

# *Joint Air & Space Power – JAPCC Conference 2008*

## *Air Commodore Garfield Porter's Presentation*

### *"Air & Space and Decision Superiority in the 21<sup>st</sup> Century "*

Good Morning.

The title of this presentation is quite daunting – well for me anyway! So, let me break it down a little and, hopefully, provide some backdrop for our panel discussions along the way.

First, Decision Superiority – put simply that's about making better decisions than our adversaries such that we maintain the initiative and can progress towards our goals.

Second, the term 21<sup>st</sup> Century implies taking a reasonably long view rather than dealing exclusively with the crocodiles nearest to the boat. So, at this Conference, we would ask you to resist just focusing on the here and now, and consider current experience in the light of the more enduring trends.

And, finally, whilst I unconditionally accept that nothing in the Air & Space environment will occur in isolation, we are here to explore specifically how the 3<sup>rd</sup> dimension can play its part in making sure that future operations are truly seamless, comprehensive and joint.

As Gen Brady mentioned, last Dec we completed our NATO Air C4ISR Roadmap. This gave us a valuable insight into where we were now and where we were likely to be going technically over the next decade or so. And, I would suggest this is a good place to start our discussions.

So, I will begin by looking at where NATO Air is now and where we appear to be heading in Network Enabling terms.

Then, given that Decision Superiority is about enabling Command, I would like to briefly describe the command model we have developed and how network enabling might affect it, as well as the BSM and I2 issues that flow from it.

I will then finish with a brief focus on Space – the great enabler – to set the scene and provide a basis for discussion on how this fledgling part of our environment might develop within the Alliance.

So, let's start with the NATO Air Ground Environment.

Although the slide is drawn for 2007, it pretty much reflects the situation today.

We currently have 18 NATO and 13 National **Air Surveillance and Control Systems**, utilizing **9 different Operating Systems**. This is clearly far from ideal, but reflects the entirely understandable accommodation of national needs in the absence of a common NATO system.

In addition, you will note on the left that we also have a large, albeit already shrinking, CAOC structure.

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**Still in the 2007 view**, you now see NATO's backbone network overlay on the map.

As many of you will know better than me, the NATO General Communications System uses a variety of comms mediums to connect NATO's Headquarters with the CAOCs and CRCs. The main system nodes are shown as buttons on the map and are co-located with the major NATO installations.

Also shown on the map are the 12 static Satellite Ground Terminals, situated around Europe and in the US, which help move NATO's data around.

At present, the NGCS does not connect to the National networks of the Alliance, which is a genuine barrier to Information Sharing. Downstream, thanks to **the NGCS Evolution** programme, NATO should be increasingly connected to the national networks through **Information Exchange Gateways**. However, as you can see in the 1st gas gauge on the left, this has yet to be put into action.

Today, the network is supported by Internet Protocol Version 4, which supports Voice Over IP (VOIP) and is being used to a degree in Afghanistan. NATO will eventually migrate to IP Version 6, giving many more systems the means to plug & play in a "Everything over IP" regime. At present there is no IP V6 capability – gas gauge 2.

As the network expands, Network Operations and Network Assurance – **Information Assurance** – will need to improve. In 2006, the NATO CIS Agency established a **Computer Incident Response Capability** that continues to grow – hence, as you can see, there is some gas in gauge 3.

The final gas gauge represents Link 16 connectivity and is empty here due to our current reliance on Link 1.

If we project current plans into 2017, we see the multi-colours changing to a consistent blue, which represents the introduction and establishment of NATO Air Command & Control System (ACCS). With a roll-out commencing early next year, this should begin to resolve many of the interoperability and integration issues associated with the earlier independent systems.

You will note, however, that there are a number of light blue areas, reflecting that ACCS roll-out does not, at this time, include the newer NATO nations.

On the plus side, the number of CAOCs should have reduced to 4 static and 2 deployable, in line with current plans. More importantly, improved interoperability with ARS and Deployable ARS sites – the black buttons – should ensure greater Alliance SSA and cohesion.

Supporting the ARS and DARS, the communications backbone network continues to evolve as the bandwidth capacity increases; this is represented here by the thicker green lines.

Turning to the gas gauges:

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**Information Exchange Gateways** are now installed to connect the NATO network to the national networks.

**IP Version 6** capacity continues to grow, as more-and-more nodes migrate. In this timeframe, NATO is operating IP Version 4 and 6 simultaneously – hence, an 80% fill.

**Network Operations** should continue to improve in line with technology. However, as our networks expand and reach out into the nations, the challenge of Information Assurance becomes more pronounced; network security will remain a major consideration.

Finally, with the implementation of ACCS, we see **Link-16 replacing Link-1** in the ground environment, thereby providing the means to share a robust Common Air Picture.

Let's now look at the situation in Air & Space itself.

Shown within the **Link 16 ring** in the centre of the slide, we have identified many of the Alliance Link-16 equipped aircraft. However, as you will see from the box on the left, only about one third of NATO aircraft are Link 16 capable; dividing it further, that's less than half of the combat aircraft and only 6% of ISR and AT assets.

Moreover, that legacy Link-1 architecture in the static and deployable Air ground environments is an obvious bottleneck to the robust flow of information.

Turning to Space, I will not go over the full range of systems depicted here, except to note that – in addition to bespoke NATO systems – US and commercial systems provide UHF services for deployed operations, as well as PNT, weather and ISR information.

This is reflected in the bar graph on the right, which shows that NATO delivered UHF bandwidth is less than its deployable ground terminal capacity. Conversely, we have sufficient SHF bandwidth, but insufficient ground terminals for optimal effect. In short, there is a mismatch, which we mitigate through reliance on national and commercial assets.

Turning the page to 2017, we see progress in many areas.

In the **Link 16** ring, we see many new additions as Alliance nations continue to upgrade their air assets.

Looking at the bar graph data, we can see that Link 16 equipped aircraft grows from 29% to 62% with combat aircraft rising to 71% and ISR/Transport aircraft to 44%. It is also worth noting that these figures only represent the information available for 2012; we can reasonably expect more over the next decade.

And, with ACCS fully implemented into the static and deployable Air C2 environment, the Link 16 protocol has finally become the tactical communications standard.

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In Space, a number of changes have also taken place; in particular, the NATO IV satellite has gone, replaced by a Wideband EHF service, which should offer NATO much greater bandwidth. We also anticipate that by this time, the Deployed Forces Communications and Information System will have delivered sufficient terminals and associated equipment to support a CJTF size operation. This means, as the right bar chart shows, that available bandwidth and deployed capacity are now much better aligned.

Overall then by 2017, we should see a significant improvement in interoperability and integration within the air and space environment.

Whilst this does assume all programmes are delivered on spec and on time, we should be in no doubt that NATO Air will be significantly better networked. The next challenge is to decide how that networking might be best employed.

To that end, the JAPCC has worked up the following model of Command to help us understand better the impact of networking.

Let me quickly build it to demonstrate how the Command business might unfold. In looking at this, we've taken a hierarchal approach with Command at the top. So far, so good, as I would suggest the whole purpose is to enable Command through Decision Superiority.

But what do we mean by command, given that we invariably mix it with Control as C2?

We think it's important to distinguish between the 2 and offer the following:

Put simply, Command is the authority to use resources to complete a task and leaves the method of achieving the aim to the creativity of the commander. So, it's about authority and creativity in both operational design and execution.

Control, on the other hand, is primarily concerned with regulating activity, either through setting constraints or directing action as laid out in the details of the cdr's plan.

Anyway, back to the model. Command needs a fusion of Information and Intelligence – I2 – to make the right decisions. In turn, that product is reliant on S&R to deliver new data for Intel and IM to provide ready access to the appropriate information.

Based on this process, Command decides the way forward – the plan. And I would suggest that this is enacted through Battlespace or Battle Management. BSM is then enabled by a combination of Control – the regulation of activity – and – providing subordinates are appropriately informed to a common baseline – the ability to self-synchronize activities to achieve any given goals.

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The latter understanding and freedom can also allow subordinates to creatively add value to the task at hand; in short, it can significantly enable Mission Command, which I would suggest is played out as a series of similar, subordinate triangles.

And, this is all increasingly underpinned by Network Enabling, which moves the data around and develops the appropriate level of SSA to allow all the actors to play their part.

If that, then, is a reasonable model to describe how the Command function will unfurl, do our current command acronyms help the commander focus on the task in hand? Well, I will say no more about C2, given my previous comments.

Neither would I suggest C4ISR covers the issue particularly well. As you can see here, assuming Comms and Computers roughly equate to NEC – they are the equipments that it requires – there are significant elements of the model not addressed.

Does this matter? Perhaps not, but does a Commander ever sit down and say have I got the Command construct I need? And, if he did, would C4ISR focus him on the structural decisions he needed to make?

It might be better to focus him on the elements above the line

If we did that, the Commander would look at his I2 needs:

- Was Intelligence, Command driven and how?
- What IM arrangements were in place?

And on the BSM side, based on the network enabling available to him, he could decide the balance between Control and Self Synchronization – Mission Command – necessary to produce optimal performance.

So maybe, something like CBMI2 might provide better command focus.

Suffice it to say, 3 of our panels have been devised to draw out the nuances of such a construct.

So, next, let me make some observations on how Air Command might be affected by improved networking.

Today, the ACC, through his CAOC, retains almost full Command and Control over every aspect of air operations.

Control, through the Air Tasking Cycle, and delivered via the ATO and ACO, is the dominant BSM mechanism. And, practically the only manifestation of mission command is the individual air sorties represented by the small, subordinate triangles at the bottom.

Now, given the routine ability of air assets to realise strategic and operational effect through tactical action, and our hitherto limited ability to provide subordinate commanders with the situational awareness and understanding necessary for a greater degree of mission delegation, this approach is entirely reasonable.

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Nevertheless, just like any monolithic structure, and notwithstanding everybody's best efforts, it struggles by its very nature to be particularly agile or responsive.

Moreover, whilst such a system accurately reflects the Commanders Intent, the distance of the staff from the action can desensitize them to the granularity and atmospherics of the battle and any emerging unintended consequences.

It is also inherently difficult for this centralized structure to co-operate efficiently across the environmental seams, where planning and execution may be carried out at a variety of command levels.

If we look at ISAF today, this picture is also further complicated by a 2 track command arrangement between ISAF and CENTAF in Al Udeid.

Whilst we could spend the rest of the day debating what is right and wrong in Afghanistan, I would suggest we would do better to look at how we might do things in the future.

But first, let me describe how we see A&S activity being categorized – those who were here last year will recognize the slide albeit on-going work has led to some change.

It is based on the degree of co-ordination required.

So activities at the bottom of the scale, here, require close co-ordination with the other components and, invariably, need to be responsive to their plans. We've termed this Joint Enabling, but the important point is that Air is contributing to both the design of other Component's plans, as well as their execution.

Essentially, these activities represent Air's contribution to the surface components' close battles for their environment.

Next, requiring a different co-ordination focus is Control of A&S – our close battle for our environment. I will focus primarily on Air rather than Space today, but I would note that Space's needs are subtly different to Air's and suspect we will draw this out in the Space panel.

The key to this category is that now the other environments are contributing to an Air-led Plan.

And, finally, we have the third category, which we have termed Deep Persistent Ops. Arguably, it is here where the nature of the 3<sup>rd</sup> dimension has changed most significantly – with persistence in particular aided by Space and the emergence of Unmanned Aircraft Systems.

DPO is characterized by activities to understand, influence and engage targets and audiences beyond the reach of the contact battles – literally in the deep.

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This category demands close coordination of all assets capable of deep activities, from whatever component and we would argue should be led by the Joint Cdr, albeit often co-ordinated in accordance with his direction by the JFACC.

So if these are the things we have to do and these categories give us an insight into who we should co-ordinate our efforts, how can networking be best used?

We could carry on as now, and use network enabling to work the Air Tasking Cycle on a faster and faster spin. This would arguably be the ultimate long screwdriver.

On the other hand, were we to rely on enhanced SSA to embrace a greater degree of Mission Command, we might need something more than this:

There would still be a need for an, albeit perhaps smaller, CAOC. However, we would need it to act more as a kind of Stock Exchange regulating a highly interactive market place rather than the Secretariat of a Soviet style 5 year plan!

The emphasis, however, would be on the ACC to ensure the structure met his needs and reflected the level of SSA he could genuinely generate.

And the categories I described earlier could provide the starting point to break out command responsibilities.

The ACC could nominate commanders to provide a focus for each area and then create further layers of subordinates as either effects or the plans of other components demanded.

It may well be that the ideal number of layers is determined by the level of cross-environmental co-ordination he needs to achieve to plan and execute his roles.

But regardless, the ACC would hold a prime responsibility for ensuring his subordinate commanders were mindful of his and the JFC's intent and priorities.

Actually, this is not particularly new – it bears a striking resemblance to the Fighter and Bomber Forces and Tactical Air Forces of a bygone age. 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 at every turn.

But, who should these commanders be? Surely, we don't want to add several layers, presumably with support staff, thereby merely creating a different type of bureaucracy.

Perhaps, we should look towards those commanders, who are already there, such as National Air Contingent Commanders, and our Sqn and DOB cdrs. These officers have been selected because they are thought to be are brightest and best, yet on operations they are asked to do little more than marshal and husband their charges to meet the schedule dictated by the ATO.

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We could use Mission Command to unleash their creative potential and, given their closer proximity to the battle, this could add real value to operational design. Providing the desired effects and objectives were adequately identified and sufficient networking was generated to deliver SSA, these commanders could be allocated responsibility for effects aligned to their unit's tasks. The pay back would be their close examination of the detail and an approach better tuned to the developments of battle.

The ACC would also need to take account of context.

So in a conflict like Afghanistan, we would not necessarily need all the categories, as you can see here. The important point is that keeping the categories in mind would ensure we had the right structure in place to focus on all of Air's roles, thereby ensuring an optimal contribution.

Looking at all this from a BSM perspective, some points for consideration include:

How much SSA can we genuinely look to generate, especially in terms of a common picture?

And, on the technical side, just how difficult will it be to manage a Link 16 regime, which everybody is able to, and needs to, join?

Can we operate in a Market vice Secretariat fashion and will the potential for creative input outweigh the risk of error? Indeed, what intermediate steps, including experimentation, might we undertake as greater degrees of networking are rolled out?

Is there a need to redefine the division of battlespace to reflect better shared understanding across the entire JOA? Should the Components deal with the contact battles for their environments and be subordinate to the Joint Cdr in conducting the Deep Battle?

And can this better understanding lead to an interactive division of battlespace where AORs build and collapse to reflect Joint priorities and respond to unfolding events?

From an air perspective, the issue may become a question of what is co-ordinated with whom. If we turn our categories diagram on its side and consider the roles that Air & Space might play, we get something like this.

You will note that, apart from Space Control and perhaps an increasing emphasis on Influence Activities, there is nothing really new here. And apologies to my maritime colleagues here – please accept that CAS and AI roughly equate to Direct Support and Area Ops!

The diagram does, however, provide an insight into the main axis for co-ordination in any given role and where, in BSM terms, the focus needs to be concentrated for the truly effective use of Air & Space power.

Moreover, the 2 purple roles in the centre of the diagram highlight how absolutely critical the generation of the right level of I2 is to players across the board, and the powerful advantage it offers to influence activity.

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With that in mind, I would now like to spend a few minutes scoping out some of the I2 challenges we are likely to face.

First, we should be in no doubt that I2 effectiveness is determined solely by its utility to Decision Superiority; thus, it must strike the right balance between accuracy, completeness, timeliness and accessibility.

Next, as we mentioned in the read-ahead material, one of the fundamental challenges in this area is actually agreeing what I2 means. In particular, I do not believe the 1991 APP-6 definition of information '*as unprocessed data, which when concerning adversaries is processed into intelligence*' aids understanding.

Of note, APP-6 offers no guidance on what data is – I struggle to believe it is a potentially higher order quantity than information – or any nomenclature for the equivalent of intelligence on either environmental or friendly/neutral issues.

In short, the definition is unhelpful and probably explains why it has been changed significantly in the new NATO IM Policy, such that Information is:

This, we would suggest, is much more useful and reminds us that anything we have recorded becomes information of some sort, which may be drawn on to be exploited with new data to provide further updates in understanding.

Another change we are likely to see as Network Enabling takes hold is the ubiquity of I2 across the battlespace. Just about everyone will have access to what they need – or, perhaps, more problematically – what they think they need, as well as what they merely find interesting.

We are already seeing the effect of rolling out networked PCs and displays across HQs and Air Stations – and as an example, I asked this question last year and I will repeat it again '*what possible advantage do we see in constantly playing UAV FMV on CAOC screens, just because we can?*'

The capability itself is not a bad thing – the challenge is to ensure we use it productively. And this challenge could increasingly find its way onto the battlefield – we are providing Rover terminals to ground force at a much quicker rate than we are providing FMV feeds – how do we take optimal advantage from these equipments, along with any emerging battlefield chat capabilities?

Reflecting on the way the Media has developed in recent times may give us some pointers here.

Before the advent of 24hr News channels, news editors collected, assimilated, edited and presented the 'News' perhaps 2 or 3 times a day.

There was time to ensure things were presented accurately with sources run to ground and collaborating evidence incorporated. One could argue the system was similar to our traditional Intelligence cycle.

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But with 24 hr coverage, much of that has changed. Today, reporters in the field report live to our homes on events as they unfold. The coverage is based on the reporter's often narrow view of events and may introduce inaccuracy or misperception due to its instantaneous nature.

The news editor can still pull it all together retrospectively, but will struggle to capture the impact of the live event and may need to mitigate his field reporter's impact on the story itself.

Do we face a similar J2 challenge as I2 is delivered to all. The FMV feed may be the equivalent of the field reporter and tactical necessity may require action based on its singular myopic view? Moreover, how do we ensure that all these tactical snippets are captured for the operational /strategic good and, just as importantly, any consequences of tactical activity incorporated into any subsequent higher level assessment?

And could we use the need to generate tactical and higher level I2 as a yardstick for the allocation of S&R assets across the battlespace?

In short, should we allocate sensors appropriate to the conduct of contact battles to the components and pool those sensors capable of deep battle collection under the Joint Commander for the common good? Were we to follow such a route, we may need to consider developing the equivalent of CAS for the massing of collection assets to critical points around the battlespace.

In addition, on-going I2 challenges are unlikely to go away any time soon. How do we breakdown National caveats and follow a *responsibility to share vice need to know* regime? How do we build Information Assurance, particularly, how do we protect ourselves from the capture of a network enabled node? And, finally, do we need to overhaul our J2/A2/G2/N2 structure and cycle to ensure a genuinely joined up product?

And now to finish, let's turn our attention to one of the key enablers of I2, Space.

Space has undoubtedly become a vital part of our economy.

Navigation and timing space systems enable financial transactions, precision farming, and precise package tracking.

Weather satellites provide data and images critical to shipping, agriculture and air travel.

Telecommunications satellites service our television, internet and communications needs practically anywhere in the world.

Advances in technology and access to military, scientific and commercial satellite services, now routinely deliver global situational awareness to today's decision makers everywhere.

Satellites can be used for remote sensing to provide information on treaty violations and verification, along with monitoring situations related to disasters, climate change, pollution, resource availability, civil unrest, refugee migration and population/urban growth.

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Satellites provide global coverage for missile warning and tracking.

Telecommunications and remote sensing satellites enhance border security, port security and security at high value events such as the G-8 Summit and the Olympics. Satellite imagery helps track and interdict illegal activities and conduct counter-drug operations.

Space improves efforts to prepare for, respond to, recover from, and prevent such threats.

And of course, we the warfighters have come to rely on space-based capabilities. Our forces use space-based systems for ISR, navigation and timing, SATCOM, missile defence, mapping, command and control...for just about every aspect of operations.

Put more simply, Space capabilities have changed, if not revolutionized the way militaries operate. If our forces have become dependant on Space, it is also true that there is little general awareness of what Space Power is, how Space Operations are conducted or what the key issues are.

Indeed, it is the assertion of the JAPCC that NATO transformation to an expeditionary, network enabled, Joint military force is dependent on, and can only occur with a genuine understanding of, space capabilities.

That said, Space can also be transformational for our adversaries. There are numerous threats and vulnerabilities to space systems. With easy access to commercial imagery via the internet, we face adversaries that are, amongst other things, much better informed.

Shown on this slide are a few examples of the vulnerabilities of space systems. Last year, the Chinese launched an ASAT, which successfully destroyed one of their satellites at an altitude of over 500 miles. Satellite ground stations have been destroyed during combat operations. In fact, NATO forces deliberately targeted a telecommunications facility in Serbia to deny C2. A few years ago, Iran disrupted the US Voice of America transmission into their country by using a jammer located in Cuba. These are just a few examples of many that we could talk about.

We also need to worry about the space environment and space debris, piracy and interference, lasers and network attack.

There are risks involved, if we do not address these new threats, which brings me to the JAPCC's thoughts on the need to develop Space Power.

Against a backdrop of growing awareness, and in some areas unease, ACT requested in Oct 2007 that the JAPCC provide an assessment of NATO space operations. In response, we delivered our NATO Space Operations Assessment to ACT at the end of May this year.

The assessment covers where NATO is today, where the mission area appears to be heading, identifies gaps and provides recommendations on how those gaps might be closed – some of which are highlighted here.

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NATO is faced with new potential mission areas. In order to protect against threats, mitigate risks and respond to attacks, we must have space situational awareness.

Second, the Alliance must decide if and how it will assure access to the space domain.

Third, we are challenged to deliver, and can only benefit from, better integration and use of national capabilities. Space is no different to the other environments – we have capabilities that our war fighters could use today, if only we can get access to them and set up the processes and relationships to use them effectively.

So what is the future of NATO Space Power?

*If the 20th century proved that you must have control of the Air, the 21st may well prove that you must also have control in Space.*

Putting it another way, would not our predecessors have considered it untenable to plan on free access to the skies without making any contingency for Air Defence or even the generation of an Air Picture?

In order to protect against threats, mitigate risks and respond to attacks, we would contend that Space situational awareness is a must. Several nations are working on developing this capability, but does the Alliance also require a Space picture?

As nations develop their own space capabilities and forces, will the Alliance be ready (or need to be ready) to conduct combined space operations?

Is there a need for a NATO Space Operations Coordination Centre to bring together National space capabilities and to coordinate joint requests for support from our forward deployed forces?

Does NATO need a constellation of small ISR satellites to provide an Alliance network whose Intel products can be shared by everyone?

Are we even reaching a point where we need a NATO Space Component Command?

In our view, now is the time for the Alliance to, collectively, addressing these and other important Space issues and we look forward to including your views in the debate.

That then, gentlemen, is a brief canter through the elements that make up this year's Conference. I hope this presentation, along with our 'Food for Thought' pre-read, has provided you with the ammunition to generate a lively debate. And, bearing in mind the high calibre of our panels this year, I urge you to take the opportunity to delve deeply into subjects that will profoundly affect how we take Air & Space Power forward.

Thank You – now if there are any questions?