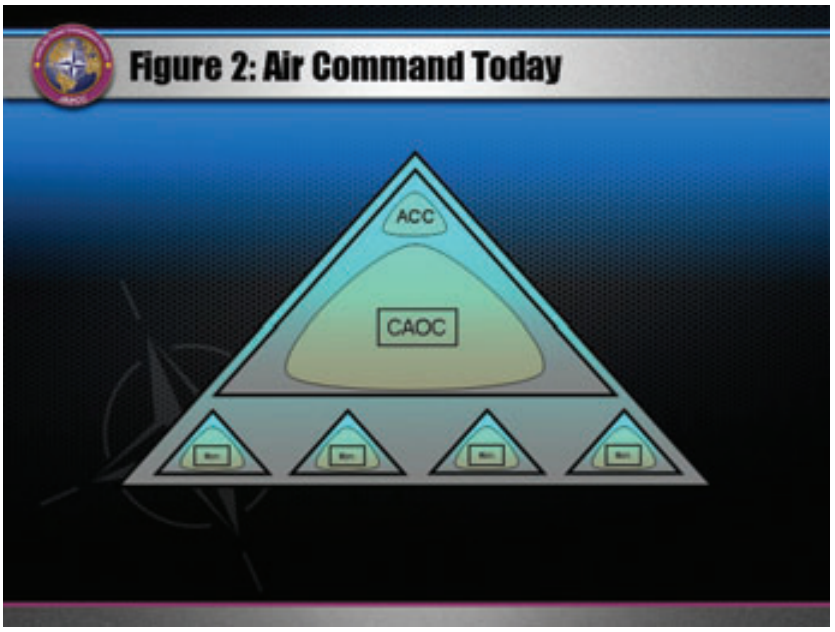


Figure 2.

to geography, legal restrictions or lack of sufficient forces, the other components cannot reach. Therefore, DEEP becomes any part of the area of operations that is not directly influenced by friendly surface forces; it may not, necessarily, be far away. In DPO, the persistence of A&S has been enhanced significantly by improved access to Space, the persistence of UAS, improved ISR sensors and distribution networks.

Future Command of A&S

Today, the ACC, through his CAOC, retains almost full Command and Control over every aspect of air operations. Control is exercised through the Air Tasking Cycle, and delivered through very closely defined directives and orders, the AOD, ATO and ACO.[4] This model is depicted in Figure 2. Given the routine ability of A&S assets to realise strategic and operational effect and our hitherto limited ability to provide subordinate commanders with the degree of situational awareness and understanding necessary for a greater degree of mission delegation, this approach is entirely reasonable. Nevertheless, like any monolithic structure, and notwithstanding everybody's best efforts, it struggles by its very nature to be agile or responsive. Moreover, whilst such a system accurately reflects the Commander's Intent, the distance of the staff from the action can desensitise them to the detail and atmospherics of the battle and undermine their ability to avoid, in effects based terms, any emerging unintended consequences. It is also inherently difficult for this centralised structure to co-operate efficiently and to react swiftly and flexibly across the environmental seams, where planning and execution are carried out at a variety of command levels.

> 'If the Joint Commander's Intent is well known throughout the command chain and the information and knowledge required to make operational level decisions can be shared amongst subordinate commanders, the ACC can free himself from the need to 'Control'.'

Change, however, may be imminent. We are already working in a Joint and, within the Comprehensive Approach mentioned above, an increasingly Interagency command environment with an Effects Based emphasis.

Network Enabling – if we get it right – should move information around the battlespace such that everyone who needs to know something does. Overall then, the Joint and Interagency nature of operations and effects based thinking will condition **what** we have to do and network enabling has the potential to profoundly affect **how** we do it.

The ACC's prime concern should be Command. That is the efficient use of the complete A&S force package to accomplish or contribute to the accomplishment of the desired Joint Effects. If the Joint Commander's Intent is well known throughout the command chain and the information and knowledge required to make operational level decisions can be shared[5] amongst subordinate commanders, the ACC can free himself from the need to 'Control'. A model along the lines of Figure 3 could then emerge, where the CAOC would still be required but would become less of a controlling authority and more of a stock exchange enabling 'A&S resource market place', with A&S mission commanders eliciting the resources they need to accomplish their respective missions. This way, the ACC is enabled to define **what** is to be done; air commanders at lower levels can decide **how** to

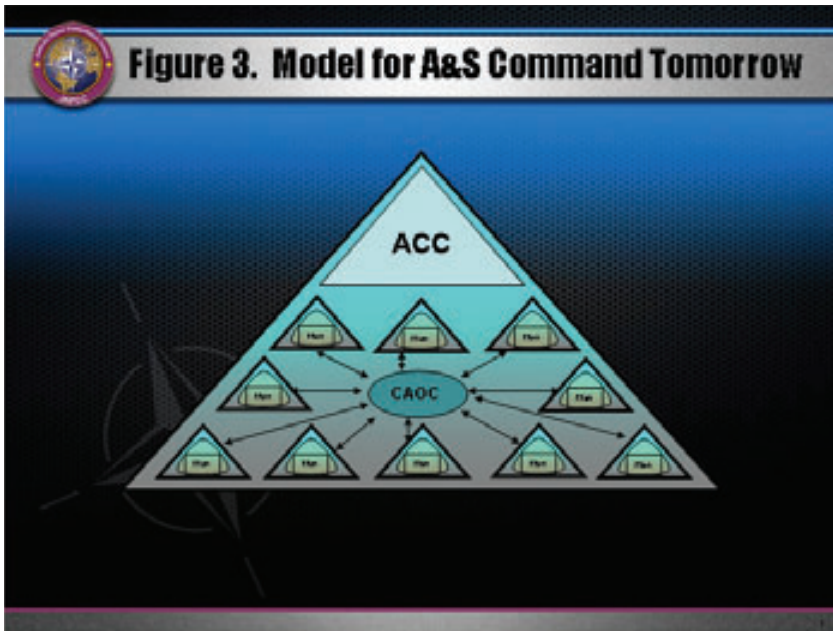


Figure 3.

do it. This is *Mission Command*! Mission Command would allow subordinate commanders at all levels to think, plan and execute their designated tasks. Thus, the scope for air commanders at all levels to contribute creatively to operational design and to make the most of their capabilities is significantly improved; operational and tactical decisions can be devolved to the Commander best placed to make them. Creativity, manoeuvre and the speed of decision-making are massively improved and result in formidable responsiveness of the force to any emerging incident or opportunity. Mission Command was adopted by Land and Maritime forces long ago; it is now time for A&S to catch up!

Emerging A&S Capabilities

Space. The importance of Space to the military has significantly increased in recent years. Moreover, Space-based systems and their output are very quickly becoming more accessible to Commanders at all levels from Strategic to Tactical. In particular, Space is crucial to providing intelligence over denied areas and Space systems will be a critical enabler of NATO's Network Enabled Capability (NNEC), decision superiority, manoeuvre and precision engagement.

Unmanned Aircraft Systems (UAS). Latest technology UAS will have ever increasing endurance, more capable sensors and weapons and they will be employable in a broader suite of roles/missions across the spectrum of operations than ever before. In particular, UAS are capable of long duration, dull tasks in dangerous or contaminated, possibly enemy held airspace, which would not be considered for manned aircraft, thus largely overcoming a previous shortfall of Air Power-that of persistence. However, the vulnerability of friendly UAS, the management of airspace containing a mix of manned and unmanned systems and defence against enemy UAS are challenges that remain to be resolved. Similarly, there are concerns that technological developments in the production of autonomous armed UAS could overtake the ethical and legal implications of operating them in conflict.

A Multi-role Force. The very real logistics cost of deploying military capabilities to Expeditionary Operations will require that those operations are conducted with a force of the minimum possible size and shape. It follows that we must make the best possible use of those assets that are deployed. A&S equipments will be more and more relevant if they are capable of performing multiple roles. Miniaturisation technology is an enabling factor in multi-roling A&S equipment, but there is an increasing need for the forces themselves to be flexible, adaptable and adequately trained in multiple roles.

Conclusions

The future of A&S in Joint Military operations is secure. However, we must actively continue to strive to operate with coherence and coordination as equal partners with our sister services. We must embrace change and emerging technology to get the best from our extensive capabilities. In particular, by making best use of the 'Information Age', we can implement Mission Command in A&S operations, thus vastly improving responsiveness and cooperation with our sister services. Space, UAS and multi-role air assets will enhance the effectiveness of A&S Power and bring even more ubiquity, flexibility and persistence. Policy and doctrine must not be allowed to lag behind. ■

1. These influencers include but are not limited to Governments, Embassies, International Organisations, Non-Government Organisations, Election Monitoring, the Media, International Trade, Economic Sanctions, Currency variations etc.
2. Formless, shapeless, vague, unstructured, fluid. Oxford Concise Dictionary.
3. Joint Enabling Operations include Fires, Influence Operations, ISTAR, Mobility, Battlespace Management etc.
4. Air Operations Directive, Air Tasking Order and Airspace Coordination Order.
5. Shared Situational Awareness (SSA) enabled by the NATO Network Enabled Capability (NNEC).

ISTAR - Searching for a way forward

by Adam Boothby, Principal Consultant PA Consulting Group

'what we are seeing, in moving from the industrial age to the information age, is what amounts to a new theory of war; power comes from a different place, it is used in different ways, it achieves different effects than it did before. Power now comes from information, access and speed. It is not only about networks, but about how wars are fought and how power is developed.[1]'

NATO's acceptance of the Comprehensive Approach following the Riga and Bucharest Summits mirrors a general understanding that in order to achieve strategic success in 'modern' conflicts, there needs to be coordinated action between a wide spectrum of stakeholders including; Non-Governmental Organisations, Military, Civil, National and International partners. From a military perspective the changing paradigm of conflict is driving ever-tighter Rules of Engagement, which in turn demand greater precision, with decisions needing to be made in shorter timescales and it seems, inevitably, the target will be 'among the people'.[2] These factors have been developed within an overarching Effects Based Approach to Operations (EBAO),[3] which is a way of thinking and a process for enabling the military contribution to the Comprehensive Approach. It is, however, much more complex than just the study of the delivery of military options and their effect. The Comprehensive Approach demands a unity of purpose across all actors, in terms of collaborative processes, shared understanding, and concerted action throughout the spectrum of Prevention, Intervention, Regeneration and Sustainment operations.

ISTAR plays a particularly important role, because it is one of the core military functions that arguably spans the spectrum of the Comprehensive Approach and is, therefore, the bedrock of an EBAO. However, the Comprehensive Approach is a complex issue in that it demands a dynamic view of the Clausewitzian Trinity of People, State and Army, where each must take primacy at different points of the Spectrum of Confrontation in order to achieve strategic objectives. This dynamic repositioning of the lead actor has fundamental implications for future ISTAR architectures.

'ISTAR... the bedrock of an EBAO.'

In order to examine the role of ISTAR in the Comprehensive Approach, a more subtle view of ISTAR is required than simply Find, Fix and Finish. ISTAR needs to recognise the continuum of the Comprehensive Approach as well as the likelihood that future military postures built on Strike are unlikely to deliver anything but tactical success. Our current adversaries and future opponents do not need to be particularly smart to recognise that by operating below our weaponry's tactical utility limits they can turn NATO's strength against them; the enemy has as much right to the manouevrist approach as we do!

> '...in order to achieve success in terms of Find, ISTAR constellations will need to be networked together in order to exploit network geometry, different sensor types and aperture sizes.'

'Nothing helps a fighting force more than correct information. Moreover, it should be in perfect order, and done well by capable personnel.' [4]

Turning first to the technical impact of the Comprehensive Approach on ISTAR, current and future threats are likely to demand higher target resolution in order to address the multiple concerns generated by 'fighting among the people'.[5] Targets will be fleeting as they try to avoid the ever more precise targeting NATO can bring to bear. This will demand simultaneous, multi-angled viewing of potential targets to combat even fairly basic counter-surveillance techniques. Hence, in order to achieve success in terms of Find, ISTAR constellations will need to be networked together in order to exploit network geometry, different sensor types and aperture sizes. However, these networked ISTAR capabilities cannot be 'ad-hoc'; the laws of physics demand a deliberate massing of ISTAR effect in order to optimise networked sensor capabilities in much the same way as Strike assets are massed for combat effect. Therefore, the rigours of the Comprehensive Approach and

demands of an EBAO will require a concept of ISTAR operations that enables the mass synchronisation of networked ISTAR effect at the Joint Force Commander's main point of effort, followed by the dissipation of assets back to Operational/Tactical routine. The implications of this type of CONOPS are profound in terms of ISTAR architecture, security and, particularly regarding 'asset ownership' or Service/ platform tribalism.

However, this is only the start point and is, arguably, the easy part because this is the purely military activity. In order to understand the implications of the Comprehensive Approach on ISTAR further, the Conceptual Framework needs to be completely reassessed. Figure 1 shows how the Comprehensive Approach needs a more acute view of ISTAR capabilities and that in order to address the demands of Prevention, Intervention, Regeneration and Sustainment the simplistic Find, Fix and Finish approach needs to be expanded and set within a broader range of requirements demanded by the Comprehensive Approach. These more demanding requirements consequently need to inform future ISTAR Balance of Investment decisions.

Using Understand, Shape, Engage, Consolidate and Transition as a broader Conceptual Framework (Northern Quadrant of Fig 1), overlaid on the Comprehensive Approach, it is possible to see that the ISTAR priorities change across the spectrum (Eastern Quadrant), with Political Influence activities holding primacy in the Understand phase, perhaps based on the deep local understanding of diplomats and NGOs.

At a technical level, differing priorities will drive differing Collection requirements. For example (Southern quadrant), HUMINT and OSINT will dominate the ISTAR space alongside SIGINT in the early phases of the operation. Critical to understanding the implications of this, is that this phase is likely to be civilian led. As the Confrontation progresses military leadership and the Influence it brings to bear through military actions begins taking primacy through the Shape phase and is only dominant in the Engagement phase, transitioning back towards Political Influence in the Strategic end-game of Consolidate and Transition. The implications for ISTAR of this leadership transition (since ISTAR is a Command led process) are that Capability Managers will need to understand that the technical requirements and force mix in each phase are different with (Western Quadrant) Strategic ISTAR in all its forms leading and finishing the confrontation, with Tactical and Operational ISTAR needs (principally to provide Shared Awareness and support Situational Understanding) ramping up in the Shape and Engagement phases. The implications of this dynamic view of ISTAR for future balance of investment decisions are broad in their impact.

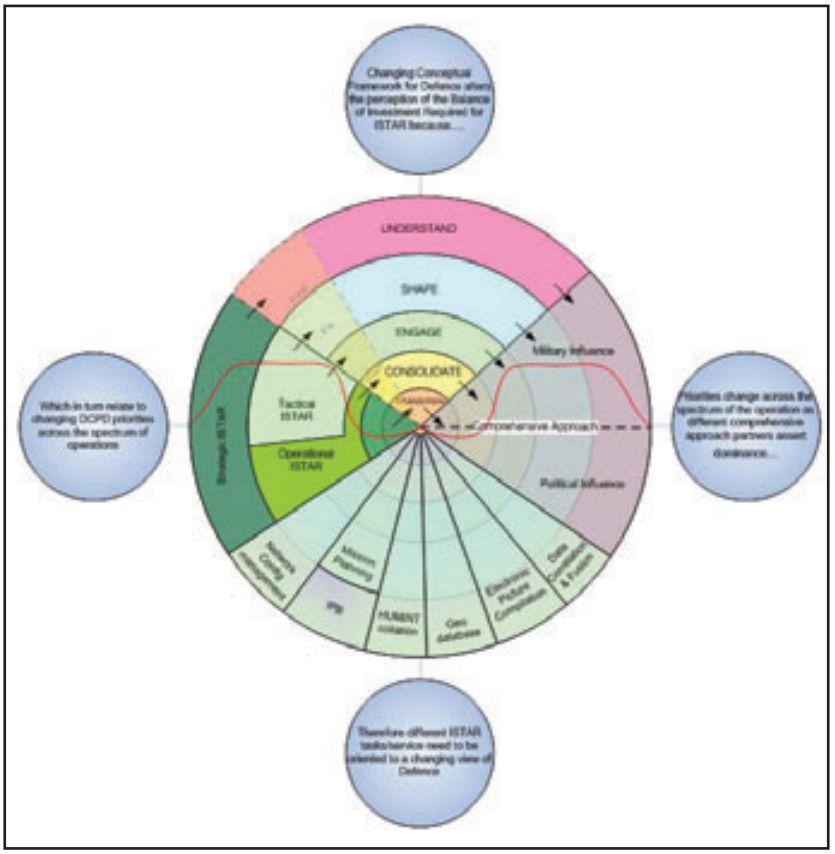


Figure 1. '...Comprehensive Approach needs a more acute view of ISTAR capabilities...'

In order to gain the timeliness and resolution required for anticipated future conflict, ISTAR will need to be networked and able to operate in a variety of coalitions in order to generate the type of constellation density required to develop an ISTAR network effect. Hence, there will be a need to deliberately brigade ISTAR assets to deliver specific effects, before returning to their 'day job'. This will demand a unity of command and multi-level security that is not currently present. The demands of sensor mix and the manned versus unmanned argument will need to be assessed in light of the required network effect, rather than specific, tribally-led tactical requirements. The

'At a technical level...HUMINT and OSINT will dominate the ISTAR space...'

ISTAR requirements from Other Government Departments will be critical in delivering Strategic success; these should not be seen as separate from the needs of Military activity.

In order to address this more complex view of the ISTAR environment, the procurement of ISTAR assets need to be addressed in terms of 'WILL BE' Architectures that are sympathetic with the Comprehensive Approach /EBAO objectives in order to align themselves with the unity of purpose demanded for future strategic success. Continued procurement based on 'AS IS' architectures will only serve to exacerbate the mismatch between current ISTAR capabilities and future demands, because the 'AS IS' and 'WILL BE' architectures both drive different Balance of Investment decisions. For example, it might be a perfectly plausible approach to attack the problem of difficult ground targets with ever more ISTAR sensors or platforms. However, this approach will not address the problem if all it does is multiply the number of ISTAR stovepipes and may in fact, make matters worse by making future interoperability and security issues more complex.

Many now believe that the future of warfare will be based on current conflicts (even peer opponents recognise that adoption of asymmetric techniques brings tactical advantage to bear); what is perhaps most accurately termed 'fighting in somebody else's house'.

'...ISTAR provides a core capability across the spectrum of future operations; however, in order to address the demands of the Comprehensive Approach it needs to be deliberately designed to deliver a networked effect.'

In order to learn lessons from past and current mistakes, the strategic implications of the Comprehensive Approach must be applied to ISTAR capabilities.

The military element of the Comprehensive Approach, based on EBAO, needs to be supported by a deliberate massing of ISTAR effect. This effect needs to be enabled by networks rather than a proliferation of collectors, and ISTAR capabilities need to be procured against an understanding of the intended architecture. Force mix and sensor capabilities need to be designed to optimise ISTAR effect and collection plans need to pay regard to the laws of physics and geometry in designing the constellation. Perhaps the most demanding implication of the Comprehensive Approach for the military ISTAR community is the need to move dynamically around Clausewitz's trinity, where the leadership and prioritisation of ISTAR capabilities will not always be a military affair.

In summary, ISTAR provides a core capability across the spectrum of future operations. However, in order to address the demands of the Comprehensive Approach, it needs to be deliberately designed to deliver a networked effect. This does not just mean that sensors need to be networked, but that Commanders will need to understand the delivery of networked ISTAR effect as well as they understand traditional kinetic options, and that they will need to be able to dynamically synchronise their forces to deliver ISTAR effects such as FIND, in order to meet desired political end-states. Networks may in the future be meshed, self-forming, mobile, ad hoc and technically brilliant. However, the effect they create needs to be as deliberate and as Command led as any other military operation. ■

1. Buzan, B (1991) pp22-28.
2. Gen Sir Rupert Smith, The Utility of Force: The Art of War in the Modern World.
3. The term used by NATO to describe its approach to effects-based thinking.
4. Che Guevara.
5. Ibid.

Doctrine vs. Reality

The Need for Joint ISR C2

By John L Mahaffey Senior Scientist, NATO C3 Agency

Introduction

The Command and Control (C2) of Intelligence, Surveillance, and Reconnaissance (ISR) systems within a network enabled joint environment is an emerging and challenging issue. Commanders owning and operating organic ISR assets have traditionally been loathe to give them to any other commander, even to those located immediately above in the chain of command. This is especially true for land based ISR systems, specifically those assigned to the tactical level, battalion and below. Historically, there are excellent reasons for this; land based ISR systems have been used by their commands in support of tactical operations, often spotting for artillery or detecting enemy fires and, as such, are a critical element in the execution of the land commander's campaign.

The emergence of network enabled systems now allows many of the products from these ISR systems to be routinely accessed, both from archived databases and in near real time (NRT). As a result, a wider array of commanders throughout the network have equal access to and insight into the ISR operations of units located both geographically and doctrinally remote from the interested command. This offers additional opportunity for commanders to leverage more ISR capability to provide the information and intelligence they require to execute their missions. However, like all new capabilities, the network enabled ISR system provides both opportunity and risk as it is integrated into the joint command structure – opportunity for more information and intelligence, countered by risk associated with a break-down in the traditional ISR C2 structure.

In a recent joint exercise, a Time Sensitive Targeting (TST) Cell attempted to task a Brigade level ISR asset against an emerging target. The TST Cell had the authority of the JFC/CJTF to use whatever assets were required to complete this task. The TST Cell, requiring positive identification of the target, attempted to task the Brigade level ISR asset, a tactical unmanned aerial vehicle (TUAV) to observe the target for identification and collateral damage estimation. Because the ISR system was available on the theatre wide area network, the TST Cell ISR Manager sent an automated sensor service request (SSR) directly to the TUAV operator. Problems ensued when the TUAV operator refused to take orders directly from the TST Cell, instead requesting they be made through the land forces chain of command. Over the next few hours, a tasking was finally produced, through the Brigade headquarters to the operator. Only then did the operator respond to the TST cell, providing the required support.

TST Cells and TUAV Operators currently conflict on a doctrinal level.

How could this happen? The TST Cell ISR Manager acted under the authority of the JFC through the J2. If the Tactical UAV was part of the Joint Force, the operator had no choice but to comply with the TST Cell request. Or did they?

Post event analysis showed that both the TST cell and the tactical UAV operator acted correctly. The request for re-tasking was reasonable in the view of the TST cell, since it had the authority of the JFC behind it. The TUAV operator refused the order because it had not come from his Brigade headquarters and, therefore, was not binding. Both elements executed their operations exactly as they were trained, and both failed. The problem then is not with the operator or the TST cell, it is one that is primarily doctrinal, exacerbated by technology.

In this case study, the TST Cell sent the tasking message to the operator directly - without coordinating with the Land Component Commander (LCC) G2 or G3 or the Brigade S2 or S3 - because it could. The network architecture, coupled with a network enabled application allowing sensor requests between station operators, facilitated the direct tasking without coordination from the TST Cell to the TUAV system. This in turn caused confusion for the TUAV operator resulting in deferment of the request to the Brigade Commander, who in turn coordinated with the TST cell via the LCC. In this case, the TUAV operator followed the chain of command as doctrinally required, but in so doing, delayed the provision of the information vital to the prosecution of the TST.

Doctrine vs. Technology

Because the ability to task, view and manage ISR systems at the tactical level is a new capability, the accompanying doctrine still needs to be expanded and developed. In this case, the land component UAV is not the same as the Air Component Command (ACC) UAV. For example, a TST Cell, desiring to re-task an ACC UAV need simply contact the A2 and A3, who then coordinate with the supported commander and the air command and control system to change the ISR system's collection plan and location (orbit). Operators familiar with RQ-1 Predator and RQ-9 Reaper operations will recognize this ability to rapidly re-task the asset based on emerging requirements and cueing from other assets such as the E-8C Joint STARS.

The Land Component, on the other hand, follows a much more rigid doctrine of ISR operations. One of the primary reasons for this is the fact that, unlike the ACC, LCC ISR assets are mostly held

organically within subordinate units (e.g. Brigades, Battalions and Companies). ISR assets assigned to these units are often used in direct support of operations, as opposed to persistent support for Intelligence Preparation of the Battlespace (IPB). Historically, land based ISR assets have had few network enabled capabilities for the receipt of ad-hoc tasking from outside their direct chain of command or for the direct transfer of their products to a database or network.

As a result, coordinating organic ISR systems with the LCC and its subordinate units is a much more complicated issue. Direct contact with subordinate systems is now possible through ever more robust networks. Land based ISR systems, such as TUAVs, unattended ground stations, artillery fire finding radar and their associated analysis and exploitation stations are now within direct reach of joint operational or subordinate commanders via the network.

Going back to our case, the TST Cell must coordinate with the LCC G2 and G3, then the Brigade S2 and S3 who will review their own organic capabilities to provide answers to the TST Cell in lieu of immediately changing the location and collection plan of the ISR system (e.g. TUAV). Essentially, the LCC and Brigade are supporting the JFC as required, but are not allowing the TST Cell to directly task or manage their organic ISR systems. Operators familiar with RQ-3 Hunter and SPERWER operations will recognize the requirement to re-task assets only through the chain of command.

This does not diminish the support to the Joint Commander. It simply means that commanders seeking to rapidly re-task systems organic to the Land Component must change their C2 paradigm. The Land Component will decide how to best answer the request, not the requestor themselves. This concept of operations is applicable to all component and unit commanders owning and operating organic ISR assets. In many ways, the ACC is the exception to this rule, as its organic ISR assets are generally chopped to a supported commander (e.g. LCC) for their operations.

Managing the 'Joint ISR' Capability

The problem of 'Joint ISR' management is rooted in doctrine. However, like most problems, this can be solved by a mix of both technical and operational solutions. Technically, the development of ISR management and collaboration

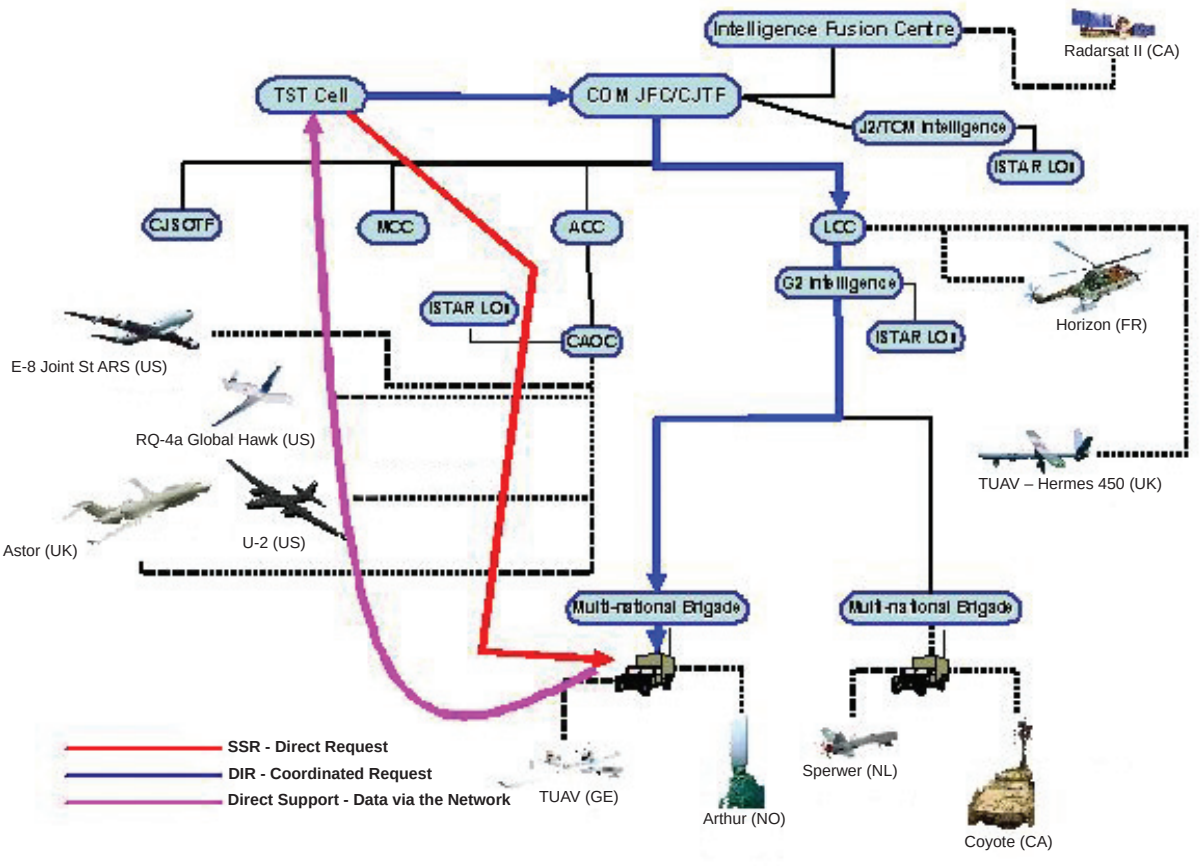


Figure 1. Direct versus coordinated tasking of network enabled ISR systems.

NATO's AGS system is expected to be operational by 2013.

tools observing business rules based on the chain of command will enable coordination prior to tasking. Operationally, new doctrine based on increased access to multiple levels of ISR systems is required to address these operational battles over ownership and management of ISR assets in the field.

Experimentation by the Multisensor Aerospace ground Joint ISR Interoperability Coalition (MAJIIC) program is developing network enabled solutions for the planning and execution of ISR operations in the network enabled environment. Systems such as the Norwegian Command and Control Information System (NORCCIS) provide the ability to rapidly re-task ISR assets by sending dynamic information requests (DIR) and exploitation service requests (ESR) to network enabled systems in the network architecture.

Based on results from Trial Quest 2007 and MAJEX 2007, the DIR and ESR are being applied using business rules allowing the requests to move through the network in accordance with the chain of command, requiring coordination and authorization at each applicable level. As a result, a DIR from the TST Cell to the Brigade will move directly to the asset, but require coordination at the LCC and Brigade level before the ISR operator will act upon it. By using this mode of transport and coordination, the ISR system benefits from the speed and accuracy of the network, whilst ensuring commanders are informed and have approved requests for service. Figure 1 depicts the contrast between the original SSR, moving direct from the TST Cell to the Brigade and the DIR in which the request will flow from the TST Cell to the Brigade via appropriate levels of command. Note that in the figure, the data provided by the UAV is still sent directly to the TST Cell via the network, leveraging the best of network capabilities and command requirements.

It should be noted that the capabilities indicated in Fig. 1 [previous page], will undergo operational evaluation and technical experimentation during MAJEX 08, October 13-18 2008, at the NATO C3 Agency in The Hague, Netherlands. During this exercise/experiment, operators from the MAJIIC nations and NATO Commands will provide operational evaluation of the DIR and the ESR in addition to experimentation on other network enabled ISR exploitation, management and planning processes.

While NORCCIS and other Collection, Coordination and Information Resource Management (CCIRM) tools provide the technical solution to multi-level ISR management, the doctrine still lags behind the technology. Regulations, directives and processes outlined in Bi-SC 65-5 (Collection Management) and AM 80-70 (Synchronization and TST) need to be updated to address these new capabilities. Until current doctrine is modified to include the Joint, network enabled ISR capability, the senior theatre commander and staff will continue to adjudicate conflicts between subordinate commanders intent on supporting their individual operations by supplementing their organic assets with assets made available through network enabled ISR systems and capabilities.

These requirements are key to future Joint ISR operations within the alliance as well. The advent of a NATO owned and operated Alliance Ground Surveillance (AGS) system and the integration of national Full Motion Video (FMV) UAVs will provide NATO commands with assets to be employed and shared among their subordinate commanders. The ownership/coordination problem is likely to worsen until both technical and operational solutions are fully integrated into operational networks and procedures. This will require a cooperative stepped approach, matching technical and doctrinal development in order to ensure that, as Joint ISR systems and capabilities are integrated into the network enabled environment, ISR system operators and commanders can employ them efficiently and with optimum effect. ■

21st Century Luftwaffe

Lieutenant Colonel Dr Thorsten Weber, NATO SHAPE J4

Protecting assets at home, abroad and in space – German Air Force Transformation Centre's perspective

Luftwaffe military-strategic context

In August 2004, the new Bundeswehr Concept was promulgated setting the scene for transformation of the German Armed Forces. The then Federal Minister of Defence, Dr. Peter Struck, underlined that the defence of Germany against external threats would continue to be the constitutional and political mission of the Bundeswehr. However, defence - in accordance with the German constitution - would not be limited to defending national borders, but must also address risks and threats to Germany and its allies' security where they evolve. As we have seen, this security has been increasingly affected by international terrorism, organised crime, the proliferation of weapons of mass destruction (WMD) and the impact of regional crises and conflicts.

Germany copes with these challenges and risks through a preventative cross government security policy known as the Comprehensive Approach. This approach includes the willingness and capability to enforce freedom and human rights and establish stability and security where required. This may necessitate the deployment of armed forces in accordance with international law to prevent crises, settle conflicts or prevent terrorist attacks.

The unique characteristics of airpower – speed, range and precision engagement from elevated positions – provide unique capabilities to monitor affected areas, find, fix, track and identify potential threats and, if necessary, counter them. Besides ensuring homeland defence, modern aircraft provide superb flexibility and can be rapidly deployed to express political will abroad. The recent White Paper 2006[1] sums up the effectiveness of airpower as follows, 'With its extensive special capabilities to deliver effects in and from the air, including space, the Air Force contributes to German security.'

This article discusses the 3 main areas in which the Luftwaffe will be involved in the near future - homeland defence, peace support operations (PSO) and space. It examines the Luftwaffe's unique capabilities and limitations and describes potential ways and means to cope with future challenges.

Homeland Defence

Over recent decades, the Luftwaffe has been permanently tasked with safeguarding German air sovereignty, thereby ensuring the protection of German citizens and German territory against attack. Incidents in the past have shown that responsiveness against evolving threats - especially Renegades - is of paramount importance. In order to swiftly recognize, identify and assess critical situations, a team of experts is required, capable of exploiting all the information at their disposal. Therefore, to handle such situations the National Air Policing Centre 'Führungszentrale Nationale Luftverteidigung' was established. Armed with an up-to-date recognized air picture and constant contact with decision makers, this institution can manage critical situations professionally, tasking Luftwaffe assets if required.

The F-4F Phantom was the Luftwaffe's work-horse here for decades, maintaining Quick Reaction Alert (QRA) to address potential airborne threats. This essential task will be taken over by the EUROFIGHTER - an aircraft of pre-eminent ability, ensuring increased responsiveness and reactivity.

Furthermore, as a result of recent developments, particularly the global transfer of military technology, concerns about WMD have been raised worldwide. The White Paper 2006[2] on German Security Policy states that 'the proliferation of WMD and their means of delivery is steadily emerging as a potential threat also for Germany.'[3] The Luftwaffe could play a more significant role in addressing this growing concern. Conceivably, using manned and unmanned assets, the Luftwaffe could provide intelligence information to other agencies responsible for arms control. Contingent on a political decision, one could also envision that future national early warning and cueing sensors might contribute to a supranational missile defence umbrella.

'The Luftwaffe is only capable of exploiting its full spectrum of capabilities if air, ground and maritime assets are combined in a networked environment.'

Future PSO

The Luftwaffe's contributions during the 1999 Kosovo crisis and its current commitments in Afghanistan have highlighted specific requirements and capabilities needed to cope with the challenges of future PSO.

Nowadays, information has become one of the most decisive factors in military operations. In particular, the non-linear battlefield demands quick decision processes and swift information distribution capabilities. The philosophy of network enabled capabilities requires a flexible and adaptable connection of sensors, decision makers and effectors. The Luftwaffe is only capable of exploiting its full spectrum of capabilities if air, ground and maritime assets are combined in a networked environment. Consequently, 'information superiority is a decisive factor in carrying out active protection measures.'[4] Thus, information gained by airborne, ground and maritime sensors must be consistently available to all military decision makers. The fusion of data received by different sensors distributed over the area of operations will enhance situational awareness, not only of the Luftwaffe, but also of the other services and allies. Having direct access to reconnaissance information, commanders at every level will benefit from the advantages of a common relevant operational picture (CROP).

The Luftwaffe has acknowledged the importance of network enabled capabilities and has already initiated several sensor fusion experiments, such as COMMON SHIELD, involving airborne, ground and maritime sensors and platforms. In this context, the introduction of unmanned aircraft systems (UAS) into the Luftwaffe in early 2010 has been considered as a litmus test for network enabled capabilities due to the high bandwidth SATCOM requirements for C2 and sensor data distribution. Moreover, UAS - when employed as airborne communication nodes - could themselves become airborne C2 assets. Recent studies have shown that high altitude airships could be equipped with communication payloads, ensuring persistent ultrawideband information exchange over the battlefield for months at a time.

Intelligence surveillance and reconnaissance (ISR) is a key capability in future PSO. Since March 2007, six TORNADO

The EURO HAWK will be a major part of the Lufwaffe by 2011.

aircraft have been conducting surveillance and reconnaissance as part of NATO ISAF missions. Although relying on conventional wet film for photometric data collection, the high level of image quality is still unrivalled by modern electro-optical sensors. Because of their speed and responsiveness TORNADO aircraft ensure swift access to remote locations. However, due to reliance on air-to-air refuelling for extending missions, persistence is limited. Furthermore, the requirement for post-flight image processing currently denies the Luftwaffe the capability of real time imagery based intelligence gathering.

Consequently, the Luftwaffe is looking for an unmanned platform to supplement TORNADO capabilities. Medium Altitude Long Endurance Platforms could satisfy this urgent imagery intelligence requirement. In the area of signal intelligence, the Bundeswehr is procuring the EURO HAWK, a High Altitude Long Endurance UAS based on the GLOBAL HAWK platform. The EURO HAWK will be equipped with highly sophisticated signal intelligence antennas, eavesdropping on enemy activities on the ground from safe distances and relaying critical information directly to analysts at home. Tasked by the Strategic Reconnaissance Command 'Kommando Strategische Aufklärung', the Luftwaffe will begin operating this platform from Jagel, northern Germany, by early 2011.

'...airpower can express political will by a show of force, influencing the enemy's decision process on the strategic and operational level prior to the first shot.'

With regard to sensors and endurance, stakes are high as a result of the complexity of the non linear battlefield. Future sensors should employ a multi-spectrum analysis capability to 'uncloak' enemy camouflage efforts or support counter-IED missions. Recent conflicts have shown that synthetic aperture radars must complement electro-optical devices to ensure all weather capability. As we have seen in Afghanistan, ground troops rely heavily on imagery intelligence. Thus, future procurements must consider remote video terminals in order to swiftly relay real-time information to the warfighter. In short, future mission success is directly linked to airborne intelligence gathering capabilities.

Effective engagement capability is paramount to gain and maintain the initiative both in the physical and cognitive dom ain. The speed and range of modern aircraft permit the rapid deployment of air assets. Therefore, airpower can express political will by a show of force, influencing the enemy's decision process on the strategic and operational level prior to the first shot. At the tactical level, the deployment of reconnaissance aircraft or unmanned surveillance platforms might potentially deter the enemy from preparing attacks or insurgents from burying mines and deploying IEDs. Additionally, manned aircraft such as the EUROFIGHTER can monitor 'no-fly' zones, thereby preventing conflict escalation. Thus, the Luftwaffe could achieve decisive cognitive (non-kinetic) effects in future PSO by deterring hostile activities.

In the physical domain, recent experiences have underlined that, in particular, hit-and-run tactics by insurgents make it extremely difficult for friendly forces to gain the initiative, especially in

heavily populated or remote areas. If quickly called in, airpower can deliver a swift response by providing close air support. It is here the Luftwaffe is investing huge efforts in the enhancement of airborne platforms and revision of the Forward Air Controller (FAC) structure. UAS will ensure the 'unblinking eye in the sky' providing persistent surveillance and acting as a target sensor for FACs on the ground in support of joint and combined operations. Closing the loop, TORNADO IDS could be quickly called in and provide desired kinetic effects. In order to minimize the likelihood of unintended results, the Luftwaffe has already underlined its desire for scalable and precise weapons. Deployed by manned or unmanned assets, those weapons will reduce risk for non-combatants and avoid fratricide.

Furthermore, high threat scenarios involving advanced surface-to-air missile systems could greatly decrease survivability of airborne platforms. Therefore, a smart combination of stand-off capability and low-observable platforms might ensure the success of own missions even under those harsh conditions. Thus, the Luftwaffe is conducting a study on unmanned combat aircraft systems (UCAS) elaborating technological and operational requirements. The outcome will outline first ideas for the development of UCAS beyond 2020.

Space

Space has become a new centre of gravity both in economic and military terms. From an economic perspective, communication, global transfer of money, agriculture etc. all heavily rely on space assets. Similarly, military mission success depends on space-based intelligence, surveillance, navigation and communication. Therefore, any interference with those sensitive assets whether intentional or unintentional, hostile or natural could severely affect terrestrial safety and security. With the promulgation of the 'Conceptual Guidelines for Utilization of Space by the Bundeswehr'[5] in 2008, the idea of a military space sector was initiated to describe future military activities with regard to space. In this context, the Luftwaffe has acknowledged its responsibility as primary stakeholder for space surveillance, early warning and some designated tasks within missile defence, whilst other issues such as intelligence and communication remain under joint control. The GAF Transformation Centre "Zentrum für Weiterentwicklung der Luftwaffe" has already completed a study on space situational awareness - followed by a draft concept - and initiated research on the protection of space assets.

Conclusion

To conclude, the Luftwaffe is effectively contributing to homeland defence by safeguarding air sovereignty over Germany. Because of the establishment of new structures, Renegade incidents can be handled professionally. Due to the Luftwaffe's current and future commitments in PSO, a seamless implementation of networked enabled capabilities and mission-tailored SATCOM systems is necessary. Furthermore, the complementary deployment of both manned and unmanned ISR platforms is essential for mission success. The revision of FAC and the procurement of unmanned platforms are decisive in enhancing the Luftwaffe's effective engagement capability within a non-linear battlefield, particularly to protect troops on the ground and to ensure joint mission success. Finally, the Luftwaffe's responsibility in space has been acknowledged and must be elaborated to address security and safety in this high ground. Considering these issues, the Luftwaffe will be even better prepared to protect our assets at home, abroad and in space.

The TORNADO will still be called upon to provide kinetic effects.

1. Federal Ministry of Defence. "White Paper 2006, Weißbuch 2006 (English Version)", October 2006, p.127. Available from www.weissbuch2006.de.
2. Ibid.
3. Ibid. p.20.
4. Federal Minister of Defence. "Outline of the Bundeswehr Concept, Konzeption der Bundeswehr (English Version).", 10.08.2004, p.16. Available from www.bmvg.de.
5. Bundesministerium der Verteidigung. "Konzeptionelle Grundvorstellungen für die Nutzung des Weltraums durch die Bundeswehr", Generalinspekteur, 15.01.08.

Air Power In Countering Irregular Warfare

by Group Captain John Alexander, JAPCC

Countering the activity of irregular adversaries, as characterized by operations in Afghanistan, is a challenging area for Air and Space Power. It was the prevalent form of warfare of the Twentieth Century and may remain so, yet NATO Air and Space Power theory and doctrine has traditionally focused on high intensity inter-state warfare.[1] The JAPCC analysed the role of Air Power in countering irregular warfare in Journal Edition 6 and at the JAPCC 2007 Annual Conference. This article is based on JAPCC's most recent paper consolidating this work.[2]

Irregular Warfare

It is assumed that regular warfare is that between the armed forces of states and irregular warfare is everything else. One definition of irregular activity is 'behaviour that attempts to effect or prevent change through the illegal use, or threat, of violence, conducted by ideologically or criminally motivated non-regular forces, groups or individuals, as a challenge to authority'.[3] It therefore includes guerrilla warfare - tactical actions to ambush and raid - and the avoidance of ground holding action, terrorism to erode the authorities' and population's will, provoking over-reaction, and the use of propaganda. Irregular warfare is evolving because of globalisation, climate change, identity politics, extremist ideologies and technology such as the internet and the use of cyberspace, networks, and irregular adversary access to sophisticated weapons. However, the enduring characteristic of irregular warfare is the challenge to state authority by non-state actors. The irregular adversary seeks to create or exploit ungoverned space.

'Irregular warfare is evolving because of globalisation, climate change, identity politics, extremist ideologies and technology...'

The Military Contribution

The principles for the military's contribution to building state authority and countering the effects of irregular activity developed for colonial counterinsurgency campaigns remain valid: the political nature and, therefore, civilian primacy; the need for long-term and integrated civil and military commitment; the importance of intelligence and information operations; the need to separate the insurgent from the mass of the people; the need to neutralize the insurgent through appropriate and proportionate military responses; and the need for political reform and socio-economic development to remove the cause of the problem. These are reflected in recent US Army doctrine.[4] NATO's 1973 definition of counterinsurgency is 'those military, paramilitary, political, economic, psychological, and civic actions taken to defeat insurgency'[5] which foretells the NATO Effects Based Approach to Operations (EBAO), including the 'coherent and comprehensive application of the various instruments of the Alliance'[6] within a comprehensive approach. Though enduring, these principles must be tailored to the context and circumstance. Finally irregular warfare may be part of a spectrum of conflict, of which Krulak's 'three block war' of simultaneous and adjacent warfighting, police action and humanitarian assistance is a graphic example.[7]

The Air Contribution

The NFJASP's[8] three layers of Air and Space activities – Deep Persistent Operations, Control of the Air, and Joint Enabling – apply across the spectrum of conflict. For example, Air Power demonstrated depth and persistence in Afghanistan in 2001-2, working with Special Forces and indigenous land forces, to dislocate the irregular adversary through an attack on its command structure – using precision, information and cyber operations, ISTAR, and global mobility. Also Air and Space Power is critical in inter-agency operations targeting recruitment, training, funding, movement and logistics networks and sanctuaries, and in denying sea, land and air lines of communication. Control of the Air denies the adversary freedom of manoeuvre while maintaining our own, and it deters the adversary from concentrating, thereby forcing him to fight as an irregular. The contested airspace will normally be that within man-portable air defence systems or small arms range, hence the importance of countering irregular activity around airfields, airstrips and landing zones. A flexible airspace control structure must enable the Air equivalent of the 'three block war' – for example by allowing parallel CAS, air mobility, and ISTAR, providing a structure for commercial or humanitarian air movements, whilst rebuilding a control capability for indigenous aviation needs.

'Air Power has a critical role in strengthening a weak or failing state's authority by training its Air Force and restoring essential services'

Finally, Air and Space is critical to enabling Maritime and Land operations, through providing ISTAR, tactical mobility, and precision CAS. Therefore, operations to counter irregular activity are both joint and Air-reliant.

Countering Effects of Irregular Activity

Joint military activities, as part of an EBAO, to counter the effects of irregular activity will include effects in the cognitive and physical domains through a combination of fires and influence, or kinetic and non-kinetic activity. These include influencing the will of the population in order to isolate irregular forces, through support for the legitimate authority, to protect the population through the provision of human security, and to expose the weakness of the irregular's view of the future. Air Power is vulnerable to being portrayed as disproportionate or indiscriminate by the adversary, the media or both and this may cause such operations to be seen as illegitimate, both in theatre and at home. Air Power has a critical role in strengthening a weak or failing state's authority by training its Air Force and restoring essential services. EBAO requires understanding of the full context of the situation and, in irregular warfare, effects are rarely apparent in the short term. Air and Space ISTAR will contribute, along with HUMINT and other sources, to this understanding as part of a joint ISTAR plan. Air and Space Power can deliver an alternative to the irregular's message through Information Operations and influence activities such as PSYOPS, provision of human security, assisting development, and providing incentives. Influence is achieved through the ability to communicate intent, resolve and legitimacy rather than through the

use of force itself. Offensive action may be required to clear areas of significant adversary activity and to enable economic, social and political lines of operation to work. Special Forces or indigenous forces, whose understanding of the environment allows precise targeting, and whose reach allows them to conduct deep operations with Air Power may be more effective than Land search and destroy operations.

Implications for Air Power

AJP-01 Allied Joint Operations defines the 'components of fighting power' as perceptual, moral, physical and doctrinal. Countering irregular activity is absolutely reliant on the perceptual component, which focuses on the observation and perception of the operating environment by an individual, a commander or an organisation. This in turn requires effective Air Land Integration with small and often isolated Land units, who use mission command to conduct HUMINT-led operations and interface with the local population. A mantra of 'centralised control decentralised execution' will result in unmatched Joint, Air and Land command and control constructs, which leave Air as a responsive tactical level activity rather than a shaping activity at all levels. The degree to which the NFJASP's three layers of Air activity are co-ordinated between the joint commander and components and the strategic, operational and tactical focus for each is shown at Figure 1. Essentially Air Power conducts deep persistent operations co-ordinated by the joint force commander. Air is the supported component for delivering control of the air and space, co-ordinated at the operational-level, and supports maritime and land with tactical-level joint enabling

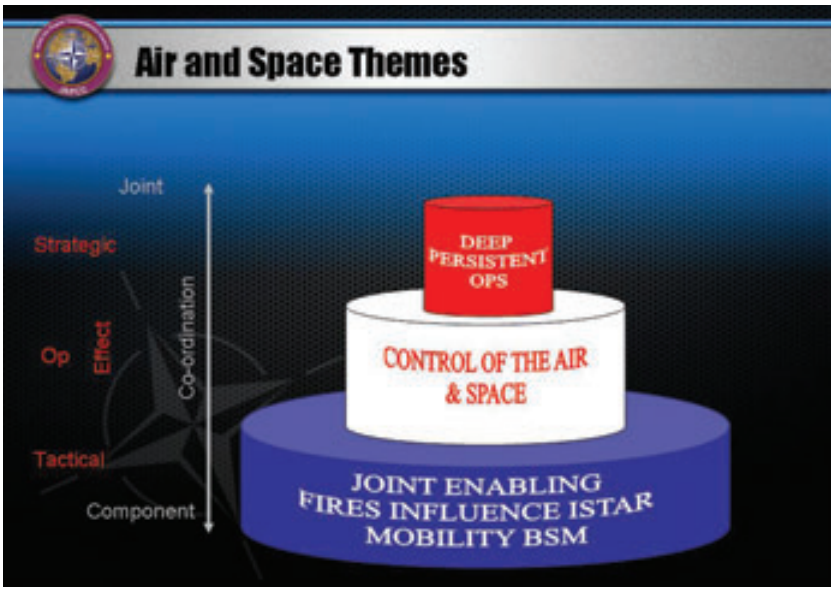


Figure 1. – Levels and Co-ordination of Air and Space Activity.

activities. This in turn allows a model to be constructed to provide the required command, information and intelligence, battlespace management, liaison and co-ordination, and to exploit network enabling, and so on.

As well as cross component cooperation at all levels, integration is required with political, civil and diplomatic agencies, international organisations and non-governmental organisations. Network Enabling provides an opportunity for shared awareness and understanding to enable decentralised planning and execution, rather than just speeding up the targeting cycle. Shared situational awareness is the fluid in which command and other Air 'C2' activities swim as shown at Figure 2 below.

The ISAF solution has been to empower the Regional Air Operations Centres and to provide deployable air integration teams to the provinces in order to integrate Air Land operations. The difference is that in a network enabled future we should be able, with assurance, to extend mission command down through the layers thus seeking agility and creative input

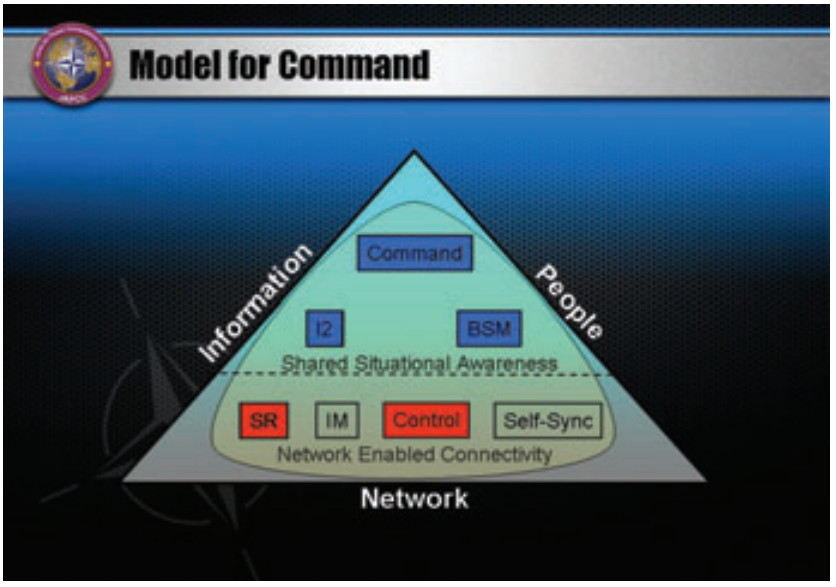
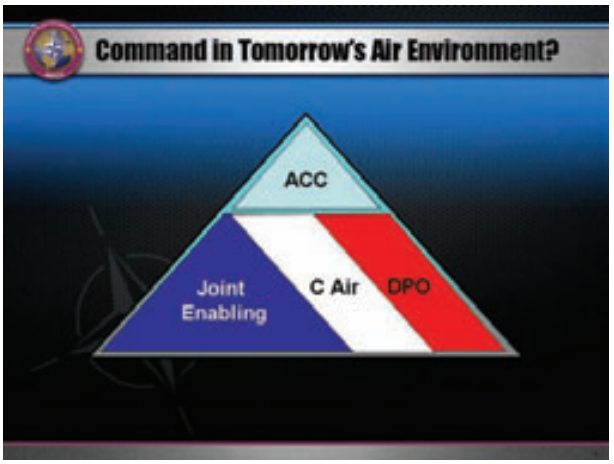


Figure 2. – Command, Battlespace Management and Information & Intelligence.



Figures 3 & 4. – Functional and Regional Command.

at every turn. The requirement for a CAOC would remain, but in more of a co-ordinating role. The emphasis, however, would be on the Air Commander to ensure the structure met his needs and reflected the level of shared situational awareness he could genuinely generate. He would also need to take account of context. This allows the Air Commander to nominate responsible commanders for either functional or regional responsibilities, with further layers of subordinates as either effects or the plans of other components demanded. Figure 3 above shows such a functional construct.

In Afghanistan, all the functions are not required, given that apart from surface to air fire, Air is not contested, hence a regional construct could emerge. An example is at Figure 4 above.

With regard to the moral component, Airmen must understand irregular warfare is not a lesser form of warfare nor is it solely a Land Component responsibility. We must consider the whole spectrum of conflict. The physical component should be robust enough to cope with the challenges, particularly the longevity of irregular warfare; force structures need to be balanced for the spectrum of conflict; and there will be a need to develop critical elements such as the selection and training of commanders and the effective employment of FACs and Air Liaison parties. Finally, while NATO doctrine is that all 'operations are operations',[9] the JAPCC argues that NATO doctrine and training should be adapted to reflect considerations for irregular warfare, including Air Power.

Conclusion

Figure 5 below illustrates (using an incomplete list) how Air and Space Power roles will vary in importance depending on the character of the operation, where the 'Big War' is state (Alliance) v state level operations; the 'Long War' is countering irregular activity in which ungoverned space is contested, and the 'Contained War' is denial, blockade, and no-fly zones. ■

Figure 5. – Air and Space Power in the Big, Long and Contained War.

1. See for example Meilinger, Phillip S. 'Historiography of Airpower: Theory and Discipline', The Journal of Military History 64 (2000), pp. 467-501, and Dennis M. Drew 'US Airpower Theory and the Insurgency Challenge: A Short Journey to Confusion,' The Journal of Military History, 62 (1998), pp. 809-32.
2. JAPCC Paper Air Power in Countering Irregular Warfare
3. UK Joint Doctrine Note 2/07.
4. US Army FM 2-24 Counterinsurgency December 2006.
5. AAP-6 (2007).
6. BiSC Pre-Doctrinal Handbook EBAO dated 4 December 2007, p. 1-2.
7. Charles C. Krulak (1999). The Strategic Corporal: Leadership in the Three Block War. Marines Magazine, 1999, http://www.maxwell.af.mil/au/awc/awcgate/usmc/strategic_corporal.htm [accessed 15 March 2008].
8. See article entitled 'NATO Future Joint Air and Space Power' in this Journal.
9. AJP-01(C) Allied Joint Doctrine, p. x.

Interview with Lieutenant General Angus Watt, Canada's Chief of the Air Staff

Conducted by Lieutenant Colonel Jim Bates, JAPCC

Since taking on your appointment as Canada's Chief of the Air Staff in July 2007, what do you see as the key challenges facing the Service and what are your priorities?

Probably my biggest challenge is age – age of my people, age of my equipment and age of my infrastructure.

In terms of the people challenge, I have a very unhealthy demographic distribution, which looks like a double-humped camel. That is a product of a number of things: First, it is the product of the evolution of our society in terms of getting older and it is also a product of the downsizing that occurred in the Canadian Forces in the mid-90s, particularly in the Air Force. In the Air Force right now, the average age of our non-commissioned members is 38 and the average age of our officers is 37. In some occupations, like technicians, the average age is 42. That's pretty old. It does not mean they cannot do the job; they are fully capable of doing the job, it just means they are going to reach certain retirement gates relatively soon and then they go. So we have those two humps and the valley in between. First up is largely composed of baby boomers coming towards the end of their career, then there is that valley produced by the 90s, and then there is a new hump of those we brought in after 2000, which was necessary to rebuild our strength. On that point, there are a number of challenges; most particularly, during the period 2012 to 2016 when the first hump retires. I am going to have folks that will be taking charge of a leadership function in the Air Force and they are going to be in relatively small numbers. So we are aiming in a number of ways to compensate for that. First of all, retention will be a focus. Also, adapting our operational practices to compensate for a diminishment in expertise and experience on our squadrons and units, for about 4 or 5 years,

and at the same time pumping up our training establishments so that we put in as many folks as possible, train and absorb them. We will move through that period and then we will be back into, I believe, a reasonably healthy demographic distribution.

Second is age of aircraft. I have 18 fleets, roughly 350-400 aircraft. The average age of my aircraft is 26 years. Ten years ago, in the 90s, it was 21 years. In the mid 80s, it was 17 years of age. So we have gotten progressively older. We are not the only Air Force in the world facing that challenge. The United States Air Force says they have now reached the oldest average age that they have ever had, which is 24 years. I'm at 26. It does not mean the aircraft are unsafe, we always maintain them to absolutely world-class standards of airworthiness. But it does pose certain challenges in terms of the cost to maintain them, availability is ostensibly lower with older aircraft, serviceability and sometimes mission equipment starts to achieve obsolescence and so you have to go through expensive mid-life upgrades. Now there is good news on the horizon with the aircraft age problem. I am starting to bring in new equipment and new aircraft. The C-17s have arrived this past year, a wonderful new addition to our inventory. We signed a contract for C-130Js to replace our older E-model Hercs, we are working on replacing the Aurora and the F-18 in the next decade and our fixed-wing Search and Rescue. We are also buying Chinooks to upgrade our rotary-wing capability so there are a lot of new platforms coming. But in the meantime, I have to put up with a relatively older fleet of aircraft.

The CAF fleet has started to modernise with the purchase of C-17s.

'...a relatively small number of Air Force people are making a huge impact [in Afghanistan].'

The third is age of infrastructure. I have 13 Wings, of which 10 have infrastructure. The replacement cost value of that infrastructure is just under $6 billion, which means I should roughly invest $120 million in maintenance and repair and $120 million in re-capitalization, so about $240 million yearly. Over the past 10 years we have had trouble reaching that 2% for re-capitalization. The good news is, in the past few years we are getting very close and there are construction cranes popping up all across my wings, but the fact remains, of that $6 billion of infrastructure, 50% is 50 years of age or older.

So in summary, my priorities are to raise, train and equip; attracting people, training them, getting them into the units and retaining them for a long and fulfilling career in the Air Force and investing in new fleets.

The CAF must get younger to maintain its expeditionary nature.

Canada is making headlines with its new acquisitions. Is the International Security Assistance Force (ISAF) mission solely driving these procurements?

Not at all, in fact some of those acquisitions have been in the books for quite a while. We are not designing the Canadian Forces and optimizing the Canadian Forces to fight in southern Afghanistan for the next 20 years, although we are buying some equipment for that mission. There are a wide variety of missions around the world, even now, which we continue to execute that are not always well appreciated. For instance, the NORAD mission continues to be alive, dynamic and relevant and, as northern preoccupations grow with climate change, the NORAD mission, I think, will continue to gain in importance. We do search and rescue across the country, 24 hours a day, 7 days a week, and responded to 9000 incidents last year saving countless lives. The C-17 was good for hurricane relief in Myanmar, then in Jamaica, it is flown up north, but it also serves the needs of Afghanistan. We have two Chinook programs underway; a short-term program to purchase Chinooks for use in Afghanistan and to get that up and running within one year, which is an incredible achievement when you think about it – going from zero capability to a fully deployed combat-ready contingent in Afghanistan. The reason for the short-term program is that our longer-term purchase of those aircraft will not deliver in time to help the soldiers now currently executing the mission in Afghanistan. So we are bridging the gap by buying Delta model Chinooks quickly, through Foreign Military Sales, and then eventually we are going to have a replacement of Foxtrot models.

The CAF Search and Rescue responded to 9000 incidents last year.

Although it is for the Afghan mission, we are going to have the Foxtrot model serve in a wide variety of missions around the world for the next 30-years.

How will Canada's Air Power role in ISAF be changing as a result of the new capabilities coming on line?

Not dramatically. Right now our contribution to the Afghan mission consists of running the main support base. We have a Canadian theatre support base in the area, outside of Afghanistan. That is where we provide the airhead to provide support to the soldiers; the Air Force runs that. We provide the air bridge, obviously, transporting troops and equipment over there with C-17s, C-130s, contracted airlift, and airbuses. We run the Unmanned Aerial Vehicle function, a Sperwer vehicle right now. We have a project underway to replace that with a leased capability. It is on track and it will deliver a new, much more capable aircraft, by the end of this year [2008] for use in Afghanistan. The Air Force will continue to operate that as a joint capability on behalf of the force there. We have a C-130 that is doing ISAF internal airlift; we will continue that for the next little while. We will add to it the Chinook capability that I talked about; it should be up and running by early next year and there may be some other Air Force capabilities that go in, but the government position has yet to be taken. In the meantime, we are present in virtually every aspect of that mission in small numbers such as logisticians and support personnel. For instance, I have Air Force construction engineers that are in the midst of a very effective counter-improvised explosive device (IED) campaign by paving roads. Our soldiers, as you know, are taking a lot of causalities with IEDs and we found one of the best ways to combat IEDs is actually to pave the road, making it hard to plant an IED. The Army was running out of engineers to do that so they came to me and said, "Can your guys do that?" I said, well my guys and gals don't drive paving trucks, but they certainly can design those projects and supervise those that do. So I sent over a small cadre of a dozen or so Air Force construction engineers and they are supervising an Afghan workforce of about 500 people that are literally paving roads by hand, which helps solve the IED problem, keeps the Afghans employed and committed to their future. It is a

win-win situation. So, a relatively small number of Air Force people are making a huge impact.

Canada's Air Force is of an expeditionary mindset with recent missions to Bosnia, Kosovo and Afghanistan. What is going on inside the Air Force to cultivate this expeditionary capability?

Remember that Canada is so big that even inside our own country it is an expeditionary mindset, just to get from A to B and to continue operations. For example, the Forward Operating Locations in our high Arctic are a considerable distance away from our Main Operating Bases and we routinely deploy up there and, in fact, deployed up there with greater frequency this year as a result of an increased emphasis on NORAD operations. So we have always been of an expeditionary mindset, but we are enhancing that through a number of projects and capabilities. One is a project that has been underway for four or five years called the Air Force Support Capability where we have taken our various support entities and grouped them into mission support squadrons on our various wings. They are about a hundred people strong, various logistics and command and control capabilities. The advantages of it are that they train together, they deploy together, and they return together. In the past, what we have done is sort of gather those support capabilities piecemeal and it always made it very difficult when you deploy because you show up at the deployment never having seen your colleagues. This way they obtain that group integration even before they go. We are already using it to provide the contingent to man the forward support base for Afghanistan. So every rotation now is a mission support squadron that goes over and does that. It has proven to be very successful.

To that, we are adding a new Air Force Expeditionary Capability project starting with an Air Expeditionary Wing, which is a brand new wing being stood up in Bagotville, Quebec. The stand-up team is starting this summer with an initial operating capability in 2010. It consists of about 250 people focused mainly on security, logistics, command and control, and communications; all the key enablers, which allow you to go to an airfield and set up a military operation of whatever nature there. And so the concept would be, we would be tasked to go to an airfield – not a green-field site, there would have to be a runway – we set-up military operations, plug in some of those mission support squadrons I talked about to provide the logistic support, add various air capabilities – F-18s, Hercules, Auroras, whatever the nature of the operation requires – plug in a little bit of the leadership cadre at the top and then the core of it would be this Air Expeditionary Wing, the key enabler which would allow it to rapidly deploy. Their day job, when not deployed, would be to foster that air expeditionary mindset and capability across the Air Force by writing doctrine, writing standards, and developing and running exercises to keep that capability on a fine edge.

So from a Joint perspective, how does that fit with what the Army and the Navy are doing?

The whole idea is that the Air Force Expeditionary Capability would provide the air component, a joint capability; so we are all, Army, Navy and Air Force, developing similar concepts, which allows for a modular, tailored solution. This allows the Canadian Forces to select from a menu of capabilities, assemble them in a way that is needed, and rapidly deploy them with the appropriate leadership. On that last point, what does all this mean for today's Air Force leaders in terms of leadership qualities?

Today's Air Force leaders need to be just like yesterday's and tomorrow's – leadership is an enduring thing – it does not change every year. I view, especially, senior leadership in the Air Force as a very simple equation: it is thinking plus communicating equals leadership. And what you need from our Air Force leaders is a wide variety of intellectual and cognitive skills, the thinking aspect, to be able to take complex issues, sift through them quickly, come up with solutions, brief them at appropriate levels, obtain the necessary guidance and then formulate that into clear direction to your subordinates. However, you could be the greatest thinker in the world, but you have to be able to communicate too. You have to take those thinking skills and be able to combine them with the ability to articulate what the Air Force is all about, where it is going, what it needs to do, to provide vision, to provide guidance, to provide direction to a wide variety of audiences. You can be talking, as I do, one minute to the Minister in his Parliamentary Hill office and the next minute you're talking to air cadets on an annual review. They are all important audiences, but they all have to receive the message in a slightly different way. So, take those cognitive skills, combine them with world-class communication skills and you have a leader.

Thank you sir for this interview.

ISAF Needs a SOLE!

Lieutenant Colonel (ret) Rick Newton, Joint Special Operations University

I'd flown the night before so did not have to go in until noon. As I drove to the squadron, I was thinking, "We've been flying a lot lately. We need to focus on night flying, low level ops, and mountain flying…not normal stuff. There's a trust building among the crews and the ground teams as we work, plan, and prepare together. As long as we stay focused, we'll be okay."

There was a note waiting for me when I arrived at the squadron, "You have an appointment with the commander. I'll meet you there. OpsO."

The meeting with the boss did not go as I had hoped. His lead-off was harmless enough, "…I need you to do a special job for us when we get to the box." I was thinking he had a special mission for my section that might entail some specialised training. "This could be very interesting," I thought. I was totally unprepared for what came next ..

"I need you to be the air liaison officer for our task group. While the rest of us are down country, we need you in the headquarters co-ordinating air support for the task group."

Almost as soon as the boss said it, I started thinking about what he meant. I had a thousand questions. What air support was he talking about—aren't we that air support? What is an air liaison officer? Sure, the commander said all that stuff about sending a liaison was supposed to hurt, but they were not talking about me!

Back in his office, the OpsO explained it all. The commander really needed his best guy as the liaison to the CJFACC. I was the guy he trusted. My world had changed dramatically—and I wasn't happy.

While this anecdote may seem far-fetched, the story is true, many times over.[1] Sure, the flags on the pilots' shoulders were different, but the results were consistently the same…young aviators are being asked to do great things for their national special operations task groups (SOTGs) as Air Liaison Officers (ALO), because NATO SOF did not learn the lessons from years of exercises, NRF certifications, and real-world operations. National SOTGs are compensating for the fact that NATO SOF does not have the command and control structure to coordinate, deconflict, synchronise, and optimise air support for SOTGs throughout the theatre.[2] While it is too late to change what is past, we can change organisations and processes for the future.

The special operations structure for NATO's International Security Assistance Force (ISAF) in Afghanistan was designed to address the concerns of expeditionary operations in an austere and distant environment.[3] For NATO SOF, timeless military principles of unity of command and simplicity were seemingly forsaken for more important considerations of political expedience, risk mitigation, and inclusivity.

Some special operations task groups have deployed to ISAF without any air assets. On the other hand, some brought very capable, technologically sophisticated, special operations aviation capabilities, but they kept those high value resources under tight national control. The middle case was SOTGs with organic or on-call air support; able to provide routine, but limited resources for their task groups, but unable to support the most demanding special operations missions.[4] While not every special operations mission requires technologically advanced air, it is also true that some missions can only be successful if the air element has the ability to fly at extremely low level, with little to no illumination, in the most inhospitable of environments. The challenge for SOF is to use appropriate air assets based on capability and capacity, regardless of nationality.

That challenge would test the Wisdom of Solomon. So, what then might special operations planners do to ensure adequate and appropriate air support throughout the theatre of operations? The answer—start with the doctrine.

AJP 3.5, Allied Joint Doctrine for Special Operations, directs the CJFSOCC to provide a Special Operations Liaison Element (SOLE) to the CJFACC to coordinate, deconflict, and integrate joint special operations with conventional air operations. The SOLE also ensures that special air operations are included on the ATO and that SOF airspace control requirements are reflected in the ACO. Requests for air support for special operations are routed through the SOLE.[5] Without a SOLE to optimise allocation of organic and direct support assets and to prioritise theatre-level requests, national SOTGs must fend for themselves—and the results may be a frustrating, or perhaps embarrassing, misallocation of precious air assets. So, what does this mean for a national ALO?

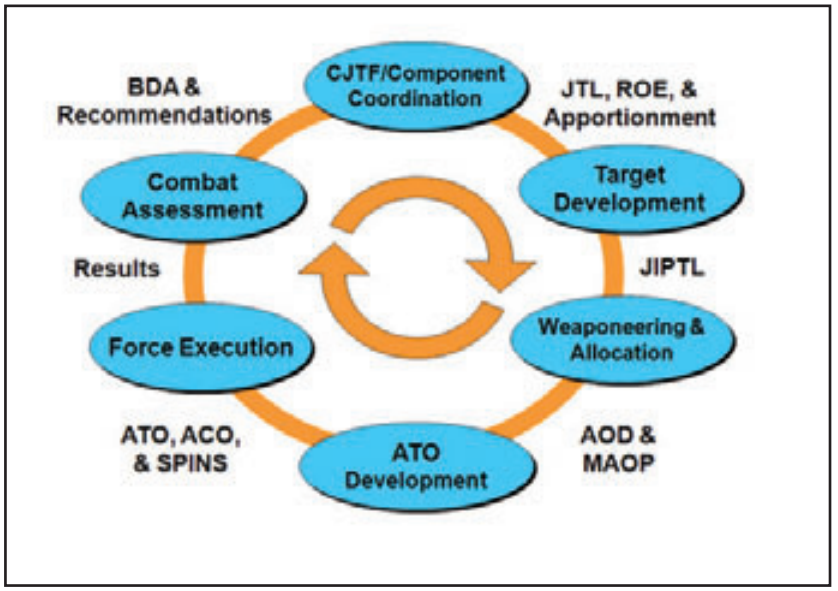
'Without a SOLE to optimise allocation of organic and direct support assets and to prioritise theatre-level requests, national SOTGs must fend for themselves...'

First of all, the SOF air liaison must be intimately familiar with the mission and the tasks his SOTG has been given in their area of operations. Then, what sort of airlift, ISTAR, and other resources will be needed to support the assigned missions, and how often? Next, the ALO must prepare himself by knowing the threat and the environmental requirements for the assigned area. And finally, what capabilities are available to the SOTG?

This first part is relatively easy and should be the result of the commander's estimate and the staff's mission analysis. Where it gets difficult for the ALO is getting any additional air support requirements over and above organic or direct support capabilities or capacity. This is the essence of the problem. All air assets, whether conventional or specialised, are inherently limited. Thus, the CJFACC must optimise limited assets to meet the Joint Force Commander's objectives. The ATO process is used to apportion and allocate air support in theatre. From a practical perspective, this means that special operations requirements must be represented during each step of the ATO process.

Successful special operations ALOs must know the air component's battle rhythm and when the important meetings, working groups, and boards meet, in order to establish a presence and relationships with the key players.[6]

This article is not about the joint air tasking process and how it works. But, it is helpful to remember the six steps in the



Joint Air Tasking Process.

process and that it generally takes 2-3 days to build and execute an ATO. (See diagram above) If the SOF ALO only works a mission every three to four days, then this battle rhythm is not difficult to sustain. The ALO can follow each mission through the entire process, from start to finish. But, if the SOTG is working multiple missions, some spanning two to three weeks from infiltration to extraction, perhaps with one or more resupplies, then the ALO's task becomes more difficult.

One SOF ALO said it best, 'Early on I discovered I had so many critical meetings to attend in order to establish and maintain my situational awareness, ensure my guys got the support they needed, and be involved with the task group so that I could predict future requirements and avoid potential conflicts, that sleep became a luxury. I didn't need to be an insomniac to be successful, but it helped.'

It is nearly impossible to attend every important meeting, long term, and sustain that presence. While an SOTG commander will want his liaison to represent his SOTG and look out for their needs, there is a better, more effective way to manage air support requirements.

'...I had so many critical meetings to attend in order to establish and maintain my situational awareness, ensure my guys got the support they needed, and be involved with the task group...I didn't need to be an insomniac to be successful, but it helped.'

At the tactical level, the SOTG-J3 arranges for local air support from the other components within the Regional Command. That role is a tactical responsibility and is beyond the scope of this article. At the ISAF level, however, NATO SOF needs an organisation to take a theatre-level approach to air support. Sending an officer to the air component from the SOTG is not the whole answer to theatre-level co-ordination, deconfliction, and integration of special operations.

The SOLE is a team of special operations experts; primarily airmen, but it can include ground and maritime Special Forces when the situation warrants specialised expertise. The SOLE Director is the CJFSOCC's representative to the ACC and is the conduit between the commanders for their concerns, as well as serving as the source of situational awareness for each. Equally, the SOLE Director becomes the ACC's primary advisor for SOF. He should have the rank commensurate with the host commander's key staff and have access to the CJFSOCC in order to best represent him at the CJFACC's key meetings. As most ACC are general/flag officers and their staff directors are colonels, the successful SOLE Director is usually a colonel.

The SOLE should have the manning and training to ensure adequate representation at each step in the ATO, ACO, ISTAR, and targeting/effects processes that comprise the Joint Air Tasking process. The right size of the SOLE depends on the CJFACC's battle rhythm, the number of SOTGs, and the phase of the operation.

What a SOLE usually lacks is the national perspective of the SOTGs. Instead of sending ALOs to the air component, it is recommended that SOTGs send their ALOs to the SOLE. This ensures the SOTGs' requirements are identified to the special operations airmen by articulating requirements, explaining priorities, and working out alternative courses of action to best meet the SOTGs' needs.

Taking this approach relieves the national ALOs from having to be insomniacs—the SOLE monitors evolving requirements, attends the meetings, co-ordinates with the ALOs for information

and mission changes, and helps focus the liaisons' attention and efforts. In turn, the liaisons serve as conduits between the SOTGs and the SOLE, making sure the senior SOF airman can articulate their perspectives, limitations, and potential contributions.

So, what should be the way ahead? Go back to the doctrine. ISAF needs a SOLE; large enough to represent all ISAF SOTGs. That SOLE needs a CIS package that enables secure data and voice communications with the ISAF SOCCE, the ISAF cell at the Combined Air Operations Centre, and with ISAF SOF Cell at Ramstein. I estimate they will need approximately 12 people to adequately accomplish everything they will be expected to do. The ISAF SOLE must be addressed in the force generation process as a critical, 'must-fill' requirement. While it is highly desirable that the majority of the SOLE come from the special operations framework nation, that requirement can be waived if at least the SOLE Director and the SOCCE Commander are from the framework nation and they have a solid and positive relationship.

Afghanistan is a mature theatre of operations. The SOTGs have requirements for ISTAR, air transport, personnel recovery, fire support, and other capabilities that are best addressed at the theatre level. NATO SOF has been in ISAF too long to continue 'ad hocing' their air support. It is time to go back to the book and build the SOLE that should have been in place from the start. The current system of national SOF ALOs is working because good people are making it work—but there are misallocations of resources both internal to the SOTGs and at the theatre level. If we're not willing to apply the doctrine in a mature theatre, then we should probably change the doctrine and eliminate the SOLE from NATO's lexicon. At least then, NATO SOF would be admitting to itself that they would rather do things harder than smarter. ■

1. Over the past year, the author conducted a dozen interviews with special operations airmen from as many countries and discovered the same or similar stories related to their experiences preparing to deploy as air liaison officers for their national special operations task groups.
2. The Special Operations Liaison Element (SOLE) is a liaison team provided by the Commander CJFSOCC to the Combined Joint Force Air Component Command (CJFACC), or appropriate component air C2 organisation. AJP 3.5, Allied Joint Doctrine for Special Operations, 2nd Study Draft, pg 3-3, 2008.
3. The author was privileged to participate in the planning for NATO SOF's deployment to ISAF.
4. The principal tasks for special operations forces in NATO are direct action, special reconnaissance and surveillance, and military assistance.
5. AJP 3.5, 2nd Study Draft, pg 5-8.
6. The importance of establishing relationships cannot be overstated...in fact, it is often said within SOF that the key to success in special operations lies in the relatinships established with the population you are trying to influence. One succesful ALO told me he took up smoking just so that he could go outside and have some informal time to interact with his counterparts and build the relatinships that might pay off later should he need the other components' help.

'NATO SOF has been in ISAF too long to continue 'ad hocing'...'

Focusing the Maritime Picture

Automatic Identification System (AIS)

by Commander Renato Micheletti, JAPCC

Maritime Security Awareness

Protecting maritime commerce from attack or exploitation by terrorists is critical to global security. Maritime security also has a major defence dimension. It is highly unlikely that NATO will be able to sustain a major campaign in the foreseeable future without the capacity to transport assets by sea. Because of this, an accurate, real-time picture of all aspects of maritime activities – the Recognised Maritime Picture (RMP) – is vital to NATO.

NATO defines Maritime Security Awareness (MSA) as 'the understanding of military and non-military events, activities and circumstances within and associated with the maritime environment that are relevant for current and future NATO operations and exercises'. NATO Air assets have historically provided a valuable input to the RMP and, hence, to the MSA of the Commander Joint Task Force, both within and beyond the traditional NATO Area of Responsibility. During the Cold War, Maritime Air (MA) was routinely used to locate and identify enemy combatants and auxiliaries. Commercial shipping was identified when possible, but this required time consuming 'rigging' by MA to gain information on individual ships. At best, a MA crew would gain tactical information on a handful of merchant ships per mission.

With the new challenges that the Alliance is facing in Defence Against Terrorism and the potential use of commercial shipping as weapons, transporters of weapons or intelligence gathering platforms, it is imperative that data

on commercial shipping feeds the RMP. NATO has been obliged to evaluate all available sources that can provide maritime information. Among the immediately available options was the Automatic Identification System (AIS).

AIS should be used with other sensors to conduct maritime surveillance operations.

AIS

The legal basis of AIS lies in Regulation 19, Chapter V of the International Maritime Organization (IMO) Safety Of Life At Sea. This document sets out the navigational equipment to be carried on board ships, according to their type. In 2000, IMO adopted a new requirement for ships to carry AIS. The regulation required AIS to be fitted aboard all ships of 300 gross tons or more engaged on international voyages, cargo ships of 500 gross tons or more not engaged on international voyages and all passenger ships, irrespective of size. The system works by integrating a VHF transceiver system with a GPS receiver and other navigational equipment on board ship, and must be maintained in operation at all times. The equipment provides ship's identity, type, position, course, speed, navigational status and other safety-related information, automatically to shore stations, other ships and aircraft. The equipment also receives this information automatically from other AIS fitted ships. Although AIS is used primarily to improve safety at sea, it can also be used for monitoring maritime activity.

AIS in Military Activities

The range of a ship-borne AIS receiver is 20-40 NM in normal conditions; however it can be picked up at greater than 200 NM by airborne platforms, dependent on their altitude. Military Surveillance capabilities are considerably enhanced if they are fused with AIS and vessel traffic system products from competent civil authorities, who have gathered the data from shore stations, coastguard and other civilian installations. There is scope for using a deployable, land-based, AIS capability during expeditionary operations in areas such as choke points and archipelagos.

AIS capability adds value to operations - specifically in maritime choke points.

In Maritime Interdiction Operations, AIS obviates the need for conducting full VHF voice hailing of contacts of interest (COI), with its concomitant delays due to language difficulties and misunderstandings. An AIS transceiver fitted to 'rigid-raider' type boarding boats could significantly improve their coordination and utility and provide a measure of tracking and ID, thus avoiding blue-on-blue engagement.

In adverse weather conditions or for boarding parties over the visual horizon, AIS could also be used to vector the boats back to mother

'AIS would also have considerable utility in Search & Rescue (SAR) operations...'

or onto further COI. AIS would also have considerable utility in Search & Rescue operations, where it could assist the Scene of Action Commander (whether ship-borne or airborne) by improving his situational awareness and allowing him to use other available assets efficiently. AIS is already in use by several member nations in support of ongoing NATO operations and the results to date have been impressive.

AIS System Limitation

Whilst AIS data can be used for military purposes, it must be kept in mind that the system was developed for non-military use and, therefore, has certain limitations. AIS positional data is only as accurate as the positional source used. Off-sets can be applied relatively easily and malicious tampering in the conduct of illegitimate activities is entirely feasible. Experience to date, however, has shown that the majority of false information transmissions were a direct consequence of either poor onboard technical implementation or due to the inadequate training of operators. Furthermore, anomalies in AIS data may arouse suspicion and focus attention, so any malicious tampering could be counter-productive.

Other errors may be caused by AIS receivers detecting spurious data, as well as the poor positioning of receivers causing AIS data interruption due to masking. Even if AIS data is correct and the system is working properly, the military planner must bear in mind that not all ships are mandated to carry AIS. This is a major limitation in building the RMP, especially in those areas (choke points, littoral waters) where the majority of merchant traffic is not required to carry AIS and the principal threat may come from very small vessels. Furthermore, a ship's Master may legitimately switch off AIS, if he considers that its continued use may compromise the security of his ship. The criminal use of AIS data, particularly by those engaged in piracy, has proved a major risk to merchant shipping in high threat areas, so this latter situation is not unusual.

AIS on Airborne Platforms

Airborne platforms collect and provide significant amounts of data because of their ability to cover large areas due to their speed and operating altitudes. The degree of contribution to the RMP is dependent on factors like endurance, mission profile, operating altitude, equipment fit, level of system integration, data processing ability, crew work load and environmental conditions. Although maritime-related missions are predominantly

undertaken by Maritime Patrol Aircraft (MPA) or naval helicopters, typically using sophisticated radars, ESM systems, acoustic sensors, data links and EO sensors, AIS may also be fitted to a wide range of other air platforms. These may include Airborne Early Warning Aircraft, UAVs, transport aircraft and even satellites (the US Coastguard is conducting a study into the latter). At its most basic, an aircraft installation will consist of an AIS receiver, aerial, and display. A more advanced installation may include a data storage unit and a transmitter to broadcast the aircraft's position and to pass received data to other units. Operational experience has proved that it is possible to fit a standalone AIS receiver to an aircraft very quickly, without integrating it into the tactical system. AIS data, downloaded post-landing and then transferred to Maritime Headquarters, generally still holds military value because the course and speed characteristics of shipping are not normally subject to major changes over relatively short periods of time. Data received from AIS must be properly classified and have a confidence level assigned to each track. NATO standard confidence levels remain extant, and AIS should be considered as a sensor in its own right when deciding track classification and confidence levels. However, AIS data does not carry an indication of its track quality, unlike LINK or most organic MA sensor data, and this must be taken into account when considering the contact classification. Because of this, AIS tracks should be classified according to the source e.g. low quality if coming from a suspect vessel, to higher qualities if analyzed by a trusted operator, confirmed by another sensor or visually identified. The ability to store the MERSHIPS Guide/Lloyds of London database on the aircraft's tactical computer hard drive (including photos of the vessels for easy comparison), pre-flight insertion of COI details, coupled with software that automatically highlights suspect vessels will all combine to reduce aircrew workload in the collection and processing of a large volume of AIS contacts. This will increase both the quality and the amount of data input to the RMP.

AIS can be fitted to airborne platforms to increase maritime coverage area.

Conclusion

The potential contribution of AIS to an accurate RMP, particularly when data is gathered by airborne platforms, is clear. However, it must be recognised that, due to its vulnerability to deception and spoofing, it should be used only either as an aid to classification, to be corroborated by other means, or as a low Track Quality data source. It must not be seen as a panacea and should be used in conjunction with other sensors when conducting maritime surveillance operations. The proposed development of the Long Range Identification and Tracking capability by the IMO may significantly extend the ranges at which surveillance may be conducted and this may enable rogue shipping and critical COI to be continuously tracked. However, the susceptibility of the system to manipulation, coupled with the reliance on the honesty of a vessel's master, will continue to undermine its legitimacy. Notwithstanding these concerns, AIS will become an increasingly important and widely used capability in the short to medium term, capable of producing a 'quick win' at relatively low cost.

Delivering Logistics to the Frontline Warrior

by Maj General (Ret) Karl-Heinz Münzner, NAMSA General Manager

NATO's Maintenance and Supply Agency (NAMSA), based in Capellen Luxembourg, has been supporting the NATO armed forces for 50 years. Established by the North Atlantic Council (NAC) in 1958, it was set-up with the objective to maximize the effectiveness of logistics support provided to NATO armed forces and to minimize the cost to NATO nations: individually and collectively. Times have changed in the last half century, and now NAMSA finds itself at the forefront of providing logistics on the ground wherever NATO has a mission to fulfil.

Many factors have shaped this change: reductions in budgets for defence spending, a continued downsizing of national forces, Crisis / Humanitarian Response Operations, increased national commitments to NATO, UN, EU, etc and the corresponding competition for scarce resources to name a few. Set against this background, there is a fundamental synergy amongst existing capabilities, which in turn has led to Logistical Transformation: both for NATO and the nations.

Support to NATO operations

NAMSA began its Transformation in parallel with that of NATO. NAMSA has broadened its former exclusive focus on supplying spares and maintaining weapon systems to include the support of Crisis Response Operations (CRO) in theatre.

In the mid-90s, NAMSA started to develop its operation support capabilities on a small scale when it was tasked on a national level to construct camps for the armed forces in the Balkans.

This was new territory for the Agency, but the results inspired SHAPE to task NAMSA directly in 1999 with various engineering projects on behalf of KFOR, including the repair of roads and rail links. NAMSA was soon faced with a number of challenges, not least of which was its own procurement regulations that stipulated that all tenders must be made by International Competitive Bidding (ICB) amongst industry within the NATO area. Potential difficulties culminated when a contract for gravel (to be used as a foundation for both road and rail beds) was won by a nation in northern Europe. Although the regulations had been complied with, the time it would take for a convoy of vehicles to reach the final destination, the numerous border crossings that this would entail, plus the additional hazard of 'tolls' being extracted whilst in

the Former Republic of Yugoslavia (FRY), caused the Agency to re-think their strategy. Finally, permission was sought and given by the Board of Directors to enable NAMSA to provision Sole Source inside FRY, a non-NATO country. Nevertheless, in the majority of cases ICB is used for NAMSA procurement. This experience also marked the start of NAMSA's continuing strategy of ensuring that both procurement staff and logisticians are available in-theatre. For more than a decade now, NAMSA specialists have been serving in theatre, providing support for NATO operations.

Since the mid-90s, NAMSA has been involved in many CROs. In 2002, NAMSA provided the airlift to Mozambique for one NATO nation that wished to send equipment (including helicopters) and supplies to the stricken area, but had no strategic lift capability. The only plane capable of lifting Super Puma helicopters was the Antonov 124. From the time the initial request was received to 'wheels down' in South Africa (nearest available airstrip capable of taking an Antonov) - including international tender, procurement, loading and flight times – a mere 84 hours had elapsed – a lesson for those who think that NATO moves slowly!

A year later and NAMSA was again providing airlift, this time to Iranian earthquake victims. In 2005, NAMSA deployed the Combined Joint Task Force camps (stored at its Southern Operational Centre in Taranto, Italy) to Pakistan to help with NATO's Pakistan earthquake relief effort. NAMSA now has contracts in place for assured access for both strategic sea and air-lift. The lessons learned from these missions have been applied in an incremental manner to larger operational commitments.

NAMSA in Afghanistan

NAMSA is evolving today in a new context, underpinned both by NATO's Transformation and by the Alliance operational commitment in Afghanistan.

The transformation of defence logistics is driven, in part, by operations in Afghanistan and, in this framework, NAMSA is a major contributor to effective solutions. Logistics support for operations in Afghanistan is a major challenge that continues to test Alliance capabilities. The scale of NATO's commitment in Afghanistan has shown that, for logistics support, the 'lead nation concept' represents a heavy burden, which most nations are unable to bear for long periods.

These factors have resulted in the need for multinational logistics solutions, which ensures that each nation receives the logistics support it requires to sustain its forces, but with a reduced logistics footprint. Accordingly, senior logisticians of the Alliance have written multinational logistics solutions into NATO doctrine for the logistics support of operations and are working towards making this a reality.

Earthquake relief efforts.

'Kandahar Airfield (KAF) represents the largest operational support project ever undertaken by NAMSA.'

NAMSA is engaged in a wide variety of projects in locations throughout Afghanistan, including infrastructure projects (construction of bulk fuel installations, runway and taxiway repairs, de-mining and construction of temporary and permanent buildings) and the provision of support services. By the end of 2007, the earthworks at Kabul/Afghanistan International Airport (KAIA) were completed in preparation for NAMSA's most ambitious (€80M) infrastructure project to date. The vertical construction of KAIA's north side enlargement began in the spring of 2008, and includes the provision of accommodation, offices space, hangars and a medical facility. This represents NAMSA's largest infrastructure project to date. Some of these projects and services are commonly-funded (through NATO budgets), whilst others are multinationally or nationally funded.

Kandahar Airfield (KAF) represents the largest operational support project ever undertaken by NAMSA. The Agency has developed an integrated, contracted, multinational solution for Real Life Support (RLS) for up to 13,000 troops and for the bulk of airport debarkation services. NAMSA is managing a contract for 6 key stakeholders (5 nations plus the NATO command structure), plus 2 NATO Agencies and one nation under separate Sales Agreements; this will achieve lower prices than could be achieved on a piecemeal basis. These RLS contracts have resulted in substantial cost reductions for the nations e.g. the cost of providing meals has been reduced by an estimated €5M a month, whilst the quality and choice have vastly improved.

'By the end of 2007, the earthworks at Kabul/Afghanistan International Airport (KAIA) were completed in preparation for NAMSA's most ambitious (€80M) infrastructure project to date.'

In a project of the type and magnitude of KAF, NAMSA is making multinational logistics in-theatre a reality. NAMSA staff are committed to maintaining the link between industry and foxhole by using state-of-the-art, network-based logistics chain management and to generating trust in multinational logistics solutions in-theatre.

On another front, NAMSA has signed a Memorandum of Cooperation for a Trust Fund project with the Afghan government to improve safety and physical security at munitions depots in Afghanistan. The project will cost €6.29M and will be implemented over 24 months. It will provide assistance to the Afghan Ministry of Defence in carrying out an assessment that will form the basis of a national action plan for ammunition stockpile management, including the disposal of surplus and unserviceable stocks. Finally, it will review the training needs of the Afghan National Army and the civilian workforce in its depots and provide appropriate training in ammunition logistics and technical duties.

The NATO/PfP Trust Fund mechanism, established in 2001, is a vehicle to assist NATO's partner nations in the safe destruction of stockpiles of anti-personnel landmines, small arms, and munitions and to help manage the consequences of defence reform.

To date, NATO Member and Partner Nations, as well as other nations and international organizations, have pledged more than €38M to ongoing and completed Trust Fund projects.

Afghanistan operations represent the largest ever NATO usage of contractors in-theatre and illustrates the kind of contracted support solutions that are potentially available for the NRF. Contracted solutions are not just 'fire and forget,' they bring with them the responsibility to manage contractor performance and to undertake constant quality assurance assessments to ensure that the services are being provided as contracted. To this end, NAMSA has procurement specialists, logisticians, civil engineers, food specialists, Quality Assurance and other specialist personnel in-theatre to act as the bridge between its civilian contractors and the military end user.

'To date, NATO Member and Partner Nations, as well as other nations and international organizations, have pledged more than €38M to ongoing and completed Trust Fund projects.'

In summary, returning to the new realities of 21st century military logistics, one can say that Transformation has occurred at NAMSA. By taking the burden away from the war fighters, NAMSA has proved that multinational logistics solutions for operations can be provided cheaper than, and just as fast as, that of any military force. Savings in cost and time and improvements in effectiveness are being demonstrated on a daily basis in Afghanistan. As a direct result of this success, nations and the Alliance are turning more and more to NAMSA for logistics support. ■

Contracted solutions are monitored for performance, quality and to ensure services are provided as required.

The MAJIIC Experience

Transforming NATO's ISR Capability

by Lieutenant Colonel Frank Scholze and Lieutenant Colonel Jens Fehler, JAPCC

ISR information and data collection is traditionally integrated within the operational planning process. However, recent Lessons Identified point to issues of non-sharing and limited collaboration. The resultant increased intelligence resource need, and the increase to the military footprint, works to the detriment of all. The Collection, Co-ordination Information Requirements Management process, while essential, is routinely frustrated by a lack of oversight of asset availability and ownership of assets.

This point was made in the JAPCC C4ISR Roadmap. Although predominantly dealing with air related ISR issues, it has direct read across to problems and challenges in the Joint arena. This complex area is characterised by technical deficiencies, procedural gaps, political restrictions, and mindset obstacles.

Historically, the development of ISTAR concepts took a long term perspective and tended to ignore the problems faced in current operations. Where they existed, single service solutions to these problems appeared to ignore the need for a coherent Joint approach, and there was no mechanism to gather feedback from the warfighter or end user.

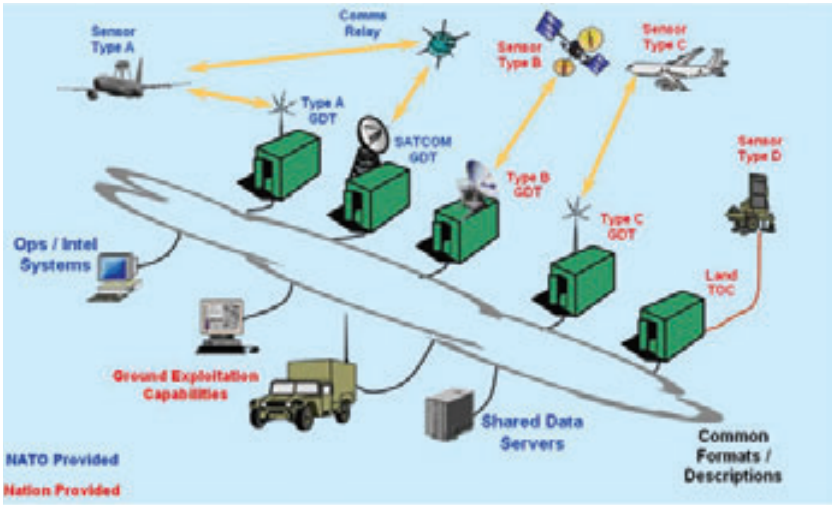
'MAJIIC is a multinational effort to maximize the military utility of surveillance and reconnaissance resources...'

The commander in the field needs to make appropriate decisions based on a common Joint operational picture and shared situational awareness. For this to happen, there must be timely and persistent data collection and access to multiple information sources, as well as technical and Command and Control (C2) resources.

MAJIIC

The Multisensor Aerospace Ground Joint Intelligence Surveillance and Reconnaissance Interoperability Coalition (MAJIIC) is a project that started in 2005. A 6 nation Coalition AErial Surveillance And Reconnaissance (CAESAR) initiative created the basis for the project, which now has 9 contributing nations. Working in close cooperation with industry, the nations participating in MAJIIC are Canada, France, Germany, Italy, the Netherlands, Norway, Spain, the United Kingdom and the United States of America. The nations have appointed the NATO Consultation, Command and Control Agency (NC3A) as a facilitator for the project and to provide overall technical management.

The programme was planned to culminate in a full scale project demonstration in 2009. Participating Nations agreed to an extension to this timescale to 2010 with the Expanded MAJIIC now called E-MAJIIC. MAJIIC is a multinational effort to maximize the military utility of surveillance and reconnaissance resources through the development and evaluation of operational and technical means for the interoperability of a wide range



MAJIIC interoperability architecture in principle.

of ISR assets. The multinational agreement also includes options for a follow-on project, Multinational Advanced TRansformational ISR Coalition Services (MATRICS).

The primary aim of the MAJIIC project is to improve commanders' situational awareness through collaborative employment and use of interoperable ISR sensor and exploitation capabilities. MAJIIC's aspiration is to bridge the deep ditch that exists between exercise generated knowledge and warfighter needs. To achieve this, MAJIIC addresses interoperability from 3 primary perspectives:

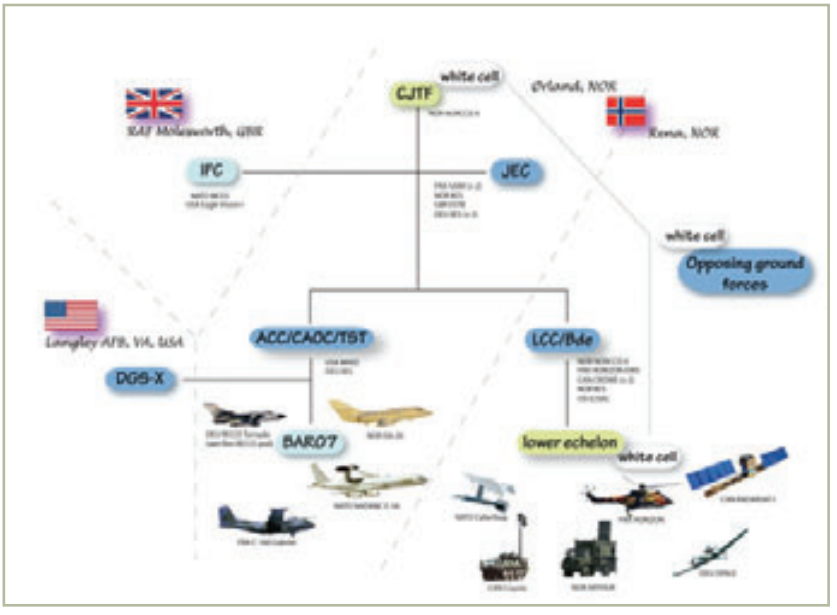
• The Operational Perspective includes the development and demonstration of concepts of employment (CONEMP) and tactics, techniques and procedures (TTP) for collaborative employment and use of coalition ISR assets in support of military missions. These documents have been prepared for easy incorporation into NATO and national doctrine.

• The Architectural Perspective includes the development of procedures and technology for sharing ISR data and information, system architecture design principles, tools and technology for collaboration, and tools for managing coalition ISR assets.

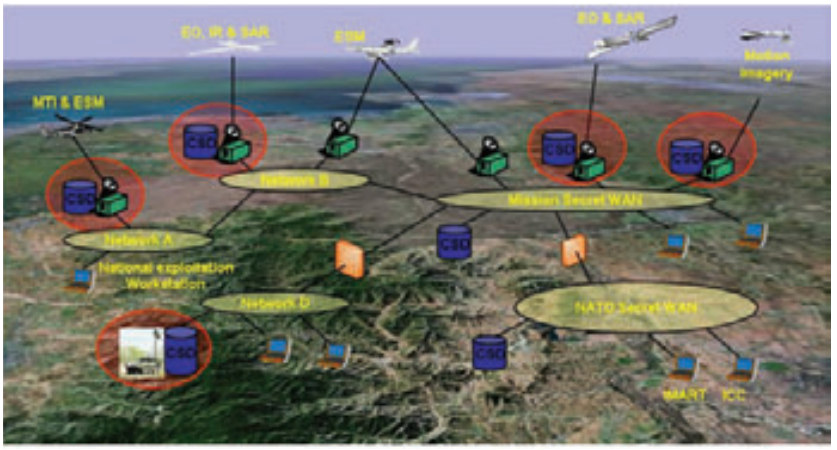
• The Technological Perspective includes the definition and development of key data formats and protocols for the various sensor and data types, along with tools to support common geo-registration, and data exploitation.

MAJIIC also addresses the ability to collaboratively employ and exchange data from a wide variety of ISR sensors and sensor types in a network-enabled manner, including close coupling between the ISR assets and the NATO and national C2 environments. For example, it aims to enable interoperability between, say, a French HORIZON Ground Moving Target Indicator (GMTI) radar sensor platform and a German Interoperable Imagery Exploitation System (IIES) through the use of common interfaces for data formats and exchange mechanisms; it leaves the inner workings of each national system outside the scope of the project and requires only minor modifications to the external interface of each system. The end user would just receive the requested intelligence product. Where that product came from - ground or air-based system, U.S., British or Czech - would be immaterial.

The common formats and exchange mechanisms employed in MAJIIC are based on NATO standardisation agreements (STANAGs). MAJIIC enables the exploitation of sensor products from every location in the world, as long as they can data link to the network. MAJIIC assesses a wide range of network-enabled architecture approaches for enabling the exchange of near real time (NRT) and archived data and information, including techniques such as broadcast, publish-subscribe and request-only. As part of this, MAJIIC has implemented an interface based on STANAG 4559 (NATO Standard ISR Library Interface) for metadata-



The TRIAL QUEST 07 / BOLD AVENGER 07 structure.



MAJIIC network for the warfighter.

based access to and retrieval of archived data from any Coalition Shared Database (CSD) throughout the interconnected MAJIIC environment. In areas where no STANAG exists, such as Instant Messaging tools for distributed operator collaboration, the project will assess widely used commercial standards for their potential use in coalition operations.

In order to be adaptable to real-world deployed operations, where the availability of terrestrial and satellite bandwidth might be scarce, MAJIIC is able to support interoperability using any network type or bandwidth, as well as any combination of networks and interconnections. This approach includes dissemination of near-NRT and archived data, the latter by using CDS, which are synchronised at the metadata level to provide full visibility of all archived data throughout the network, independent of where the users are located.

Through this approach, MAJIIC provides a true network-enabled capability enabling a wide variety of users at different locations and levels of command to access and retrieve data in accordance with own tasks, needs, priorities, and preferences. Notably, the MAJIIC architecture is compliant with the NATO Network-Enabled Capabilities initiative.

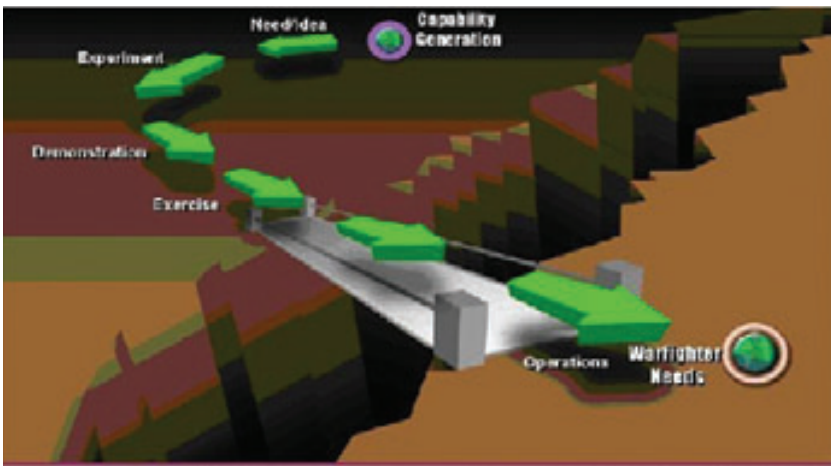
MAJIIC and its CSD deliver an information and knowledge sharing network where nations are free to decide on the amount of data and degree of detail, as well as the classification. As a closed self-contained information system, MAJIIC also provides network privacy. However, as with all systems, the quality of the input determines output quality and, hence, the benefit for the user.

The project's aim was to stage the technical ISR demonstration - TRIAL QUEST 07 (TQ 07) as an integral part of the live-fly exercise BOLD AVENGER. To ensure the strongest possible operational foundation for the project, the efforts under MAJIIC run alongside the development of draft operational doctrine in the form of CONEMP, TTP and other requirements. This development and evolution is supported by operational expertise from the participating nations working in close cooperation with NATO commands and liaising with a wide range of NATO, multinational and national activities and programmes. In this respect, JAPCC is directly supporting NC3A with air related input as well as the exchange of information and expertise.

TRIAL QUEST 07

TQ 07 addressed warfighters' needs concerning information superiority and situational awareness. It took place in September 2007 in Norway, supported by organisations and units from Europe and North America. It addressed the following interesting and challenging issues: the integration and C2 of ISR assets in a complex operational scenario, the combination of technical demonstration and live-flying exercise, the integration of unmanned and optionally piloted airborne sensor platforms, as well as the exploitation of various sensor products (e.g. GMTI, EO, OPT, IR).

The event was prepared and conducted under the lead of



Bridging the ditch to operations by implementation of MAJIIC.

the Conference of National Armaments Directors' (CNAD) Joint Capability Group on ISR (JCGISR) and its ISR Integration sub-group with outstanding support and contribution by the Norwegian hosts, in particular, the Royal Norwegian Air Force and the Ørland Main Air Station.

TQ 07, with the essential contribution of MAJIIC, broke down the stovepipes we have in intelligence and surveillance systems. In essence, it demonstrated that the integration of existing and future ISR capabilities is not only possible, but achievable. As mentioned, TQ 07 was conducted in parallel with BOLD AVENGER, a NATO air exercise, supporting time sensitive targeting and ISR activities. The main objective was to prove technologies, processes and procedures in the Defence Against Terrorism context, integrated for the first time in a live-fly exercise. Additionally, a Land Component Command element, including allocated assets, was included in the demonstration program in order to identify interfaces across the Joint environment.

For the purpose of the trial, a Joint Exploitation Cell was established as an organisational tool to plan and execute ISR operations including collection, exploitation and dissemination management. The conclusion from this ISR demonstration was that it is technically possible to support the standard NATO Intelligence cycle in a complex operational exercise environment. ISR interoperability is no longer a utopia, but a vision. All that is required now is the motivation to transfer the concept into reality for the benefit of the coalition warfighter.

Bridging Exercise Results to Needs

More work needs to be done to get ISR capabilities to the warfighter. NC3A intends to complete MAJIIC with MAJEX 08, a simulation exercise, which will demonstrate the capability to NATO stakeholders in October 2008. To build the bridge to the needs of operations and warfighters, it is critical to decide on the rapid implementation of the MAJIIC concept and the technology of this ISR capability, and not to stop at the edge of the ditch.

Technical deficiencies can be solved by consistent implementation of standards, but this requires a motivation to use the standards, rather than to express objections against them. MAJIIC is a good example of how, by applying common standards, the integration of both legacy and modern ISR systems is possible.

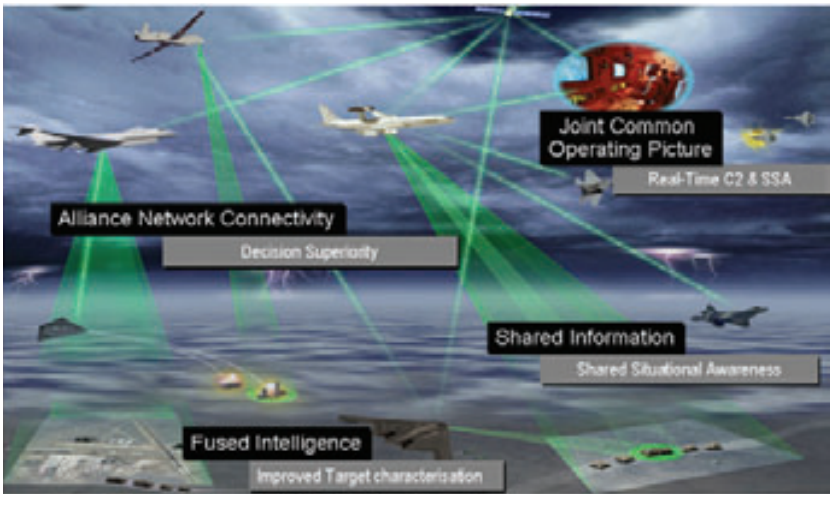
The promotion of a Common Understanding of NATO doctrine, harmonization of NATO's and individual nation's approach to operations and the development of a Joint Force Culture could overcome procedural gaps. A classification and information sharing policy, which reflects Joint operational needs and the minimization of national caveats for asset deployment will make ISR capabilities and assets available to the commander and warfighter.

MAJIIC delivers a practicable solution to address the frustrating ISR deficiencies mentioned in the introduction. However, any idea needs support, and NATO is dependent on the contribution of its member nations. These nations must be shown the benefits of a concept like MAJIIC and its CSD.

The one overwhelming conclusion is that if there is no will to provide input to the data base there will be no significant output to assist the commander in the field or the warfighter.

However, the challenge for the future will be the management of the entire Intelligence data flow from collection to dissemination. The link with existing and future Joint C2 systems would be the next step. But that is a different story… ■

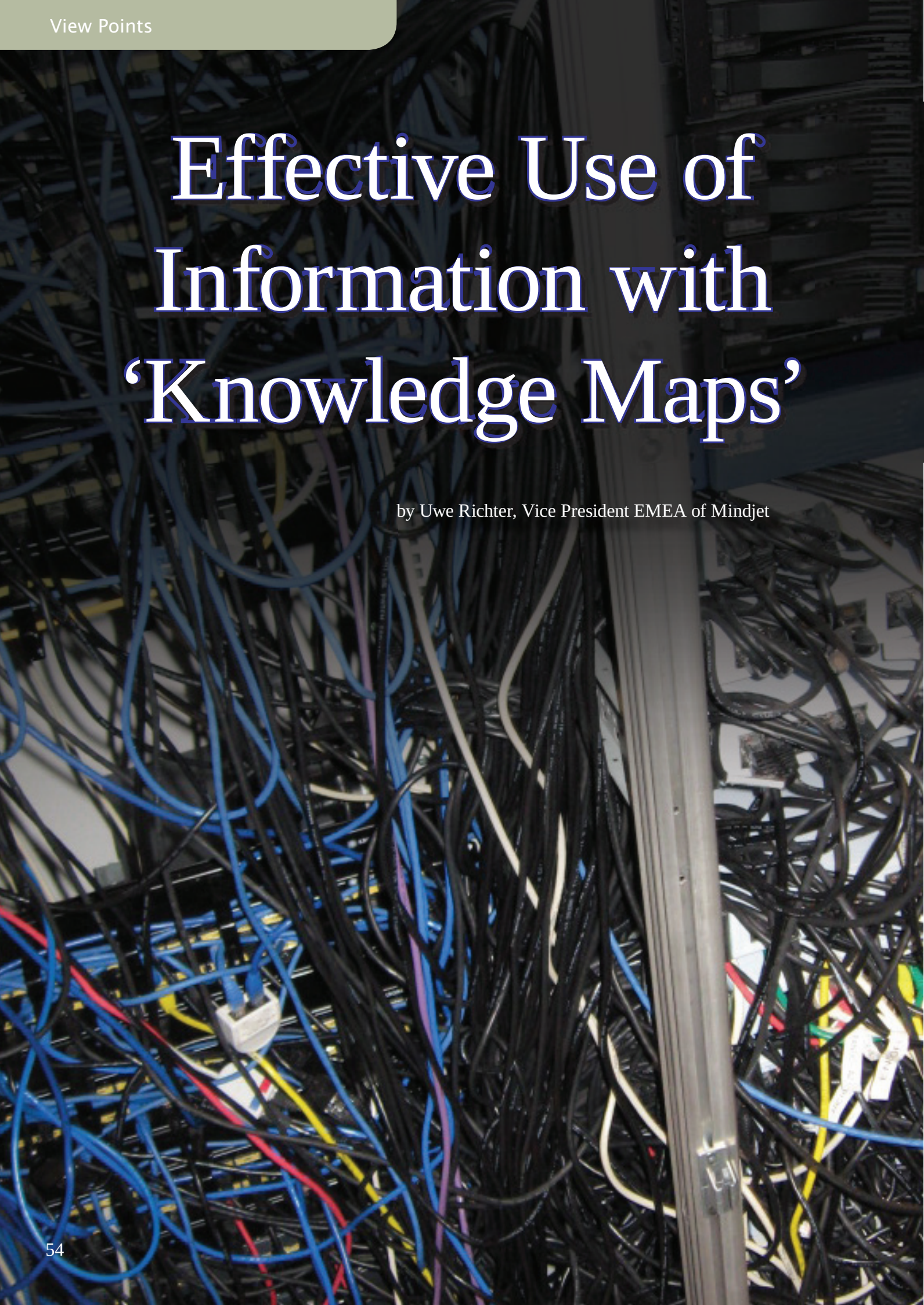
End notes:
For further information on MAJIIC please contact NC3A or the authors. For details on the JAPCC C4ISR roadmap project please enter www.japcc.org



ISR competency.

Effective Use of Information with ‘Knowledge Maps’

by Uwe Richter, Vice President EMEA of Mindjet



Airmen are used to working with a recognised air picture, or RAP. It therefore makes sense that, when working on projects as part of a team, a recognised knowledge picture (RKP) might be extremely useful. But what would an RKP look like and how would we interact with it? We are living and working in a highly technical environment with communication systems allowing us to communicate and collaborate via email, blackberry, voice- or video over IP. Complex software systems, labelled with all sorts of abbreviations like ECM, DMS, SCM, promise to deliver any data record in the blink of an eye. With modern Web 2.0 technologies, we are no longer just receiving messages, but we are fully integrated in the enterprise-wide communication process within the framework of a 'co-operation culture'.

But has this made our jobs any easier? On the contrary, more and more employees are complaining about increasing levels of stress and that the list of urgent tasks, which need completing, is constantly growing. According to a study from Nucleus Research, one out of four employees spends more than five hours per week searching for information that is vital for their work. Ironically, this is not due to a lack of information, but rather to information overload. Fewer employees are expected to produce a higher output – after all, they have state of the art communication and information systems on hand. Unfortunately, they don't have a strategy for managing this flood of information effectively. A strategy to process all of this information is urgently needed, not least because the worldwide data volume is predicted to increase by an order of magnitude each year and reach 1.8 trillion gigabytes by 2011 according to an International Data Corporation (IDC) study.

What are the implications of this for a modern enterprise dependent on proper information management? If knowledge can be defined as the fusing of relevant information and human understanding, and if this knowledge can be transformed into clearly defined concepts and objectives, then a process for communicating these products is essential. That is why effective instruments for the exchange of information and the stimulation of creativity within working groups are so essential.

'According to IDC market researchers, a company with 1,000 employees wastes $48,000 per week – or $2.5 million per year, because employees cannot find and retrieve the information they require.'

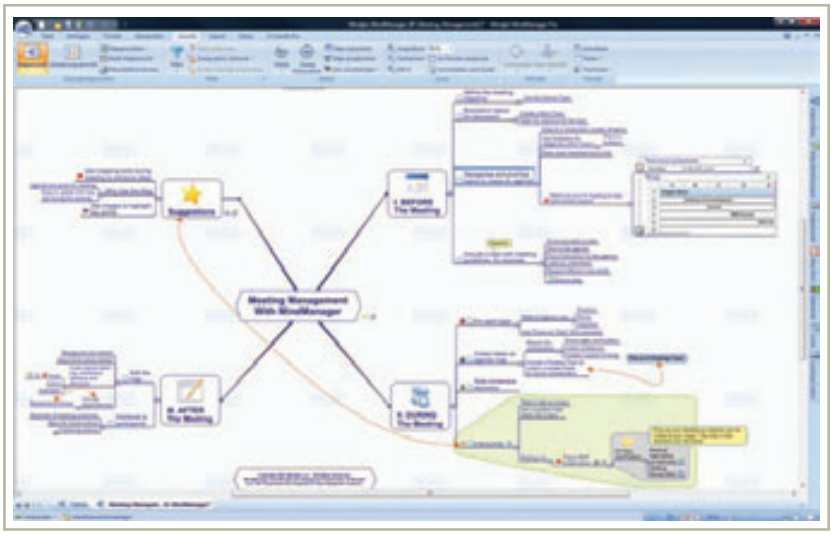
Yet the 'productivity tools' given to employees very often turn out to have quite the opposite effect. When working with different applications and various interfaces the problem is aggravated. Employees waste a lot of time copying the contents of one program, (email, text processing, spreadsheets, project management tools, etc.) into another. The requirement to shift from one application to another, to search, modify and save information costs additional time. According to IDC market researchers, a company with 1,000 employees wastes 48,000 US dollars per week – or 2.5 million US dollars per year, because employees cannot find and retrieve the information they require. Employees thus spend a considerable time of their workday on unproductive work – as much as 35%, according to IDC.

Working Unimpeded by Linear Structures

There is another important aspect to consider; one that is often ignored. Very few of the standard software applications process information the way the human brain does. Psychologists tell us that we process information associatively and visually - not in a linear fashion. If it is the users who have to adapt to the 'mindset' of the applications and not vice versa, then the results are loss of time, inhibited creativity and ideas and concepts that are, at best, neither linked nor practicable or, at worst, meaningless. The conflict between the way standard software applications force individuals to handle information and collaborate with each other and the way they could use this information most effectively is of vital importance to any organization. After all, this conflict affects the productivity of the workforce and, in the long run, their competitive power, efficiency and effectiveness. Well-designed tools for collaborative working will help an enterprise to close this gap, providing the employees can perceive real benefits from using them. Tools need to be designed to enable individuals to use information more effectively, by gathering and arranging all relevant information in an intuitive and visual manner. By doing this, relationships between pieces of information can be shown much more clearly than is possible with a linear information structure.

Mind Mapping to Business Mapping

The concept of the Business Map goes back to the original pen and paper method known as Mind Mapping. The method has its origin in cognitive research conducted in the 1950s and was popularised in publications by (for example) Tony

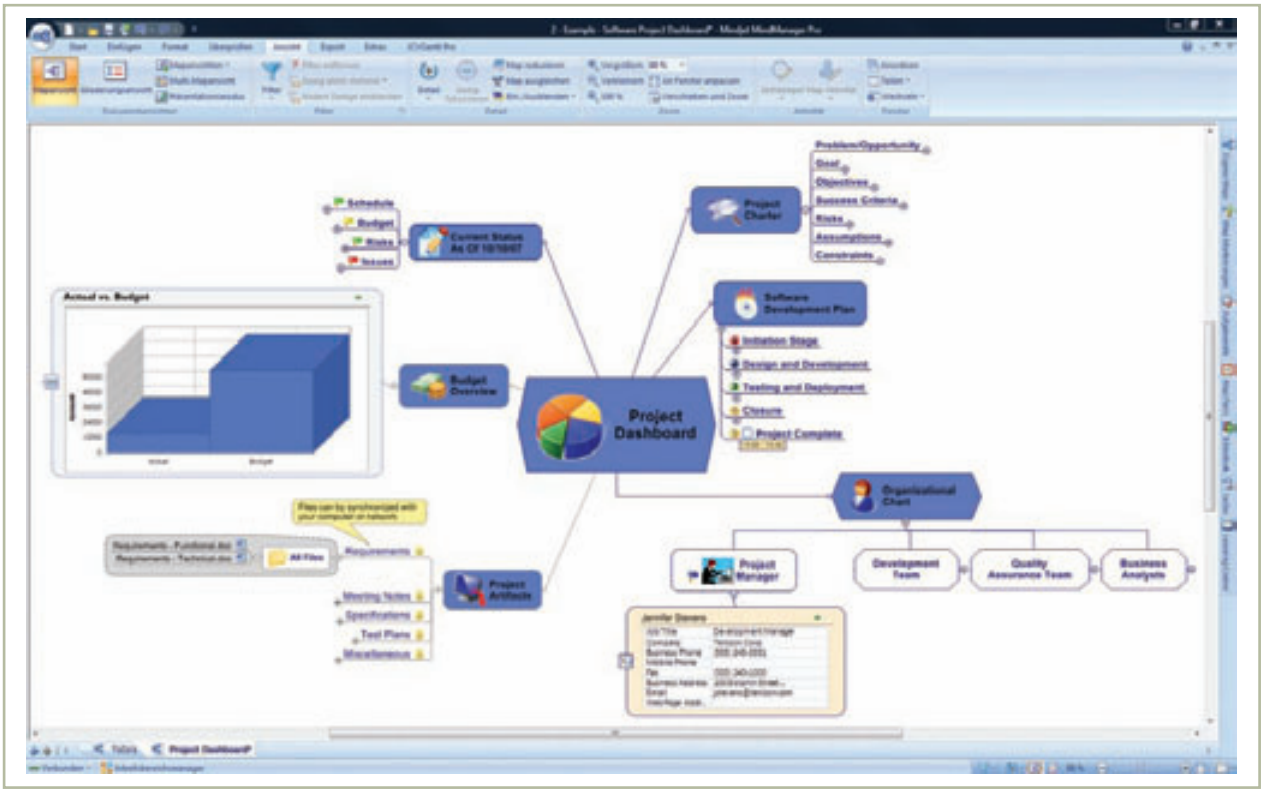


Example how a Business Map can be used to make a clear plan for a meeting.

Buzan, as an effective technique for enhancing individual memory and creativity functions. School and college students are now taught mind mapping (aka brain diagrams, spider diagrams) as an effective way of note taking and revising for exams. Mind Mapping methods were computerized and refined for individual users and teams working in an office environment. A typical program is able to represent all project related information in a single document and in a visual diagram format. Starting from a central point, branches connect to all related tasks with sub-items and information arranged radially around the center node.

Advanced variants of the software allow users to integrate structured information from applications and databases, unstructured information like text documents, spreadsheets, images, emails and even personal comments into a map, thus putting them all into a useful context. In combination with the non-linear visual representation, these separate, isolated information fragments become elements of an integrated information network. The result is an information dashboard or 'knowledge map' that can be used by individuals, teams or even organization-wide to present complex issues in an easy-to-understand format. By doing this, it is possible to share the expertise of team members with others and thus arrive at better decisions. This advanced Mind Mapping method is known as Business Mapping or Business Information Mapping.

The three basic processes of the Business Mapping concept are: capturing, organizing and sharing information. Once information has been captured, any user may organize their Business Map individually. Users are not restricted by the defaults of classic computer applications and may arrange all information elements of the map



Business strategy visualized with a Business Map.

'...improved view of the entire project with access to all the details, improves the communication of information in a team...'

in a way that is meaningful to them. All team members can see the whole picture and every detail at a glance. The quality of ideas and suggestions provided by the team members should improve because they develop a better understanding of the interrelations between key problems, individual operations and strategic goals. Responsibilities and project progress can be recognized and handled quickly. This improved collaboration should result in a significant saving of time and a higher quality solution.

Improved Comm with Information Sharing

The map thus becomes a 'single stop shop' for anyone looking for information. Since all the information is consolidated in a single document, all team members working on the project use this document. Thus, every team member can easily locate their own position in the project process and the whole work process can be streamlined effectively. Large enterprises may have groups of up to 100 individuals working on the same project, often distributed across several time zones. Instead of connecting all these individuals via email and constantly requiring them to download updated tables, spreadsheets and related information to keep up to date, a common Business Map can be used to provide all team members with the same information.

Business Maps provide an additional advantage particularly to international enterprises: Since Business Maps do not need comprehensive process instructions, but interrelations and processes are visualized, language barriers are no longer a major obstacle. This also applies to cultural differences, because the Mind Mapping principle is based on a universal mindset. This helps to avoid misunderstandings and to improve cooperation and thus is of particular use in multinational organisations.

All in all, Business Mapping methods help to transform available data and information into knowledge that can be used actively by putting this data and information in a visual context. The result is an information dashboard, which can be used by individuals or teams to organize structured, unstructured and personal information. This improved view of the entire project with access to all the details, improves the communication of information in a team, enhances collaboration and facilitates and accelerates the decision-making process. Thus, Business Mapping may help an enterprise to achieve the key objective of the modern economy - increased productivity. Employees should benefit from a reduction in work-related stress, fewer overtime hours and a more positive work-life balance, as they can now use their time at work to accomplish tasks rather than searching for information. Finally, since the non-linear visual map structure reflects the way most people think naturally, this method can help to tap into the full creative potential of the work force.

Business Mapping does not only open new options for organizations and individuals to capture and share information, but it helps to create the *new* knowledge, which may give the organization the competitive edge. ■

CYBERSPACE WARFARE: THE NEW FRONTLINE

By Lieutenant Colonel Mel Deaile[1], 608 Air Operations Center

'NATO is at war.' When the phrase is uttered, it engenders images of the ongoing global war on terror in Afghanistan that the Alliance entered after invoking Article 5 of the North Atlantic Treaty immediately following the terrorist attacks of 9/11. In actuality, NATO nations find themselves confronting threats to their national interests on many fronts. Adversarial forces probe, test, and challenge the nations' defences daily trying to find vulnerabilities. These new attacks, however, originate in and travel through cyberspace at the speed of light, making it difficult to anticipate them or trace their genesis. Furthermore, those orchestrating the attacks are shielded by the anonymity of the internet, an unfortunate characteristic of this new warfighting domain. The attackers and the defenders in this new conflict never physically confront one another; they are, nevertheless, engaged in a struggle to out-strategise and out-manoeuvre each other. The characteristics of this new cyber war are reminiscent of another war NATO fought for over five decades . . . the Cold War.

Air Force Cyber Command (AFCYBER), the U.S. Air Force's (USAF) newest major command, has been charged with organizing, training and equipping its cyber forces, and also takes on the heraldry of Strategic Air Command (SAC). In the original SAC heraldry - a mailed fist against a sky of blue holding an olive branch and a lightning bolt - the blue represented the realm of its operations, the fist showed 'strength, power, and loyalty', while the olive branch represented the peace that SAC strove to ensure. The lightning bolt flashed across the insignia to

emphasize the speed and power the organization could unleash at a moment's notice. A similar mentality applies to AFCYBER. While it strives to ensure peaceful and protected access to cyberspace, it stands ready to unleash its power on a global scale, at the speed of light, against anything that would threaten USAF freedom of action in cyberspace. Perhaps just as important as the symbol of SAC is the fact that AFCYBER has adopted the same operating mentality as that of its predecessor.

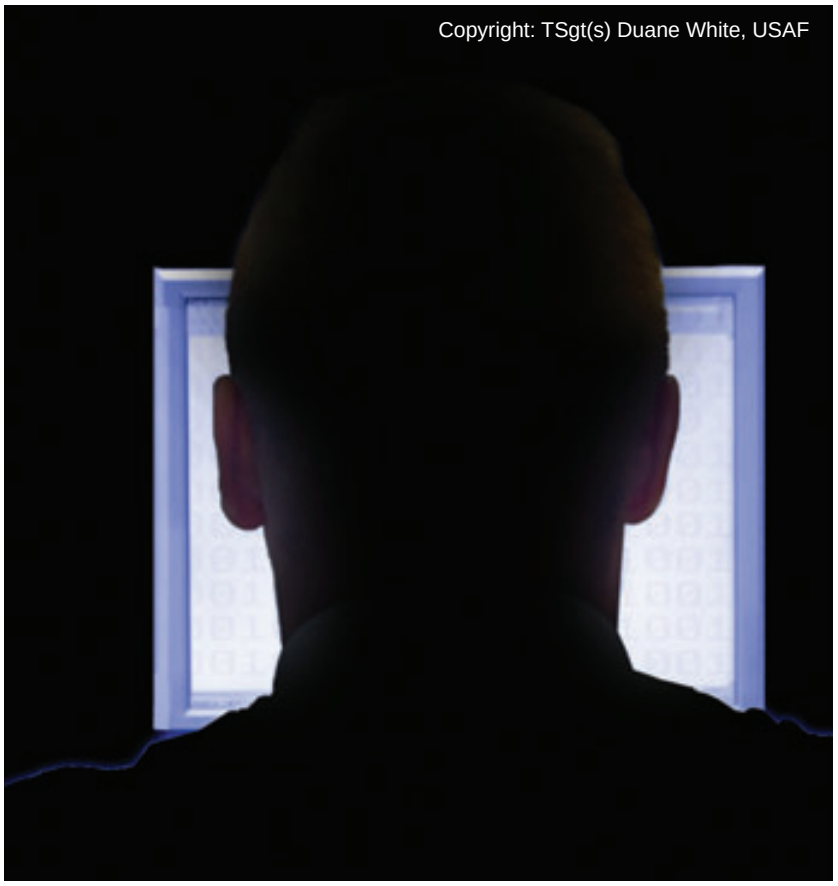
When General Curtis LeMay took command of SAC in 1948, he changed the operating paradigm of the organization. Previous leadership had SAC training the same way air forces had trained prior to World War II. LeMay recognized that confronting an enemy in the air power age necessitated change in the organization's operating attitude. 'We are at war now,' LeMay said in reference to SAC operations.[2] The conditions of the Cold War meant presenting a credible deterrent to the Soviets. Intelligence reports suggested that Soviet operatives were planning to sabotage elements of SAC's forces if the Cold War ever became hot. Vigilant security helped SAC maintain a credible deterrent and kept the organisation focused on the fact that the nation was engaged in a war. Similarly, in the information age, cyber warfare begins with presenting a credible deterrent so that potential enemies realize the futility of challenging 'friendly force' freedom of action in cyberspace.

Today, a growing number of adversaries threaten every nation's ability to establish superiority in cyberspace. Just as saboteurs previously planned to attack bases to prevent air forces from executing their war time missions, adversaries are currently conducting operations in cyberspace to prevent air forces from being able to establish dominance in that domain. NATO nations maintain a tremendous lead in the ability to establish air superiority by pursuing advanced technologies and realistic flying and C2 training. Fielding the most advanced systems in the world serves to dissuade other competitors from openly challenging NATO's superiority in the air. This strategy can work when it comes to the air domain, but the same course of action does not work well in cyberspace, due to its unique features.

Cyberspace has its own distinct operating characteristics, which make it entirely different from air and space. First, the domain of cyberspace must be established – it is not just 'there.' Although the electromagnetic spectrum has always existed, the domain itself is generated by man and machine. Second, cyberspace has low barriers to entry. A lone individual with a laptop and a wireless card instantly gains access to cyberspace. Third, cyberspace can act as an equalizer. The experienced hacker can be just as much of a threat to Air Force interests in cyberspace as an organized nation state trying to use cyberspace for their own purposes. In 1988, one man, Robert Morris, invented a worm - a short string of computer code - that hampered the operation of over 60,000 computers. As an overall trend though, the volume, complexity and organization of cyberspace attacks are of a higher magnitude when the actors are nation states. In Spring 2007, for example, an organized attack on Estonia shut the nation's banking and government systems down for days. A nation's security is very much dependent upon computer information systems - and, therefore, the security of those computers is paramount.

It is the specific mission of the Air Force to establish and maintain air superiority. Today and in the future, maintaining

AFCYBER takes on the heraldry of Strategic Air Command.



'...orchestrating the [internet] attacks are shielded by the anonymity of the internet...'

such air superiority requires the use of cyberspace to link Air Force assets, whether they traverse great geographic distances, provide sensor to shooter integration, or C2 multiple platforms across all domains. Furthermore, foreign exploitation of technical information and operating procedures in the cyber realm threatens the Air Force's ability to maintain their technological advantage in the air and may even provide adversaries with the ability to confront the Air Force in other domains. Since attacks can travel at the speed of light, often the best defence in cyber warfare is to increase the 'cost' to the adversary such that he declines to launch an attack in the first place.

Cyber warfare, like atomic warfare before it, relies heavily on deterrence rather than overt action to thwart attacks of significant consequence. The U.S. National Strategy to Secure Cyberspace highlights how important this domain is to the livelihood of the nation, 'Cyberspace is the control system of our country . . . (it) is essential to our economy and our national security'.[3] Not just military operations, but civilian operations from power transmission to financial transactions to health care need protected cyberspace. It is this author's opinion that the collateral damage from an all out attack could be as traumatic to the nation's survival as a weapon of mass destruction. Deterrence in cyberspace requires three essential elements:

1. Removing the anonymity inherent in cyberspace operations in order to attribute attacks to their originators
2. Precisely locating and targeting those responsible for intrusion into friendly cyberspace
3. A robust defence-in-depth that makes it impossible for individuals to disrupt, deny, or degrade cyberspace operations

Defending cyberspace demands a construct similar to the way the Air Force defended its first domain of operations: the air. When man took to the skies, radar provided indications and warning of those trying to enter friendly airspace. Warning lines delineated the boundaries of the air space and Identify Friend or Foe (IFF) procedures helped classify the intentions of those entering the airspace. Behind the 'line,' there was defence-in-depth (fighter engagement zones and missile engagement zones) in order to engage any threat entering friendly space. Even if a threat penetrated the layered defences, the operating bases had Ability To Survive and

AFCYBER operators updating anti-virus software.

Operate (ATSO) plans so that airmen could 'fight' through the attack. With cyberspace, the same concepts apply.

In the missile age, the Ballistic Missile Early Warning System provided the necessary indications and warning of a missile launch so that there would be enough time to react to an inbound threat. A 'cyber early warning line' must be placed as far forward as possible. Along this line, intrusion prevention and intrusion detection systems will monitor and protect against those entities, which threaten Air Force cyberspace. The USAF has implemented card reading authentication systems and bio-metrics to act as an 'IFF' recognizing all users of USAF cyberspace and providing awareness of their intentions. Defence-in-depth through firewalls, applications, and anti-virus programs enable the USAF to trade space for time and gain more understanding of the threat. Such gains will allow the USAF the ability to employ its dynamic targeting F2T2EA (Find-Fix-Track-Target-Engage and Assess) processes that engage and neutralize malicious actions. Within the United States, engagement can simply mean liaison with law enforcement agencies to deter future attempts. Vigilant defence, however, also means empowering every airman to defend the network.

Threats from inside the network are just as potentially lethal to operations as those from outside the system. Visiting the wrong website, opening a suspicious email, or forgetting to scan a file before uploading the information onto a government machine can provide an opportunity for mal-ware, key loggers, or viruses to infect Air Force networks. It is everyone's responsibility to protect the network, just as base defence and force protection is the responsibility of everyone on the base. During the Cold War, SAC officers carried firearms as a reminder that they were a command at war. In Afghanistan, where force protection is everyone's responsibility, those deployed forward carry weapons. While programmed defences may not be able to protect every client, every client must be 'armed' to protect the network in the current war for cyberspace. Enabling an outside entity to take control of a computer and use it as part of a zombie net to launch attacks on other Air Force interests, whether by accident or design, is handing a weapon to the enemy.

Card reader authentication systems and biometrics provide additional protection.

During the Cold War, airmen rarely, if ever, directly faced their enemy, but servicemen knew they were at war. Much like the Cold War, airmen in today's struggle may never see the enemy. Yet the enemy is there, looking for network security vulnerabilities and weaknesses. Adversaries are constantly trying to gain information about NATO's capabilities in order to leverage that information to gain an advantage in other domains. Presenting ourselves as a 'hardened' target is the most obvious strategy to thwart attacks against NATO's ability to manoeuvre freely in cyberspace. Should this fail, time tested techniques, tactics, and procedures that have been proven in the air will be used to ensure NATO superiority in cyberspace. To be truly effective, individual nations can not be the only ones implementing cyber protection. NATO must take a more active role in identifying risks and threats and take immediate action to mitigate the threats of operating in cyberspace. Everyone in NATO is now on the frontlines of this war and must be armed to fight the enemy. ■

Editor's Note: The Secretary and Chief of Staff of the USAF have announced they are considering delaying planned actions on AFCYBER to allow ample time for a comprehensive assessment of all requirements and to synchronise the mission with other key Air Force initiatives. However, the overall content and message of this article remain constant.

1. This article could not have been possible without the timely and necessary feedback and guidance of my colleagues: Lt Col Jeff Jones, USA, Maj Barney Ellis, USAF, and Mr. Dave "Frito" Lay, Col, USAF.

2. Curtis LeMay and Mickey Kantor. Mission with LeMay: My Story. Garden City: NY: Doubleday Publishing, 1965, p. 436.

3. 'The National Strategy to Secure Cyberspace.' Washington, D.C.: Government Printing Office: p. vii.

NEWS

Iraqi military attending the NATO school in Oberammergau.

NTM-Iraq Training

'While NATO does not have a direct role in the international stabilization force that has been in Iraq since May 2003, the Alliance is helping Iraq provide for its own security by training Iraqi military personnel, supporting the development of the country's security institutions, and coordinating the delivery of equipment'.[1]

As part of the NATO Training Mission to Iraq, Iraqi military personnel are now being trained on current security and defence issues at the NATO School in Oberammergau, Germany. JAPCC supports NATO School activities regarding Air and Space power by providing SMEs to educate students on a given subject. Upon request by NATO School, JAPCC assigned Maj Duman to brief the NATO military planning systems, force planning methods and offer recommendations about rebuilding the Iraqi Air Force. The experience was mutually beneficial – the Iraqi students were able to receive current and pertinent information, while the JAPCC was able to explore and actively discuss the difficulties of rebuilding an Air Force from scratch.

Footnote: [1] nato.int

AAR Signal Lights

AAR Signal Lights are used to give instructions and information to the receiver pilot aircraft during air refuelling from the hose and drogue system. Sequencing of lights varies between nations, and even varies between tankers from the same nation. Although nations define their Signal Light sequence in National Annexes in Part 5 of ATP-56(B) (AJP 3.3.4.2), the number of different sequences is too many to commit to memory. Therefore, receiver pilots tend to only familiarize themselves with Signal Light sequences of the tanker expected on their next mission. In Coalition Ops, the type of tanker encountered during the mission is not always known prior to take-off. This lack of standardization can impact AAR operations and is considered a flight safety issue.

The AAR Coordination Cell from JAPCC is engaged with Nations to formalise a lighting sequence for future STANAGs.

This is but one area of standardisation where JAPCC work will help the War Fighter.

View of AAR signal lights.

SOF Aviation Forum

From 16 - 18 September 2008, the JAPCC organised a SOF Aviation Forum and hosted the third annual SOF Aviation Conference. Both events were sponsored by the NATO SOF Coordination Centre. The aim of the forum was to identify Lessons Learned from recent and ongoing operations and find ways to implement them into new doctrine and Techniques Tactics and Procedures. An extensive report on the conference is planned for the next edition of the Journal.

Movement Control

A NATO Movement and Transportation Ad Hoc Working Group recently finalised its work on the NATO Concept for Movement Control (MovCon). JAPCC's Combat Service Support Branch staff contributed considerably to this work, not only as a member of the Ad Hoc Working Group, but also as a core member of the drafting team. The concept describes the Movement Control organisation, together with its responsibilities and associated arrangements for the deployment, sustainment, roulement and redeployment of NATO forces. It provides a basis for national and NATO preparation to enable effective and efficient planning, routing, scheduling and control of troops and cargo movements over the various lines of communications. The MovCon Concept is now ready for ratification by the nations. It is antincipated that this newly developed MovCon Concept will eventually be incorporated in the NATO Movement and Transportation Doctrine (AJP 4.4) as part of a complete revision of this doctrine document.

JAPCC Space Activities

The JAPCC has produced a report titled 'NATO Space Operations Assessment', which was delivered at the end of May. As part of the Space Assessment project, the C4ISTAR Branch hosted a NATO Space Workshop in April 2008. This was the first NATO workshop to address the space operations mission area. 33 key stakeholder organizations were represented and the workshop provided valuable insights and concepts included in the Assessment. Our Space SME, has been advocating the development of Space Power at many international forums. The JAPCC was invited to give presentations on Space at the German Forces Staff College in Hamburg, at a JISR ICDT meeting at the Haag, at the Missile Defence Working Group meeting in Glons, at the Military Space Conference in Paris, at the Military Satellite and Space Systems Conference in London, and provided a special briefing for the Panel on Air Defence at HQ NATO. Additionally, classroom lessons on space topics were presented at the NATO School and ACO's Tactical Leadership Programme in Belgium. Furthermore, the AD Transformation provided a keynote presentation on Space at the Utilisation of Space conference in Berlin and the AD Capability provided a presentation at the European Air Chiefs meeting at the ILA Berlin Air Show.

JAPCC SMEs in Afghanistan to develop the ANAAC Air Structure.

ANAAC Air Structure

To help establish and maintain a safe and secure environment for the Afghan people, the Afghanistan National Security Forces (ANSF) depends heavily upon on the Afghan National Army Air Corps (ANAAC) as a force multiplier and to provide mobility and air support. Decimated during the Russian occupation, the rejuvenated ANAAC is now rapidly expanding both in numbers of personnel and the number of aircraft on inventory. The Combined Air Power Transition Force (CAPTF) have been tasked to help the ANAAC grow and are responsible for the overall development and mentoring of the Air Corps. As part of the development plan, CAPTF has asked the JAPCC to consider and design a suitable structure for the ANAAC. Additionally, they asked the organisation to develop efficient and effective Air C2 processes. The structure and processes are to be implemented in the 2011 to 2016 timeframe. This unique project will provide strategic and operational guidance and assistance to CAPTF and will help direct their future work. JAPCC completed a fact finding trip into theatre at the end of August and the project is expected to be complete by the year's end.

In Memory

It is with great sorrow that we announce the untimely death of our friend and colleague Lieutenant Colonel Karl Litzenberger GAF. 'Charly' was instrumental in building the JAPCC's reputation in NATO and will be sorely missed by us all. The International Staff of the Joint Air Power Competence Centre Kalkar joins our German hosts in expressing our deepest sympathy to Charly's wife and family at this very sad time. ■

Biographies

Lieutenant Colonel Jens C Fehler, joined the German Army Artillery branch in 1978 and holds a masters degree of the Hamburg Bundeswehr University (now Helmut Schmidt University). He has been trained on Artillery target acquisition and surveillance systems, and ISR elements on division level. He participated in operations on the Balkans and Afghanistan. Working on Unmanned Aircraft Systems since 1983 and ISTAR since 1991, Lt Col Fehler started as one of JAPCCs Unmanned Aircraft Systems Subject Matters Experts in 2006. His fields of expertise include operations with different tactical UAS Systems, Air Imagery, Flight Safety and Air Accident/Incident Investigation, Concept Development and Experimentation, and ISR Operations Planning, and Command and Control.

Lieutenant Colonel (ret) Rick Newton teaches special air warfare, command and control, irregular warfare, and campaign planning at the Joint Special Operations University at Hurlburt Field, Florida. He also serves as adjunct faculty at the NATO School in Oberammergau, teaching special operations planning, integration, and targeting. Mr Newton has served as combat rescue and special operations helicopter pilot in Korea, Florida, Iceland, and New Mexico. He has also been a theatre-level planner at US Special Operations Command and at US Air Force Air Combat Command. Mr Newton is a 1977 graduate of the US Air Force Academy and holds Master of Military Art and Science degrees from the US Army Command and General Staff College and from the US Army School of Advanced Military Studies. He has more than 2500 hours of military and civilian flying time.

Mr Carl-Otto Schartenberg is the founder and Managing Director of COS-SYSTEMS providing Technology Consulting, Systems Engineering and Management Support. Mr. Schartenberg has more than 18 years experience in multinational program management with emphasis on systems technology, systems analysis, risk management, network planning and engineering coordination. He has provided management consulting for many high risk, high investment programs with special focus on project controls by systems science to facilitate highly complex system oriented project management. Mr. Schartenberg is a graduate of Technical University Berlin, Institute of Aeronautics & Astronautics with degrees in Aerospace Planning based on Systems Technology, Systems Analysis, Computerised System Design, Applied Space Propulsion Systems; Electrical, Chemical & Nuclear Propulsion Systems, and Rocket Technology – Launch Systems.

Lieutenant Colonel Deaile is Strategic Division Director, 608th Air Operations Center. LTC Deaile is a pilot with extensive experience in both B-52s and B-2s. He has deployed in support of Operation DESERT STORM and ENDURING FREEDOM. He has logged 120 hours of combat time over Iraq and flew a record setting 44.3 hour combat mission. He was selected as the Air Force's Pilot of the Year for 2001. LTC Deaile is a graduate of the US Air Force Academy, USAF Weapons School, Army's Command and General Staff College, AF's School of Advanced Air and Space Studies (SAASS), and the doctorate program in Military History at the University of North Carolina-Chapel Hill.

Mr Uwe Richter is in charge of Mindjet's EMEA organization as of November 1, 2007 – for the operational day-to-day business as well as for the strategic positioning. Uwe Richter brings 19 years of experience in sales and management functions at leading Business Intelligence and Performance Management vendors to Mindjet. Prior to Mindjet he managed the CPM Business Unit in EMEA at Infor Global Solutions with a total of 250 employees. From 1989 to mid 2006 he was instrumental in establishing Cognos in Germany, where he drove growth in his last five years as Area VP Central and Eastern Europe. Richter will focus on expanding Mindjet's sales channels and on driving revenue growth in the European top tier markets. Richter graduated 1988 in Electrical Engineering at the Universities of Dortmund and Bochum.

Lieutenant Colonel Dr Thorsten Weber graduated from the University of the Federal Armed Forces in Munich, and worked as an analyst for foreign missile systems at the Federal Armed Forces Intelligence Office in Cologne. In 1998, he was posted to the 72nd Fight Wing in Rheine/Hopsten where he was responsible for aircraft ammunition and weapons maintenance. After graduating from the General Staff Officer's Course in Hamburg, he was sent to Shrivenham, United Kingdom, where he attended the Advanced Commmand and Staff Course 9. Back in Germany, he served for the German Air Force Transformation Centre in Cologne and was involved in conceptual planning mainly focussing on UAS. Mid June 2008, he was posted to NATO SHAPE J4 branch in Mons/Belgium. LTC Weber has a PhD in aeronautical and aerospace engineering and a Master of Arts Degree in Defence Studies from Kings College London.

Biographies

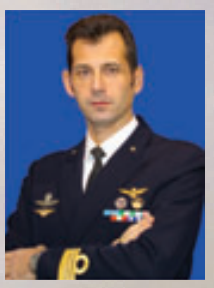
General Roger A Brady is Commander, U.S. Air Forces in Europe; Commander, NATO Allied Air Component Command, Ramstein; and Director, Joint Air Power Competence Centre, Ramstein Air Base, Germany. General Brady has commanded a support group and flying training wing, and was vice-commander of an air logistics centre. The general has served as director of personnel, logistics, plans and programs, and operations at 3 major commands. His involvement in deployed operations includes Vietnam, deployment of NATO forces supporting Operation Desert Storm, coalition support for the stand-up of expeditionary wings during Operation Allied Force, and providing air mobility support to operations Noble Eagle, Enduring Freedom and Iraqi Freedom. Prior to his current position, General Brady was Deputy Chief of Staff for Manpower and Personnel, Headquarters U.S. Air Force.

Major General (Ret) Karl-Heinz Münzner has been the NAMSA General Manager since 1 August 2004. Prior to this, General Münzner was the Department Chief for budgeting, planning, armament and logistics within the Army Staff of the German Ministry. General Münzner managed reform projects for the Bundeswehr including 'New Fleet Management' and 'Army Maintenance Logistics.' General Münzner has had assignments as General Army Logistics and Division Chief in the Army Support Command; Branch Chief for Logistics Operations; head of the Doctrine, Budgeting and IT Section in the Army Materiel Office; G4 of Army Command East; head of the Logistics Doctrine and Operations Section in Mannheim; and Commanding Officer of the 115th Armoured Artillery Battalion.

Colonel René Arns is head of the Policy, Concepts and Coordination Branch at the JAPCC. He gathered 3500 flying hours on the F-104G RAF Jaguar and F-16. He commanded the 311 FBS at Volkel AB. He then commanded the Tactical Helicopter Group (THG) and was also Base Commander of Gilze Rijen AB and was actively involved in Operations in the Balkans and the Horn of Africa during this period. His last assignment before joining the JAPCC was Head of Flight Safety and Quality in the Staff of the Commander in Chief of the Royal Netherlands Air Force (RNLAF). He is a graduate of the Netherlands Advanced Staff Course.

Lieutenant General Angus Watt graduated from College Militaire Royal de Saint-Jean in 1977 and was trained as a pilot. He flew the Sea King helicopter with the 443rd Sqn in Shearwater, NS, and taught helicopter pilots at CFB Portage la Prairie and later commanded at the 423rd Maritime Helicopter Sqn. Staff tours have included NATO HQ in Brussels and a number of positions in Ottawa, Winnipeg and NORAD HQ in Colorado Springs, mostly focused on overseeing current operations. LGen Watt commanded Joint Task Force Southwest Asia (Op APOLLO) in 2002 and served as the Deputy Commander (Air) of the International Security Assistance Force in Afghanistan in 2006. LGen Watt is a graduate of Canadian Forces Command and Staff College and the US Air Force War College and holds a BA (CMR), MPA (Auburn) and an MBA (University of Ottawa). He was appointed to his current position as CAS in 2007.

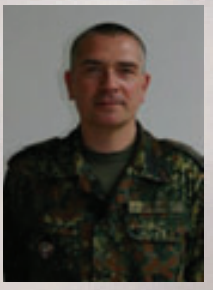
Group Captain John Alexander is JAPCC Chief Combat Service Support. Commissioned in the RAF Regiment, he served with RAF Rapier units in Germany, Belize and Falkland Islands; USAF Rapier in the UK; on secondment in Oman; as Adjutant of a Light Armoured Wing in the Gulf 1990-91; in staff appointments 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), the Open University (MBA), the Royal School of Artillery Gunnery Staff Course and Air Battle Staff Course, and has taught the Advanced and Higher Command and Staff Courses.



Commander Renato Micheletti is an AB212 helicopter pilot who arrived at the Combat Air Branch of the JAPCC in 2006 from the Italian Navy General Staff in Rome, where he was Naval Aviation Integration Section Leader at the Maritime Air Warfare Department. Prior to that, he served in many areas of the Naval Aviation operating from frigates and destroyers for almost 9 years and covering various duties on board up to the level of Flight Commander and Head of Operation Department. From August 2000 till September 2001, he was appointed Commanding Officer of ITS SENTINELLA, stationed in the Red Sea to serve with the Multinational Force and Observers (MFO) in the Sinai Peninsula of Egypt. He holds a degree in Naval and Maritime Sciences from the University of Pisa.

Biographies

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



Lieutenant Colonel Andreas W. Leibner is a member of the JAPCC Future Capabilities branch. He joined the German Army in 1980 as tank commander and has spent most of his service working with Military Intelligence at different command levels. In 2005, he deployed to Bosnia and Herzegovina as the Commanding Officer of the German National Intelligence Cell.

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

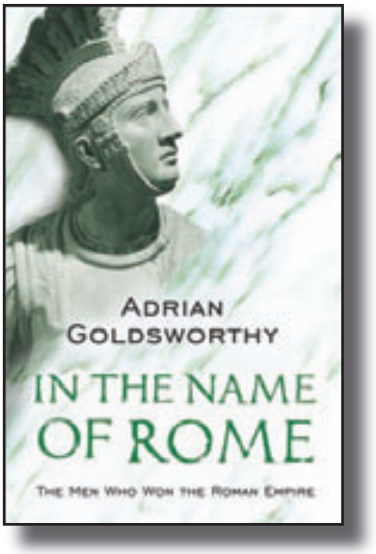
Mr John Mahaffey is a Senior Scientist in the C2 Systems Division at the NATO C3 Agency. His responsibilities include program and project management and experimentation supporting the operational and technical integration of multinational ISR systems within the NATO coalition environment. He is also the deputy program manager for NAEW&C transformation initiatives and provides operational research and advice for the NATO AGS program. Mr Mahaffey has a Bachelor of Science degree in Business Administration from the Citadel, a Master of Aeronautical Science from Embry Riddle Aeronautical University and is currently a candidate for a Doctor of Philosophy at the International School of Management in Paris/New York.

Mr Adam Boothby is a Principal Consultant with PA Consulting Group, following a recent move from L-3 Communications. Prior to working in the Civil sector, he was a Major in the British Army. His service saw him on operations in Northern Ireland, the Balkans and Middle East.
He has broad experience of networked ISTAR programmes on both sides of the Atlantic and is currently working on Full Motion Video, Satcom and Multi-Role Common Data Link programmes.

Lieutenant Colonel Frank Scholze is a member of the JAPCC C4ISTAR Branch since 2006 and serves as the subject matter expert on ISR. He attended the East German Air Force Officer School for his pilot training from 1981 - 1985 and flew the fighter aircraft Fishbed and Fulcrum. After the reunification, he joined the Bundeswehr and continued to fly Fulcrums until 1999. He got his operational experience on ISR as leader of a Recce Ground Station for Tornados in TRW 51"I" and was Head of the Training Centre for Imagery Exploitation of the Bundeswehr in Fürstenfeldbruck.

Book Reviews

In The Name of Rome
The Men Who Won The Roman Empire
by Adrian Goldsworthy
Phoenix, 2004. The Orion Publishing Group.



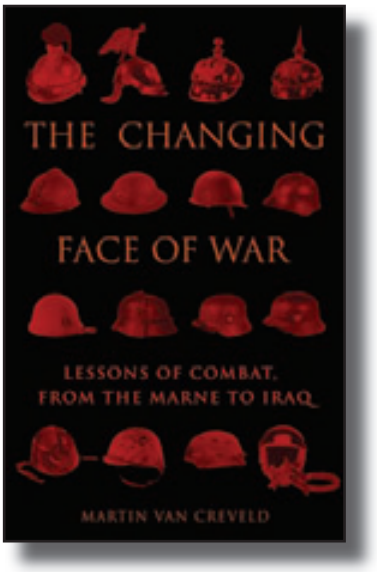
Adrian Goldsworthy is swiftly making himself the authority on Roman military. *In the Name of Rome*, examines 15 military commanders and book-ends each biography with appropriate contextual information, which provides a swift history of Rome's military activity and rulers.

The author's descriptions of the Roman military organization is sufficiently clear and substantive for the aim of the work, although I would have liked to see the aspects of Roman tactics addressed with more detail. However, this book is not a Roman military manual, it is a book about military commanders and the way they lead men into a military campaign - these lessons are valid throughout history.

If the reader is well-versed or has particular interest in a specific commander, the depth of subject material may not satisfy him/her. I would, however, recommend this book to the reader with a general interest in the men that helped shape the Roman Empire.

Review by Commander Renato Micheletti, ITA Navy

The Changing Face of War:
Lessons of Combat, from the Marne to Iraq
by Martin van Creveld
Presidio Press, 2007, Used by permission of Presidio Press, an imprint of The Ballantine Publishing Group, a division of Random House, Inc.



One of the most influential experts on military history and strategy has now written an original and provocative account of the past hundred years of global conflict. *The Changing Face of War* is the book that reveals the path that led to the impasse in Iraq, why powerful standing armies are now helpless against ill-equipped insurgents, and how the security of sovereign nations may be maintained in the future.

War today, van Crevald tells us, is a mix of the ancient and the advanced, as state-of-the-art armies fail to defeat small groups of crudely outfitted guerrilla and terrorists, a pattern that began with Britain's exit from India and culminating in American misadventures in Vietnam and Iraq, examples of what the author calls a 'long, almost unbroken record of failure.'

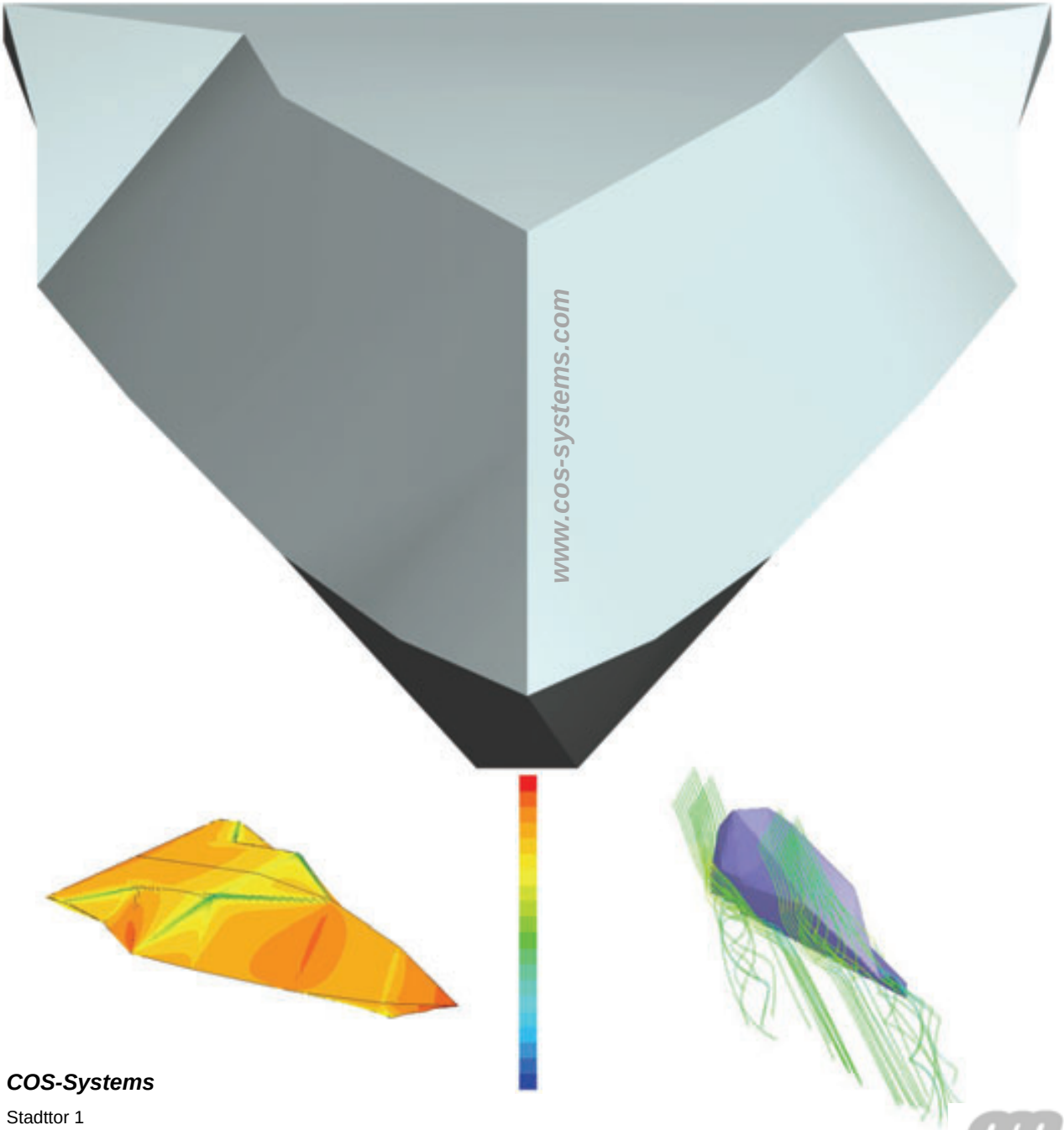
How to learn from the recent past to reshape the military for this new challenge–how to still save, in a sense, the free world–is the ultimate lesson of this big, bold, and cautionary work. *The Changing Face of War* is sure to become the standard source on this essential subject.

Martin van Creveld, professor of history at Hebrew University, Jerusalem, is one of the best-known experts on military history and strategy. He has written seventeen books, which have been translated into fourteen languages; most notable among them are *Supplying War: Logistics from Wallenstein to Patton*, *Command in War*, and *The Transformation of War.*

Review by Andreas W. Leibner, Lieutenant Colonel, DEU Army

We know,

that System Engineering is both a technical and management process. It is a discipline that ties together all aspects of a program to assure that the individual parts, assemblies, subsystems, support equipment and associated operational equipment will effectively function as intended in the operational environment. It also is a logical sequence of activities and decisions transforming an operational need into a description of system performance parameters as well as a preferred system configuration.



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