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THE JOINT AIR POWER COMPETENCE CENTRE (JAPCC)

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

April 2008

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NATO'S FUTURE JOINT AIR & SPACE POWER (NFJASP)

The future battle on the ground will be preceded by battle in the air [and in space]. This will determine which of the contestants has to suffer operational and tactical disadvantages and be forced throughout the battle into adopting compromise solutions.

Field Marshal Erwin Rommel

Reference Documents

A. Alliance's Strategic Concept (SC), C-M (99) 21, dated 29 Apr 99.
B. Comprehensive Political Guidance, SG (2005) 0918, dated 7 Dec 05.
C. DPC-D (2006) 0004, dated 7Jun 06 (Ministerial Guidance 2006).
D. Political Guidance dated 29 Nov 2006 (Riga).
E. Expeditionary Operations, Overarching Conceptual Vision and Framework (Draft) version 1.1, HQ SACT, dated Nov 2007.
F. Bi-strategic Command Pre-doctrinal Handbook (Effects Based Approach to Operations (EBAO), dated 4 Dec 2007.

1. INTRODUCTION

"*Air Power is an essential element in all military operations. It can be employed over the full spectrum of military operations, at any level, in support of national, joint or multinational operations and objectives. It can be brought to bear on an adversary's political, military, economic, information or social system structures simultaneously or separately, and it can be coordinated with land and maritime surface and sub-surface and space operations or employed independently*".[1]

1.1. Since the end of the Cold War, NATO and NATO Nations independently have made massive efforts to transform their military outlook away from a defensive territorial posture and towards the expeditionary capability needed to meet the military needs of today's changing Strategic Environment. Technological advances in communications and weapons capabilities continue profoundly to affect the way military forces do their business. It is essential that military forces not only keep pace with these changes but also look forward to ensure that we continue to take the very best possible advantage from limited military resources. In References A-F, the NATO Alliance has set out its purposes and tasks, as well as the means that are to be used to achieve Alliance objectives. To keep pace, there is an urgent need to examine the part that NATO Air and Space (A&S) Power will play in the accomplishment of those objectives and identify how that future might unfurl.

1.2. **Aim**.
The aim of this paper is to examine the role NATO Joint A&S Power will play in future operations. The paper focuses upon potential capability gaps and recommends actions to overcome them.

[1] AJP 3.3 Para 201.

1.3. **Scope**.
This paper examines the part NATO A&S Power will play in the future Strategic Environment, in light of the Transformation initiatives by ACT and it looks specifically at Command of A&S in network-enabled warfare. The paper also examines future A&S capabilities and technological advances in Space, Unmanned Aircraft Systems (UAS) and multi-role initiatives. Finally, the paper recommends actions which can be taken now and would optimise the effectiveness of A&S Power over the next 10-15 years. This document presents an informed view of how the future might develop; its conclusions and recommendations represent, therefore, more trends than hard goals and will require frequent reappraisal to ensure any deductions and assertions remain broadly aligned to actual developments. To this end, it should be reassessed as necessary.

1.4. **Assumptions**.
The Alliance will continue to perform the security tasks set out in the SC (Reference A), namely security, consultation, deterrence and defence, crisis management and partnership. It is assumed in the SC and was reinforced during the Riga Summit in 2006 (Reference D) that:

a. NATO's level of ambition will not change significantly over the foreseeable future.
b. Collective Defence will remain the core purpose of the Alliance and the character of potential Article V challenges will continue to evolve.
c. On a case-by-case basis and by consensus, the Alliance will remain ready to engage actively in crisis management, through non-Article V crisis response operations.

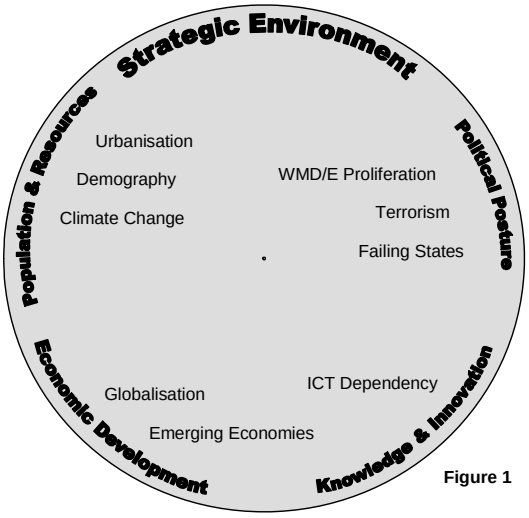

Figure 1

2. THE EVOLVING STRATEGIC ENVIRONMENT

2.1. The evolving strategic environment, described in the Allied Command Transformation "Read Ahead" document reproduced with permission at Annex A, is depicted in Figure 1. Change is endemic.

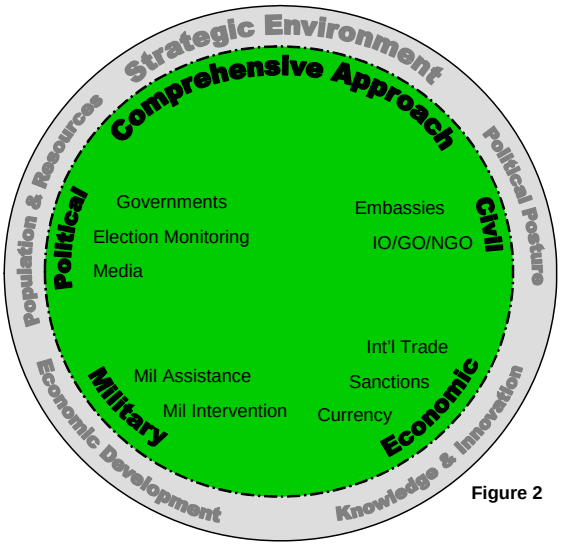

Figure 2

2.2. The future strategic environment will be driven by numerous interwoven political (including military), economic, sociological and geopolitical trends. The maintenance of stability in this complex and diverse environment will require, in addition to military effects, the application of political, economic and civil influences. This collective application of effort, known as the 'Comprehensive Approach', is depicted at Figure 2. The 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 very 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, as depicted in Figure 3.

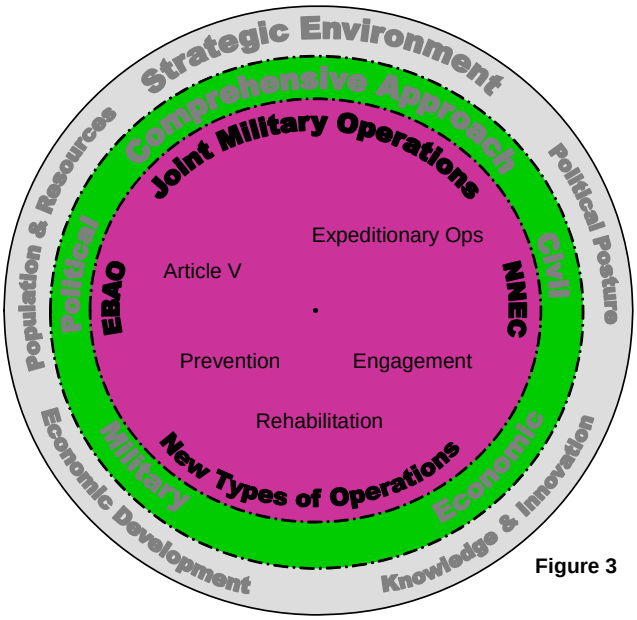

Figure 3

2.3. Technological progress in developing the sophisticated long range projection of military capability, such as autonomous UAS, reach-back command centres, Cruise Missiles, Inter-Continental Ballistic Missiles, Space, Satellite and Net-Centric communications links and Internet Protocols, will increasingly enable the conduct of warfare from a distance, with minimum risk to the lives of friendly forces, especially by the more technologically advanced Nations. This trend towards Remote Control Warfare (RCW) has political, legal, ethical and cultural implications, which will have a profound effect on the nature of future combat. RCW offers much obvious and welcome potential to save friendly life, but its broader ramifications must be considered ahead of the wave of technological progress and its impact is likely to be particularly acute in the A&S environment. Operational requirements must come before technological ambition.

2.4. Operationally, Joint Military Forces are likely to be called upon to carry out activities, which can be usefully categorized into 3 broad themes:

a. **Prevention** measures to pre-empt a potential crisis, to coerce or deter an adversary.

b. **Engagement** may be necessary to apply armed force actively to counter a threat to stability. This category specifically includes combat operations.[2]

c. **Rehabilitation** operations will be necessary after the failure of a state or any form of conflict to re-establish stable conditions. These operations may use any means, including armed forces peacefully, in support of civilian authorities.

These categories are not mutually exclusive; indeed, combinations of the three, in concert with political and economic activity, will often represent the only way to reach a favourable outcome.

2.5. As well as changes to the security environment, future military operations will be conditioned by the policies laid out in References A-F, along with the impact of Transformation under the stewardship of ACT. The former requires the Alliance, amongst other tasks, to be capable of large scale conventional conflict, in line with its Article V obligations. The latter, on the other hand, places particular emphasis on the ability to conduct Expeditionary Operations

[2] In turn, these may be usefully further delineated into major warfighting and other combat operations, thus reflecting the challenges of wars between armies and those between smaller units rather than the intensity of operations to those units involved.

(EO) in a comprehensive, effects-based (Reference F) manner often within a complex and amorphous[3] battlespace, whilst optimising the benefits that network enabling has to offer.

3. AIR AND SPACE (A&S) POWER CONTRIBUTION TO JOINT MILITARY OPERATIONS

Without A&S Power, 500,000 to 600,000 troops would be needed in Afghanistan to achieve the same effects as the 40,000 soldiers, sailors, marines and airmen we have there today. A&S Power provides the asymmetric advantage over the Taliban such that no matter where they choose to fight, coalition forces can bring to bear overwhelming firepower in a matter of minutes. Moreover, putting 5-600,000 troops into the country may achieve the same military effect, but it could also have a negative impact on the population; such numbers could appear as an occupying force rather than a security assistance force. In short, there is no substitute for effective A&S Power.

Lieutenant General Karl Eikenberry[4] (United States Army)

3.1. **Space in Joint Capabilities.** Air has, for the moment, assumed responsibility for Space simply because it is often seen as an extension of air and not as a separate medium of operations. However, all components rely on Precision, Navigation and Timing (PNT), Network Enabling, Surveillance and Reconnaissance derived from Space. This Joint requirement and the strategic nature of Space operations militate towards Space being controlled at the strategic level. Moreover, fundamental differences exist in operating procedures between Air and Space, which could, in the medium to long term, draw Space away from Air to the extent that the possibility of a new and independent space command construct may need to be explored.

3.2. **Nature of A&S Power**. Figure 4 depicts A&S Power as a component part of Joint Military Operations[5]. In considering A&S's overall contribution to Joint operations, it is useful to gauge manoeuvre against the level of co-ordination required. A&S manoeuvre takes place across the spectrum of A&S operations, but the required level of coordination with the other components is variable. Against a co-ordination axis ranging from jointly co-ordinated to co-ordinated solely in the A&S environment (albeit subject to the aims of a Joint Plan), Figure 5 reveals 3 basic categories of A&S endeavour. In Joint

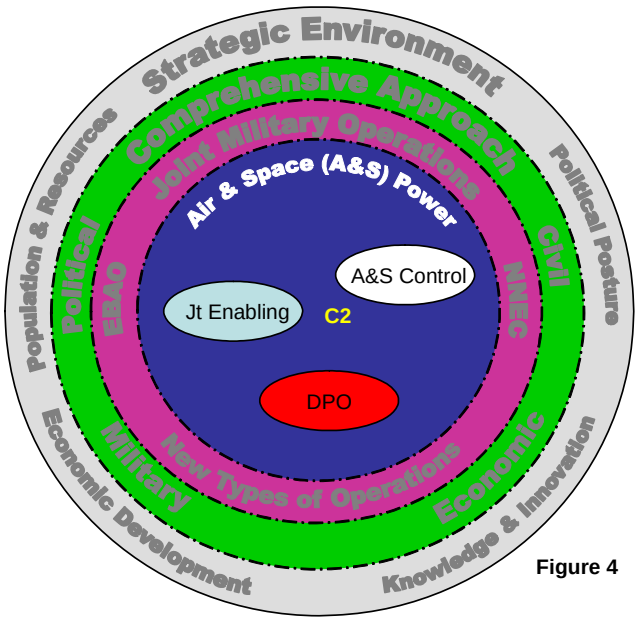

Figure 4

[3] Formless, shapeless, vague, unstructured, fluid. Oxford Concise Dictionary
[4] Lt Gen Eikenberry is the Deputy Chairman of NATO's Military Committee. Prior to this posting, he was twice assigned to command positions in Afghanistan. His last position held was that of Commander, Combined Forces Command, Afghanistan.
[5] Similar charts could, of course, be drawn for Land and Maritime Components but for the purposes of this paper only A&S is shown here.

Enabling Operations, A&S actions need to be coordinated with the other components in order to support them to accomplish their tasks; in Control of A&S, on the other hand, 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 operating out of sight and reach of the other components and therefore minimum coordination is necessary. The ACC's freedom to manoeuvre is inversely proportional to the degree of coordination required.

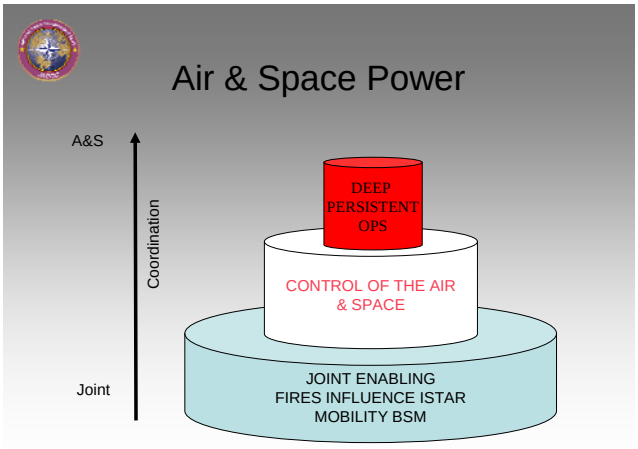

Figure 5

3.3. In sum, as we move up the axis, the Air Commander moves from supporting through supported towards practically independent actions. Looking at these categories in more detail:

a. **Control of A&S**. Control of A&S is possibly the most easily taken for granted, especially because in recent major operations in the Balkans, Iraq and Afghanistan, Control of neither Air nor Space has been contested. This is unlikely always to be the case.

i. **Control of the Air**. Expressed quite simply, Control of the Air is and will remain vital to forces wishing to manoeuvre on the surface, as well as to air platforms wishing to apply effect in the deep. This is as true for EO as it is for force on force conventional conflict. Control of the Air may need to be fought for, conceivably as a prerequisite to even attempting to achieve other Joint Military Effects[6]. Such a contest 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.

ii. **Control of Space**. Similarly, nearly all of today's Joint operations are reliant on Space capabilities. Moreover, an EBAO is critically dependent upon the information and networking that satellites routinely provide and, along with Air, Space provides the medium through which Ballistic Missiles manoeuvre with both Offensive and Defensive (ALTBMD) implications. To be effective, NATO Space capabilities must enjoy freedom to manoeuvre without interference from an adversary. Both China and the USA have recently demonstrated their ability to shoot down an orbiting satellite from the surface. Unfettered access to Space can, therefore, no longer be assumed. The means by which friendly forces will

[6] In WWII, General Eisenhower would not allow the D-Day landings to take place until Control of the Air was assured.

establish and maintain the required degree of Control of Space needs to be addressed as a matter of urgency.

b. **Joint Enabling Operations**. A&S Power's capabilities in the Joint arena have evolved significantly over the last 2 decades. 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; precision bombs have little in common with their World War II predecessors. Yet, notwithstanding Lt Gen Eikenberry's comments above, these capabilities are only useful if Joint Commanders know they exist, understand their potential and are willing to cross Service lines to tap into them. Positive progress has been made in developing Joint cooperation but cultural, educational and training barriers to progress still exist. 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. This issue is compounded by real differences between the lengths of Land, Maritime and A&S Components' planning cycles, which lead inevitably to a perceived mismatch in responsiveness. Joint operational planning must integrate the capabilities of all components. There is no right and wrong in this and all Components should synchronise their planning cycles to achieve optimum effect. To achieve this, all Component Commanders and their staff must be represented as EQUAL PARTNERS in a genuinely Joint planning process. Moreover, there is a need to close the cultural divide by improving Joint education and training in order that each component collectively has a good appreciation of the capabilities and needs of the other components. Forces need to be consistently educated, trained and exercised together from 'cradle to grave'. There needs to be commonality in vocational training, domestic accommodation, "common core skills", force protection etc; personal A&S skills should become specialised areas. In the Joint arena, combatants from all components need to be joint warriors first and environmental specialists second.

c. **Deep Persistent Operations (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 to geography, legal restrictions or lack of sufficient forces, the other components cannot reach. Deep is any part of the area of operations (AOO), which is not directly influenced by friendly surface forces. In DPO, the persistence of A&S Power has been enhanced significantly by improved access to and use of Space, the persistence of UAS, improved intelligence, surveillance and reconnaissance (ISR) sensors and distribution networks. The A&S environment offers unique and growing potential both to understand and influence matters in the deep and it is here where the nature of A&S Power has, perhaps, changed most significantly.

3.4 The impact of A&S on all environments and its potential to realise acute intended and unintended effects demands direction and orchestration of the highest order. However, A&S will unlikely ever be able to accomplish the full spectrum of Military Effects alone. This is also true of Land and Maritime Components. Therefore, it is vital that the 3 components work together as equal partners to integrate their capabilities, in order to accomplish the common objective.

4. COMMAND OF A&S

4.1. **A&S in Decision Superiority**. History shows many instances of battles being won not by the side with the strongest military forces but by the side that made the better operational and tactical decisions[7]. A fundamental to achieving decision superiority is the Commander's access to information and intelligence that is consistently more accurate, reliable and timely than that of his adversary. A&S Power will be the principle collectors and distributors of ISR, but translating the data collected into information that contributes effectively to Shared Situational Awareness (SSA) and is usable by commanders at all levels will be a considerable challenge for the Joint Commander. It follows that the Joint Commander must use the best available intelligence to inform his decisions and planning.

4.2. **The Evolving A&S Command Process**. Traditionally, Command of the Air environment has been based on the principle of centralized Command and Control and decentralized execution. This mode of operation perfectly suited the force because situational awareness [to the degree appropriate to making operational level decisions] only existed at the higher command levels. The 'Control' element of Command and Control amounted to very closely defined directives and orders given to subordinate units for the execution of missions, allowing little or no scope for initiative at subordinate levels. Network enabling and SSA now open a new realm of opportunities that beg re-consideration of this arrangement. C4ISR[8] has become an accepted term; A&S Power now needs to reap the benefits of improved information exchange and move its Command procedures forward into the Information Age. The following outlines how this might be achieved:

a. **Mission Command.** Improved SSA, enabled by the NNEC, is shared by Commanders at all levels and is no longer the sole preserve of higher Command. Commanders operating at lower levels will be well aware of the higher Commander's Intent and what effects need to be achieved in the pursuit of objectives and end states. Now they will also be equipped with operational situational awareness, which will enable them to make sound operational judgements within their sphere of responsibility – in other words, the Joint Commander will define what is to be done, Commanders at lower levels can now decide how to do it. The absolute need for the ACC to exercise centralized Control is diminished. 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. This is the principle of Mission Command[9]. Through this application of Mission Command, the ACC can detach himself from the minutiae of mission planning and execution, and focus on his main priority, command. In this context, command expressly includes not only the command of people but also commanders using their initiative creatively to apply all the capabilities available to them to support the Joint Commander's accomplishment of Joint Effects. The ACC's prime concern should be the efficient use of the complete A&S force package to accomplish or contribute to the accomplishment of the desired Joint Effects. In turn, Mission Command will allow subordinate commanders at all levels to think, plan and execute their designated tasks and to use their imagination and initiative in the same way as the ACC is enabled. 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.

[7] Lord Nelson in the Battle of Trafalgar being one of the more famous examples. Power to the Edge, Alberts and Hayes, CCRP, page 28.
[8] Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance.
[9] Through the process of Mission Command, Commanders direct **what** is to be accomplished and devolve necessary decisions on **how** to do it to subordinate commanders.

b. **Mission Command Tasking 'Market Place'**. With Control of A&S actions delegated, the need for Combined Air Operations Centres (CAOCs) to exercise tight control through an extensive Air Tasking Order (ATO) would diminish. The challenge for subordinate commanders would be to 'compete' with their contemporaries for the resources they needed to support their missions, such that only the higher priority actions attract available support. Higher Command levels would only need to become involved in this process when an unresolved dispute over priorities arose between Commanders. Similarly, the extensive roll-out of secure tactical data links and complementary ground equipments should permit a more free-flowing air structure, thereby reducing the need for unwieldy airspace restrictions commonplace to ACO/ACM. Overall, the aim should be to replace today's centralised hierarchal tasking construct with an open market system where mission/effect priority draws the appropriate level resource.

c. **Scope for Mission Command in A&S Command**. It is important to note that the scope for the ACC to apply Mission Command will vary, particularly in deep operations. Access to hostile airspace and/or the selection of strategic targets may be so politically sensitive that the ACC would need to retain closer 'Control' of such actions. Similarly, the ACC may need to retain an element of 'Control' over Air Combat Support assets, such as Strategic Air Transport (AT), Air-to-Air Refuelling (AAR) or Suppression of Enemy Air Defence (SEAD), in order to ensure that employment of such support is optimised and available to the higher priority tasks when it is needed. In reality, however, allowing the 'market place' to resolve the optimum *where, when and who* may be adequately enabled by the setting of *how much* of a capability is available. Traditional and unilateral resolution of these conflicts of interest through the ATO should no longer be necessary.

d. **Pre-Requisites of Mission Command**. To exploit fully the benefits that Mission Command offers, the ACC and his subordinate commanders need to be able to act autonomously to the extent of full self-synchronisation[10] in achieving the desired effects. However, for this to happen, several pre-requisites need to be met[11]:

i. There needs to be a clear, concise and consistent understanding of the Joint Commander's intent throughout the command chain.

ii. There needs to be a sharing of high quality information and SSA.

iii. There needs to be COMPETENCE at all levels of the force.

iv. There needs to be TRUST in information, subordinates, superiors, personnel and equipment.

If these conditions are met only partially or not at all, the commander will need to make a judgement call on the degree of authority that he is at liberty to delegate. However, each constraint incrementally limits the commander's ability to fully exploit the potential of his force and its enablers. In combat, there will never be one panacea that can solve all the different leadership and coordination challenges.

[10] Self-synchronisation is defined as "the combination of a rule set (which describes the desired outcome in various operational situations) and shared awareness that enables the entities to operate in the absence of traditional hierarchical mechanisms for Command and Control." - Network Centric Warfare – Developing and Leveraging Information Superiority, 2nd Edition (Revised) David S Alberts, John J Garstka, Frederick P Stein.

[11] Power to the Edge, Alberts and Hayes, CCRP, page 28.

e. **Implications of Successful Mission Command**. Relieved of the need to 'Control' A&S forces to the same degree as today and now focussed on 'Command', the ACC may no longer need to deploy forward with the same number of support staff. In particular, a reduced ATO requirement may obviate the need to forward deploy a Combined Air Operations Centre (CAOC). This could markedly reduce the A&S staff's forward footprint. The ACC and his immediate support staff will be able to spend significantly more time in the Joint Headquarters, standing alongside and supporting the Joint Commander, where they would be best placed to fully understand the Joint Plan, and to influence A&S' position in the establishment and achievement of Joint Effects. The efforts of CAOC staffs would be redirected towards complementing SSA with an expanded Air Operations Directive (AOD), which would now focus upon elaborating from an A&S perspective the Joint Commander's Intent. The need for contemporary Reachback initiatives, which are currently stretched to distribute directives and orders, as well as to assess the progress towards the accomplishment of Joint Effects, could be minimised as that same information would be circulated through network enabling as part of SSA delivery. In short, by allowing subordinate commanders the scope to use their initiative and creativity to accomplish effects, both the Joint Commander and ACC are better supported, commanders with the best available information to make operational and tactical decisions are allowed to make those decisions, the force is better motivated, response time is reduced and the need for existing cumbersome Command and Control architectures is diminished.

4.3. The 'Art of Command' is such that every commander needs to be creative and adaptive in choosing the right leadership style and organisation, fitted to meet prevailing circumstances. The challenge facing Air Commanders at the highest levels now is to create flexible Command arrangements, which will facilitate initiative and manoeuvre at all levels and enable the achievement of the highest level of self-synchronization possible. To some extent, this will be dictated by equipment, the commonalities of ground station networks, access to information and the roll-out of aircraft links. In short, the Commander must judge the balance between Control and Mission Command, conditioned by the degree of SSA he can generate. The result of successful Mission Command is limited only by the creativity and drive of the Command Chain.

5. EMERGING A&S CAPABILITIES

5.1. **Space**. The importance of Space Systems Capabilities to the military has significantly increased in recent years. Space based systems are used to provide missile warning, communications, ISR, PNT, meteorological information and friendly force tracking. In particular, Space-based systems are crucial to providing intelligence over denied areas. Space systems will be a critical enabler of NEC, decision superiority, manoeuvre and precision engagement. Space capabilities are vital to DPO and they are the backbone of Joint Enabling activities. Technological advances in space-based capabilities will allow future forces to take advantage of hyper-spectral imagery, moving target indication, laser communications and unmanned systems. Recent advances in smaller less expensive tactical satellites (TACSATs) and the associated miniaturization of sensors, processors, and communications provide an alternative to single, very expensive large satellites. This technology will enable the use of space at the tactical level, significantly contributing to persistence and commanders' ability to apply initiative and manoeuvre. The mix of low earth orbit TACSATs and large geo-synchronous orbit satellites with air and surface networks and sensors will create a responsive, robust and persistent network previously unseen. However, space capabilities must be thoroughly integrated with air and surface systems if they are to realise their full potential.

5.2. **UAS**. The pace of technological development of UAS by Defence Industry is staggering. 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. Moreover, the commercial application of UAS is a major growth area and, in the future, some military tasks could be 'contractorised'[12]. In particular, UAS are capable of long duration, dull tasks in dangerous, possibly enemy held, airspace or contaminated environments, 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, which 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. Further development will include the networking of UAS with unmanned ground and maritime systems. Thus, A&S Power is the current leader in unmanned systems, an area that will assuredly become Joint.

5.3. **Swing-role Aircraft and Crews**. Agility is key to EO; aircraft will be required to shift quickly from one mission type to another as conflict intensity ebbs and flows. Strategic AT will be at a premium during deployment and recovery phases, but AAR may be more important to in-place operations; bombers may be required during prevention and engagement phases but they may be redundant during rehabilitation. Technological advances in aircraft design and miniaturisation make it possible for modern airframes to perform multiple mission types, all weather day or night. Enhanced precision small yield weapons with increased stand off allow for surgical strike for both air-to-air and air-to-surface missions and a variety of bolted-on capabilities, such as radio jammers, continue to increase non-kinetic capabilities. Hitherto, this has been well demonstrated by the use of recce pods on fast jets to provide ISR during the less kinetically intense counterinsurgency operations. The reverse could also be true and there is a similar argument for placing weapons matched to sensors on some ISR platforms. Such improvements enormously expand aircraft utility and enable role swinging across the spectrum of operations. The diversity of operational roles will require much more versatile forces, which need to be adequately trained and exercised to carry out a broad range of activities, all of which contribute to the achievement of Joint Effects.

5.4. **Roles of A&S Power and Precision Effects in Delivering Cognitive Effects**. The transformation of A&S Power doctrine from traditional 'Cold War' conventional principles to the A&S activities required in expeditionary, irregular conflict is incomplete. The roles of A&S Power in the Joint battle have changed little. The A&S capability to deliver weapons with pinpoint accuracy and minimum collateral damage is recognised and well known. Perhaps not so well appreciated is A&S's capability to influence by non-kinetic means. The aim should always be to deliver or contribute to the accomplishment of Joint Effects. In this endeavour, precision-targeted ISR can provide the additional understanding necessary to further refine subsequent actions. In rehabilitation, AT and Support Helicopters can deliver humanitarian relief to remote outposts and A&S forces can be used to train indigenous forces in the skills required to re-build law, order and security. This flexibility reinforces the ubiquity and flexibility of A&S Power and the need for A&S personnel to be intelligent, adaptable and capable. A

[12] One well-known UAV Company is already offering 'UAV by the Hour', a concept in which the military defines the ISR requirement, while the company operates the UAV (remotely from a safe distance) to acquire it. The military, of course, pays for the privilege to sustain the operation.

comprehensive review and modernisation of A&S doctrine is needed to maximise this broad range of A&S capabilities.

5.5. In summary, A&S plays a vital role in providing SSA to Joint Military Commanders at all levels of command. Increased access to and technological progress in space, long range, armed and autonomous UAS with improved sensors and remote attack opportunities, swing-role aircraft, precision and more adaptable forces will collectively further enhance the persistence and flexibility of A&S Power of the future. In the future, A&S Power will become even more relevant to the conduct of Joint Military Operations than it is today.

6. **CONCLUSIONS**

6.1. The complexity of the Future Strategic Environment will require Joint Military Forces that are capable of operating in concert with political, civil and economic influencers to achieve effects across the spectrum of conflict from Article V force on force operations, through PSO to Humanitarian Relief. In this environment, advances in RCW technology will increasingly enable Nations to conduct warfare from a distance; however, it is important that the political, ethical and cultural implications of this development are addressed in parallel and that technological ambition is not allowed to overtake operational requirement. Moreover, it is essential that remaining cultural barriers between sister Components are broken down through training and education and that the efforts of all Components are successfully integrated into a collective effort to accomplish Joint Military Effects. In particular, all 3 Components need to play an equal part in the planning of Joint operations. A&S Power, through its 3 pillars of Control of A&S, Joint Enabling Operations and DPO, will play an even more fundamental and essential part in the future of the Joint Military capability than it does today. Control of the Air, a prime responsibility of the ACC, may need to be fought for; this conquest could represent a massive draw on limited A&S resources of all Services. Moreover, recent events have shown very clearly that Control of Space can no longer prudently be assumed. Improved SSA, enabled by NNEC opens up a golden opportunity for A&S Command doctrine to embrace Mission Command more comprehensively, which would massively improve initiative and creativity at all levels of A&S command and ultimately the flexibility and responsiveness of A&S Power. Emerging technologies in Space, UAVs, swing-role equipment and precision will improve the persistence, flexibility and responsiveness of A&S Power; doctrine must be aligned to keep pace with these developments. The future of A&S is assured; there is much that can be done now to ensure that its extensive capabilities are put to best use.

7. **RECOMMENDATIONS**

7.1. It is recommended that:

a. NATO addresses the political, ethical and cultural aspects of RCW and consequent operational requirements ahead of technological ambition.

b. NATO urgently needs to identify a future A&S Command construct, which will:

i. Seize the advantages now available through NNEC and SSA, in order to embrace Mission Command.

ii. Adapt A&S Command doctrine to improve the integration of air-ground planning and execution.

iii. Integrate the capabilities of all Components.

c. NATO develops a strategy for Space, which addresses the pressing need for a concept for securing the freedom of friendly forces to manoeuvre in Space and takes steps to maximize the integration of existing and future national space capabilities.

d. NATO resolves airspace challenges associated with UAS, the vulnerability of friendly UAS and defence against enemy-held UAS.

e. NATO and National future A&S force training and exercising policy should be re-designed to:

i. Develop in A&S forces an instinct to achieve effect rather than simply to take actions.

ii. Train A&S forces to exercise Mission Command in the Joint arena.

iii. Educate A&S forces in the capabilities and operating techniques of their sister Components.

iv. Train A&S forces how best to integrate their actions with those of sister Components in order to maximise the benefit to achieving Joint Effects.

v. Develop a ‘Joint warrior first, environmental specialist second’ philosophy.

vi. Develop a template for evolving swing-role options.

f. NATO urgently takes action to align A&S doctrine with the entire range of future operations, including modernisation of effects, actions and roles philosophy, especially in the Influence domain.

ANNEX A TO
05.01.04/JAPCC
/
PCD/APR08

Allied Command Transformation (ACT) Read-Ahead for 'Tomorrow'
Future Security Environment Session
Wednesday 20 February 2008

The Alliance must continue to examine the future security environment (FSE) to identify emerging challenges and threats and their subsequent impact. To accomplish this we must be creative and willing to innovate while continuing to prepare for a future beyond ISAF. In doing so we must assess possible conflicts that could occur at some indeterminate point, against an opponent who we may not at this juncture know, and in political conditions we cannot predict.

The purpose of this work is to help prepare military advice for NATO authorities to use during ongoing discussions, possibly related to a new Strategic Concept. The intent of this program is not to explore any outline or mandate for a new concept but rather to present ideas for discussion to inform those who require the best military advice possible on what the future may hold for the transatlantic community and NATO.

SACT – Multiple Future Analysis: ACT looks beyond ISAF

What the future will look like depends on a complex interaction of incalculable enduring and emerging trends as well as discontinuities of these trends known as "shocks". This paper describes some of the more common trends and challenges to support the Military Committee discussions at Norfolk which will be followed by a non-paper covering multiple possible futures. "The benefit of strategic futures work is not that it predicts the future, which is unpredictable, but it is about rehearsing possibilities, so one is better able to respond if they happen." [13]

Over the last few weeks ACT/FCRT analysts have reviewed the ACT Future Security Environment Study 2025[14] (see annex 2 for overview), the Long Term Requirements Study[15], various think-tank studies and several national studies/papers from NATO member countries, partner and contact nations on the future security environment. From this analysis, they have identified 6 trend areas and 11 security challenges for your consideration.

1. Strategic Trends

[13] Benchmarking UK Strategic Futures Work – Government Performance and Innovation Unit.
[14] The Future Security Environment (FSE) is produced by the HQ SACT Intelligence Sub-Division. The aim of this paper is to describe emerging and established trends, which if considered, could assist NATO's ability to address the future security environment in an increasingly inter-dependent world.
[15] The Long Term Requirements Study is produced by the HQ SACT Future Capabilities, Research & Technology (FCRT) Sub-Division. The aim of this paper is to support the identification of Long Term Capability Requirements for the Alliance, within the 2015-2030 timeframe.

Demographics & Urbanization: 90% of the increase in world population will occur in developing and poorer countries. A large youth bulge, combined with unemployment and under-education, is likely to exacerbate its effects. 60% of the world's population is expected to live in cities by 2030, with the number of mega-cities (>10M) increasing from 19 today to 27. The majority of those will be located in developing countries.

Environment & Resources: Consequences of climate change will be particularly severe in developing countries, both in urban and rural areas. By 2030, two thirds of the world's population is expected to live in water-stressed areas. Fossil and alternative energy sources are expected to be sufficient to cope with anticipated increases in energy demand.

Globalization & Networking: Globalization will continue to grow winners and losers. The imbalance between the revenues of developed, emerging and poor countries (as well as within) is likely to persist. Developed societies and their economies will become increasingly network-centric.

Terrorism & Religious Extremism: Transnational terrorism will continue to derive its energy and justification from political motivations, disadvantage and grievance; it will extend beyond poor and volatile regions. Religious radicalism continues to become attractive to those who feel victimized or threatened by the cultural and economic impacts of globalization and increased social interconnectivity.

Technology: Global technology diffusion is likely to accelerate, reducing but not closing existing technology gaps between societies. It will empower the individual versus nations/societies. The 'dual-use' design of technology, possessing both civilian and military utility, will benefit those less technologically capable, particularly through the production of cheap and novel applications.

Global Governance: The world is increasing its interdependence and complexity. Emerging players like China and India will alter the current strategic balance. States will remain central actors of global governance, but non-state actors will acquire more influence. International law regarding the use of force will need to adjust to those new realities, reaching an acceptable balance between effectiveness and legitimacy.

2. Security Challenges

Mega-city failure: The effects will be equivalent in character to state failure. Civil Order would demand a comprehensive Civil-Military approach, new skills, extensive use of non-lethal weapons and an enduring operational commitment from the military. The complexity of urban environments can degrade or reduce mobility, as well as the effectiveness of high-technology weapons, communications systems, and intelligence, surveillance, and reconnaissance (ISR) capabilities. In addition, population density affects countless complex social and cultural interactions that influence human intelligence and open-source information while increasing the risk of collateral damage. This will require a number of sophisticated capabilities including human and cultural mapping, running of city services and utilities, while conducting very precise combat operations against opposing forces. Frequently, small combat operations teams that combine warfighting, police, and civil affairs capabilities will be present in the environment as adversaries, allies, or neutrals. The

opportunities for close contact in this environment will multiply force protection requirements.

Recruitment: The armed forces in societies that have a declining proportion of young people may find it difficult to attract suitable or sufficient recruits. This trend is likely to be exacerbated by extended full-time education and a consequently greater age at which people will enter an increasingly competitive market for labour. This may lead to an expansion of technical applications, possibly coupled to increasing recourse to the use of foreign or commercial manpower, especially for deployed or enduring tasks. The recruitment challenge may also lead to a requirement to review the role of conscription and immigration policies.

Securing Natural Resources & Energy Security: Key natural resources, especially oil, gas and minerals of strategic value, will continue to be sourced from unstable areas. Maintaining access and containing instability risks in these areas is therefore likely to increase in importance, alongside wider developmental and stabilization roles. Energy Security, including protection of vital supply lines, will remain one area critical to the security of the Alliance. It is a multi-faceted issue that must be dealt with by multiple actors. Military intervention may be necessary to protect the integrity of production sites and/or transportation means.

Media scrutiny: The expansion of the media in all its forms (traditional tele-visual, the internet, and citizen journalists), will impact across every aspect of life. The CNN Effect (24 hour news media) is being replaced by the YouTube Effect (Diverse and sometimes anonymous postings giving all actors a media voice.). The basis of “truth” will be heavily subjective. Governments, political parties and administrative organs will be subject to pervasive scrutiny and challenge by individuals and groups. The Strategic and Operational Commanders will rely heavily upon a broad public affairs campaign that can successfully compete with the messages of opponents in traditional news media and cyberspace.

Information warfare: Development of highly sophisticated information and cultural warfare capabilities, and exploitation of pervasiveness and pliability of digital information to gain commercial or political advantages, will spread. The threat of hacking and network manipulation will increase in frequency and intensity as criminals, terrorists and other opponents move to exploit our cyber-vulnerabilities. Military Information & Communication Technology systems will require robust and comprehensive protection, fall-back options that do not depend on commercial bearers and unhindered access to exclusive space-based platforms. Military commanders will require technology and skilled operators to conduct cyber defence and cyber attacks in military and civilian information communities.

Complex Environments: The increasing complexity of future conflict environments, including pervasive media and internet coverage, will pose a challenge to armed forces which operate within them, demanding new tactics, specialized equipment and heightened levels of discrimination. Military personnel at all levels will require increased awareness of the legal implications of their actions and sophisticated training based upon objective, internationally recognized doctrine. The variety and changing character of the

environment may increase the training requirements and perhaps broaden the range of skills required to generate sufficiently agile and battle-winning forces.

Irregular / Asymmetric Activity: In the absence of direct, open state-on-state conflict, there will be a marked increase in the prevalence of irregular activity. Most will demonstrate features associated with criminality, terrorism, disorder and insurgency, fuelled by nominal or actual grievance, deprivation and resentment, or simply in reaction to market forces or boredom. There will also be increased sponsorship of irregular activity by states, seeking to utilize and exploit, through proxy, gaps in the international system, either to assert themselves or secure advantage without exposing themselves to state-on-state risks. Armed criminal, terrorist and insurgent groups will be part of the strategic landscape and will need to be identified and countered. The irregular opponents will base themselves in underground networks, both for offence and defence, especially in complex urban spaces.

Transnational Terrorism: Acts of extreme violence, supported by elements pushing radical ideologies, will continue to persist. They will use sophisticated networks and media exploitation to maximize the impact on population and seek political destabilization. Such types of activities are likely to increase in proportion with the growth of discontent in densely populated areas. The effects of demography and the concentration of population will both increase the target audience of such fundamentalist groups and the potential number of undiscriminating attacks. It will also render more difficult the identification and monitoring of ideological extremist groups blurred into the population.

Unmanned Technologies & Legality of Weapons Systems: Unmanned technologies will reduce risk to military personnel and provide an expanded range of capabilities. It will extend the reach capability of forces in extreme or hazardous environments. It will also provide permanent sensing, monitoring and reporting capability in remote or hostile areas. However, it is likely to raise further consequential legal and ethical issues when coupled with autonomous response system; particularly artificial intelligence (AI) enhanced robotics.

Weapons of Mass Destruction/Effect Proliferation: An increase in the number of nuclear-armed states will affect the ability of the world's leading military powers to undertake intervention operations. Operations that threaten the personal or regime security of autocratic leaderships in nuclear-armed states will entail particular risk. The foreseeable growth of civilian nuclear facilities in developing countries with poor security control will provide new sensitive targets to extremists' attacks and for the trafficking of nuclear material. The global access to technology in the biological and chemical fields will generalize the ability for failing states or malevolent factions to access WMD/E technology without control.

Soft power: The ability to use and counter "Soft Power", centred on access to target audiences through projection of culture, investment, education, development and other non-coercive means will increase in significance. The Military Commander will require a broad knowledge base, access to non-military expertise (possibly via a reach-back system) and a flexible, iterative planning and feedback system in order to effectively execute or support a soft power campaign. Inherent within soft power is the ability to coordinate or collaborate with external organizations at the strategic, operational and tactical levels.

These non-exhaustive and non-prioritized trends and implications are presented here to stimulate the debate on our future world possibilities as we seek your consideration and input for the discussion ahead.

ANNEX B TO
05.01.04/JAPCC
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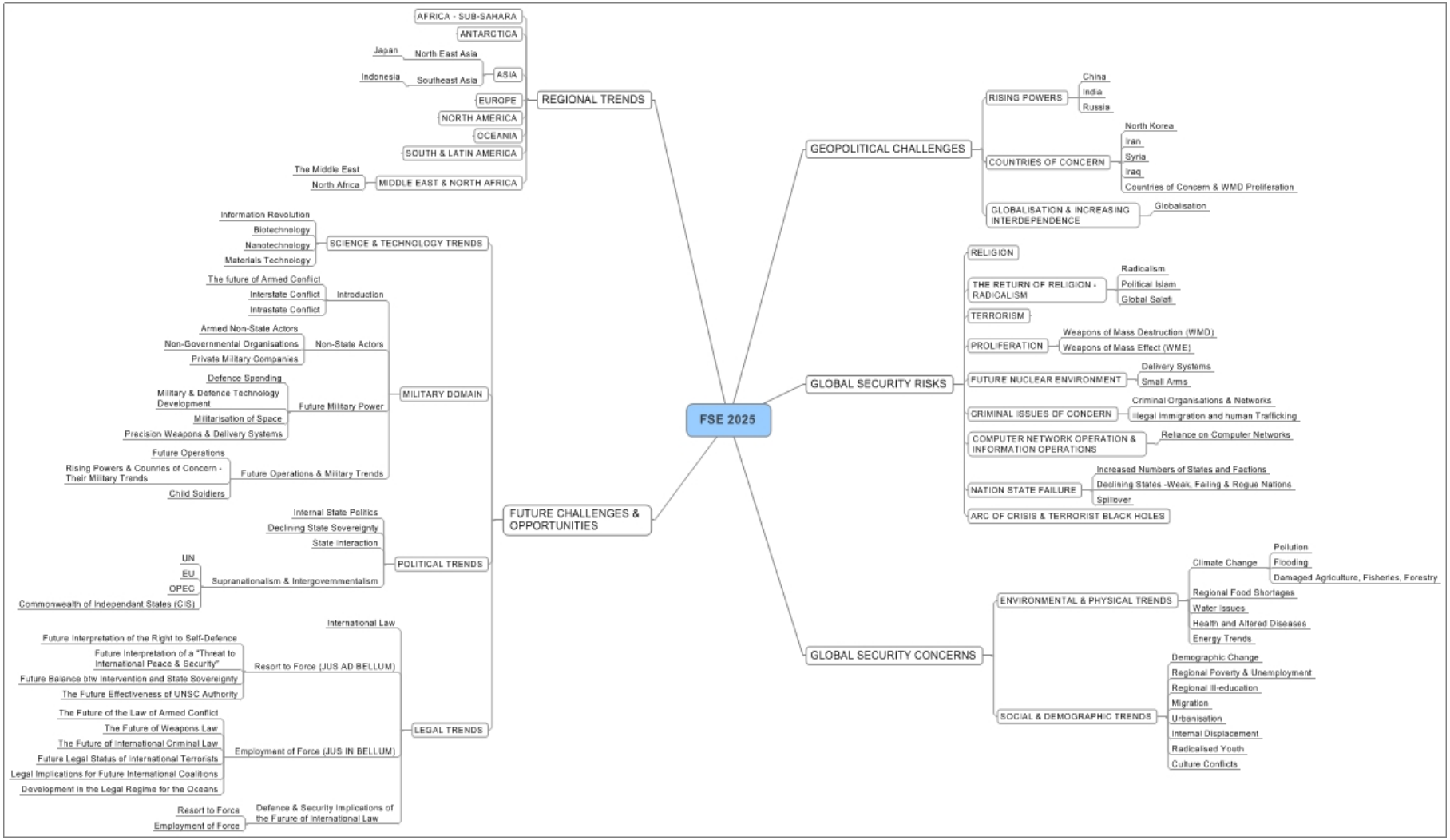
PCD/APR08

Nation/Org	Author	Document title	Year
Australia	Department of Defence and the National Security Committee	Defence White Paper	2003
Austria	Ministry of Defence	Security and Defence Doctrine	2001
Azerbaijan	Ministry of Defence	National Security Concept	2007
Canada	Department of National Defence	Future Security Environment 2025	2003
EU	European Defence Agency	An Initial Long-Term Vision on European Defence Capability and Capacity Needs	2006
	EU Institute for Security Studies	Long Term Vision Strand One - Global Context Study	2006
Finland	Ministry of Defence	Securely into the future - Ministry of Defence Strategy 2025	2006
France	Ministry of Defence	Preparing tomorrow's commitments - 2035	2007
Germany	Zentrum fuer Transformation	Ausblick auf 2035 - Trends & Entwicklungen	2006
	Ministry of Defence	Defence White Book	2007
Italy	Military Centre for Strategic Studies – Rome	The world in 2030	2007
Netherlands	Department of Defence	Service Worldwide	2007
	TNO	CCSS Report: Future Security Studies	
NATO	ACT	Future World Scenarios - Supporting Paper to the LTRS	2006
		Future Security Environment 2025	2006
Norway	Norwegian Armed Forces	Relevant Force	2004
Portugal	Portuguese Armed Forces General Staff	Future Security Environment Paper	
Slovenia	Slovenian Armed Forces General Staff	Summary of National perspective on future security threats and challenges	
Switzerland	Conseil fédéral suisse	Report 2000 on Security Policy 2nd Edition	2000
	NATO Political Military Steering Committee	PfP Draft Parp Assessment	2007
	Conseil fédéral suisse	Foreign Policy Report 2000	2000
	Conseil fédéral suisse	Rapport de politique étrangère	2007
	Conseil fédéral suisse	Rapport du Conseil fédéral à l'Assemblée fédérale sur la conception de l'Armée XXI	2001
Ukraine	Department of Defence	National Security Strategy of Ukraine	2006
UK	Development, Concepts and Doctrine Centre (DCDC)	The DCDC Strategic Trends Programme	2007
	Development, Concepts and Doctrine Centre (DCDC)	The High Level Operational Conceptual Commentary	2007
	Noaber Foundation	Towards a Grand Strategy	2007
USA	Defence Science Board	21st Century Strategic Technology Vectors	2007
	Joint Forces Command JFCOM	Joint Operating Environment	2007
	US Army Strategic Studies Institute	The Emerging Pattern of Geopolitics	2007


FSE 2025
REGIONAL TRENDS
AFRICA - SUB-SAHARA
ANTARCTICA
ASIA
North East Asia
Japan
Southeast Asia
Indonesia
EUROPE
NORTH AMERICA
OCEANIA
SOUTH & LATIN AMERICA
MIDDLE EAST & NORTH AFRICA
The Middle East
North Africa
FUTURE CHALLENGES & OPPORTUNITIES
SCIENCE & TECHNOLOGY TRENDS
Information Revolution
Biotechnology
Nanotechnology
Materials Technology
MILITARY DOMAIN
Introduction
The future of Armed Conflict
Interstate Conflict
Intrastate Conflict
Non-State Actors
Armed Non-State Actors
Non-Governmental Organisations
Private Military Companies
Future Military Power
Defence Spending
Military & Defence Technology Development
Militarisation of Space
Precision Weapons & Delivery Systems
Future Operations & Military Trends
Future Operations
Rising Powers & Counries of Concern - Their Military Trends
Child Soldiers
POLITICAL TRENDS
Internal State Politics
Declining State Sovereignty
State Interaction
Supranationalism & Intergovernmentalism
UN
EU
OPEC
Commonwealth of Independant States (CIS)
LEGAL TRENDS
International Law
Resort to Force (JUS AD BELLUM)
Future Interpretation of the Right to Self-Defence
Future Interpretation of a "Threat to International Peace & Security"
Future Balance btw Intervention and State Sovereignty
The Future Effectiveness of UNSC Authority
Employment of Force (JUS IN BELLUM)
The Future of the Law of Armed Conflict
The Future of Weapons Law
The Future of International Criminal Law
Future Legal Status of International Terrorists
Legal Implications for Future International Coalitions
Development in the Legal Regime for the Oceans
Defence & Security Implications of the Furure of International Law
Resort to Force
Employment of Force
GEOPOLITICAL CHALLENGES
RISING POWERS
China
India
Russia
COUNTRIES OF CONCERN
North Korea
Iran
Syria
Iraq
Countries of Concern & WMD Proliferation
GLOBALISATION & INCREASING INTERDEPENDENCE
Globalisation
GLOBAL SECURITY RISKS
RELIGION
THE RETURN OF RELIGION - RADICALISM
Radicalism
Political Islam
Global Salafi
TERRORISM
PROLIFERATION
Weapons of Mass Destruction (WMD)
Weapons of Mass Effect (WME)
FUTURE NUCLEAR ENVIRONMENT
Delivery Systems
Small Arms
CRIMINAL ISSUES OF CONCERN
Criminal Organisations & Networks
Illegal Immigration and human Trafficking
COMPUTER NETWORK OPERATION & INFORMATION OPERATIONS
Reliance on Computer Networks
NATION STATE FAILURE
Increased Numbers of States and Factions
Declining States -Weak, Failing & Rogue Nations
Spillover
ARC OF CRISIS & TERRORIST BLACK HOLES
GLOBAL SECURITY CONCERNS
ENVIRONMENTAL & PHYSICAL TRENDS
Climate Change
Pollution
Flooding
Damaged Agriculture, Fisheries, Forestry
Regional Food Shortages
Water Issues
Health and Altered Diseases
Energy Trends
SOCIAL & DEMOGRAPHIC TRENDS
Demographic Change
Regional Poverty & Unemployment
Regional Ill-education
Migration
Urbanisation
Internal Displacement
Radicalised Youth
Culture Conflicts