



PRESENT PARADOX FUTURE CHALLENGE



Joint Air Power
Competence Centre

Present Paradox – Future Challenge



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FUTURE CHALLENGE

March 2014



**Joint Air Power
Competence Centre**

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Foreword

Joint Air and Space Power has been of utmost importance to the Alliance since NATO's inception. The precise application of combat power from the air is founded upon superb equipment, superior training, very high levels of interoperability, and seasoned experience; all enabled by strong leadership exercised through a well-developed Air Command and Control (C2) capability.

With the end of the Cold War, we have witnessed an increase in NATO's use of Joint Air Power. In each conflict, men and women have demonstrated the unprecedented value of Joint Air Power in providing NATO and national leaders with a tool of unmatched responsiveness and flexibility.

As we prepare for the future, it is critical that NATO and its nations capture the lessons identified from recent crisis response and combat operations. Turning these into lessons learned as we transition from NATO in operations to NATO prepared for operations is paramount. This transition combined with the on-going financial crisis makes it certain that investment in future Air Power capabilities will be under heavy scrutiny. It is thus critical for NATO and its nations to actively investigate, develop and promulgate their vision for Air and Space Power for the future. Proactive and collective planning will be absolutely essential to ensure the necessary capabilities and force readiness are available to provide a decisive advantage in future Alliance operations.

Therefore, the JAPCC initiated a comprehensive project 'Air and Space Power in NATO – Future Vector'. This project intends to chart a future path with viable options and solutions to guarantee that Joint Air and Space

Power continues to contribute to the security and success of NATO and its nations. Identifying an effective framework for developing Joint Air and Space Power capabilities, sustainment, training and exercises within the principles of Smart Defence (SD) and the Connected Forces Initiative (CFI) is the desired end state.

The project will produce a bi-focal work. A short term perspective will focus on NATO Forces 2020 and provide options at both the political and military levels. This view looks to enable force effectiveness while supporting the idea of force efficiency by retaining the required capabilities to ensure that Joint Air and Space Power in NATO remain ready, capable and accessible.

The longer term perspective will focus, within the context of the Future Security Environment (FSE), on preparing for the future. It will do this by providing viable options and effective solutions as an input for an air power vision/security concept. This will lay the foundation for Joint Air and Space Power in NATO which is fit for purpose and that can successfully meet the future challenges that NATO and its nations might face.

In front of you lies the first result of this Project: 'Present Paradox – Future Challenge'. This study provides a summary of the current situation by addressing three main issues:

- The significance of Air and Space Power in recent history (tactical, operational, strategic level);
- Diminishing Air Power capabilities and capability shortfalls;
- Future Security Environment.

Chapter 5 of this document provides food for thought in different domains: at the political and military level, in the realm of Research and Development, Science and Technology and industries, and in relation to Partnership.

From this food for thought, a follow on work with a wider scope has started. This work will be the next step of the Project and will contain a series of essays that identify viable options and solutions to guarantee that Joint Air and Space Power continue to be key enablers for the security and success of NATO and its nations for both short- and long-term. The essays intend to provide a fresh, holistic, balanced perspective and offer innovative, actionable recommendations aimed at the appropriate political and policy maker levels within NATO and its nations. The series of essays will be published in a comprehensive compendium and presented during the JAPCC Conference from 18–20 November 2014.

Ultimately it is intended that the ideas and views expressed in the compendium will evolve into follow on activities in support of the enduring Project to guarantee that Air and Space Power in NATO is sufficiently available and fit for purpose when most needed in NATO, anywhere, anytime.



Joachim Wundrak

Lieutenant General, DEU AF
Executive Director, JAPCC

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Introduction – Present Paradox

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‘The relevant challenge for us today, is no longer the total level of defence spending by Allies, but how these limited (and dwindling) resources are allocated and for what priorities.’

Former US Secretary of Defense, Robert Gates

Air Power has been of utmost importance to the Alliance since NATO’s inception. A key pillar of NATO’s Cold War deterrence was the strength, flexibility and high quality of its air forces, including naval and army air services. This Air Power pillar’s capabilities were based on superb equipment, superior training, very high levels of interoperability, and seasoned experience, all enabled by strong air leadership and directed through a well-developed air C2 system.

Time and time again, NATO and its partners have turned to Air Power as their first military response option. NATO nations’ Joint Air Power was the first military means used in the Balkans, Afghanistan and Libya operations. Air Power, now coupled with Space Power, continues to demonstrate its unprecedented value through its inherent characteristics of speed, precision, economy of force, and reach. These combined qualities provide NATO and national civilian leaders with a tool of unmatched responsiveness and flexibility. Repeatedly, Joint Air Power has employed as well as sustained both hard and soft military power to safeguard populations and enable NATO operations.

At the 2012 JAPCC Annual Joint Air and Space Power Conference, Diego Ruiz Palmer, Special Advisor for Economics and Security to the NATO Secretary General, spoke on 'Air Power and Strategic Intent: Reflecting on the role of Air Power on the way to NATO 2020'. His main thesis was that 'from its beginning, NATO has been an Air Power Alliance. NATO's six decade-long Air Power odyssey is at risk – cooperate and share, or decline.' Palmer stated that 'because of declining defence spending, capable and deployable NATO air forces and naval air services become non-usable in expeditionary operations.' Adding, 'This leads to "a spiral of death" driven by declining readiness, a contracting force structure, and an ever smaller residual fighting capacity.' Therefore, Palmer concluded that 'there is a requirement to define NATO Air Power 2040.'¹

Furthermore, the 2012 NATO Chicago Summit addressed capability gaps and established a common understanding that these gaps must be minimized through the CFI and SD. By these statements, NATO acknowledged that security challenges will not diminish in times of economic and financial austerity or in an increasingly complex international environment.

But despite these words, declarations and initiatives, NATO nations have and continue to drastically reduce Air Power capabilities. The near-term cessation of Afghanistan operations combined with on-going financial stress makes it certain that investment in future Air Power capabilities will be under heavy scrutiny and most likely further reduced. Operations throughout the conflict spectrum, especially in the higher end, will be financially and politically more difficult to sustain. However, the need for responsive and flexible forces, to include air forces, remains crystal clear.

Taking this paradoxical situation into account, there is a genuine risk that NATO will not have the needed Air Power capabilities and/or the access to supporting Space Power capabilities to cope with the challenges and threats of the FSE. Although the FSE is hard to predict, it is safe to state that

the future and related challenges are uncertain, complex and risky. Therefore, they show some potentially destabilizing dynamics. It is for the Alliance interests that NATO must retain and improve its Air Power capabilities and have uninterrupted access to supporting space capabilities. Only by meeting these requirements will NATO ensure that the role Air and Space Power played in the past will be safeguarded for the future and thus, remain a strategic pillar of NATO's military capability.

Given the strategic importance of Air and Space Power for NATO, there is a need for a comprehensive vision on Air and Space Power towards 2040. This vision must identify viable strategic options that, once agreed and implemented, enable Air and Space Power to continue to contribute to the security and success of NATO, its Member States and Partners. Based on this, the JAPCC Director, who is also Commander, NATO Air Command (COMAIRCOM), felt it necessary to have a document recording the 'as-is' that provides an accurate summary of the current situation. He directed the development of this paper; which has been executed under the lead of Lieutenant General (ret.) F. H. Meulman and supported by the JAPCC staff.

Aim of the Paper

Taking into account the paradoxical situation previously described, the aim of this paper is to substantiate the Air Power paradox, provide an accurate summary of the current situation in the field of Air and Space Power, and offer an initial assessment of a FSE. The paper will provide findings, observations, conclusions and will provide food for thought/recommendations.

Document Structure and Interdependencies

This paper will address assumptions and starting points before addressing three main questions. It will include sub-conclusions and recommendations. The three main questions are:

- What was the significance of Air and Space Power in recent crises and conflicts? This question focuses primarily on the significance of Air and Space Power in Operation ALLIED FORCE (OAF), to NATO's mission in Afghanistan (The International Security Assistance Force (ISAF))² and in Operation UNIFIED PROTECTOR (OUP);
- Is the situation of shrinking Defence budgets and diminishing Air and Space Power capabilities critical? Will the NATO Defence Planning Process (NDPP) provide a balanced pool of assets and capabilities able to meet the full range of Alliance missions?;
- What are the characteristics, challenges, trends and threats of a FSE and what might be the impact on the available and required Air and Space Power capabilities?

Although the three main questions seem to be disconnected, there is interdependence between all three. If the high or critical importance of Air and Space Power in recent conflicts can be substantiated, we assume that Air and Space Power will play an important role in future conflicts as well. Even if the factual circumstances of a future conflict are not yet fully known. If shrinking defence budgets and the diminishing of Air and Space Power capabilities are assessed as actually critical then the situation arises that the role Air and Space Power played in the past can no longer be safeguarded for the future and thus Air and Space Power will no longer remain a strategic corner stone of NATO.

If we then can substantiate that there are developments, challenges, trends and emerging threats that will impact the usability and survivability of Air and Space Power in a FSE, we might, based on the outcome of answering the three main questions, conclude that the need for a comprehensive vision on Air and Space Power towards 2040 is fully substantiated, in due time offering NATO strategic options for developing an Air and Space Power strategy towards 2040.

Assumptions and Aspirations

The following assumptions are identified:

- Joint Air and Space Power is and will remain a key pillar of NATO's military capability;
- NATO's Strategic Concept and its related three Core Tasks: Collective Defence, Crisis Management and Cooperative Security, will remain valid throughout the time horizons of this paper;
- NATO's Level of Ambition (LoA) will remain the same as it currently is: that is to simultaneously execute two Major Joint Operations (MJO) and six Smaller Joint Operations (SJO). From these six SJOs: one will be maritime heavy and one air heavy; the remaining four SJOs will be land-heavy;
- The NATO Command Structure (NCS), together with the NATO Forces Structure (NFS) and national capabilities will be available to meet NATO's full LoA.

The following starting points were identified:

- Aim at the political-military strategic level;
- Be transparent; be as objective as possible, factual and honest;
- Take a joint/combined approach;
- Derive the right observations, findings, conclusions and recommendations in answering the three key questions.

Taking into account these assumptions and starting points, the three main questions as outlined before were addressed. In the following chapters, each of the main questions will be answered, leading to a final assessment and food for thought.

Endnotes

1. Diego A. Ruiz Palmer, Special Advisor for Economics and Security to the NATO Secretary General, Presentation, 2012 JAPCC Annual Conference, Kleve, Germany (10 Oct. 2012).
2. In keeping with a standardized operations nomenclature, ISAF will be used when referring to NATO operations in Afghanistan.



The Significance of NATO Air and Space Power in OAF, ISAF and OUP

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The purpose of this chapter is to assess the significance of Air and Space Power¹ in achieving the Alliance's goals in recent NATO operations. Three relevant operations, Operation Allied Force executed in the Federal Republic of Yugoslavia (FRY), International Security Assistance Force operations in Afghanistan and Operation Unified Protector, executed in Libya will be assessed.

Operation Allied Force

Conflict Summary

In 1998, the long-simmering conflict between the FRY and the Kosovo Liberation Army (KLA) erupted into full-scale fighting. Battling to end Serbian oppression, the KLA also sought national independence for the province of Kosovo. On 15 January 1999, FRY forces massacred 45 Kosovar Albanians in the village of Racak. News of the incident sparked global outrage and led NATO to issue an ultimatum to the Slobodan Milošević led FRY Government calling for an end to the fighting and FRY compliance with the demands of the international community as stated in United Nations Security Council Resolution (UNSCR) 1199 (23 September 1998).

In an attempt to settle the issue, a peace conference opened at Rambouillet, France. NATO Secretary General, Javier Solana, served as a mediator. After

weeks of talks, the Rambouillet Accords were signed by the Kosovar Albanians, the United States, and Great Britain. The Accords called for NATO administration of Kosovo as an autonomous province, the deployment of a force of 30,000 peacekeepers, and free rite of passage through FRY territory. These terms were refused by Milošević and the talks quickly broke down. With the failure at Rambouillet and taking UNSCR 1199 into account, NATO decided to launch air strikes to force compliance from the FRY Government. This air-only option implied that there was no collective political will to embark on an intervention operation involving ground forces. The NATO decision also assumed that the defined goals could be achieved through a combination of military Air Power operations and political pressure. The official NATO operation name was OAF. The operation was officially supported by all 19 members of NATO.²

Legal Framework

OAF was a NATO contingency response aimed at ensuring full compliance with UNSCR 1199. Acting under Chapter VII of the United Nations (UN) Charter, Resolution 1199 demanded that all parties in Kosovo and the FRY (Serbia and Montenegro) cease hostilities and maintain a ceasefire. Both FRY and the Kosovar Albanian leadership were urged to take immediate steps to improve the humanitarian situation and begin talks to resolve the crisis. The UN SC then demanded that the FRY would:

- End action by security forces that affected the civilian population;
- Allow the presence of international monitors and guarantee their freedom of movement;
- Facilitate the return of refugees with the United Nations High Commissioner for Refugees (UNHCR) and International Committee of the Red Cross and allow humanitarian aid to reach Kosovo;
- Make rapid progress towards finding a political solution to the situation in Kosovo based on UNSCR 1199. This Resolution was the guideline for NATO to promote regional stability, cooperation and security.

NATO stated that their military operations were undertaken to achieve:

- A stop to all military action and repression in Kosovo;
- The withdrawal of all FRY forces from Kosovo;
- Agreement to the presence of an international peacekeeping force in Kosovo;
- The unconditional and safe return of all refugees and unhindered access to them by humanitarian organizations;
- A credible assurance from Milošević's Government that it was willing to work on the basis of the Rambouillet Accords in creating an acceptable political framework for the future of Kosovo.

Once the FRY demonstrated it was adhering to these terms, NATO would cease their air strikes.³

OPLAN 10601 'Allied Force'

Military operations were originally planned to be executed in five phases under NATO's Operational Plan 10601 'Allied Force', the development of which began in the summer of 1998.

Phase 0

The deployment of air assets into the European theatre.

Phase 1

Establish air superiority over Kosovo (creating a No-Fly Zone (NFZ) South of 44 degrees north latitude) and degrade C2 and the Integrated Air Defence System (IADS) over the whole of the FRY.

Phase 2

Attack military targets in Kosovo and those FRY forces south of 44 degrees north latitude, which were providing reinforcement to FRY forces in Kosovo. This was to allow targeting of forces not only in Kosovo, but also in the FRY South of Belgrade.

Phase 3

Expand air operations against a wide range of high-value military and security force targets throughout the FRY.

Phase 4

Redeploy forces as required.

Within a few days of the start of NATO's campaign, Alliance aircraft were striking strategic, operational and tactical targets throughout the FRY, as well as working to suppress and disrupt its IADS.⁴

Since the Alliance's primary goal was to compel FRY forces to end violence against the Kosovar Albanians, it could not afford to be seen as acting inhumanely, towards both Kosovar Albanians and FRY civilians. The Rules Of Engagement (ROE) NATO operated under were fully consistent with the Law of Armed Conflict and reflected NATO's norms and moral values. Amongst other rules, NATO required positive identification of targets before aircrews were cleared to release ordnance. Moreover, NATO forces were not allowed to attack military vehicles if they were intermingled with civilian vehicles. After Allied planes mistakenly bombed two refugee convoys on the same day near the Kosovo town of Djakovica, ROE were amended to allow aircrew to fly lower in order to Positively Identify (PID) targets. While lowering the potential for unintended civilian casualties it increased the risk to Allied pilots.

The Opponent

FRY's IADS were equipped with former Soviet Union equipment and dominated by Surface-to-Air Missile (SAM) systems backed up by Man-Portable Air Defence Systems (MANPADS) and Anti-Aircraft Artillery (AAA). Furthermore, there were approximately 240 combat aircraft including 15 MiG-29 and 64 MiG-21 interceptors. Although the equipment and technologies reached

back to the 1960's, the personnel were properly trained and prepared to operate their systems. For situational awareness, the FRY IADS comprised more than 100 interconnected acquisition and tracking radars, complemented by a civilian and military observer network. This enabled the FRY to monitor NATO aircraft as soon as they took off from their European bases.

The FRY's initial strategy was to create a 'kill zone' below 10,000 feet Above Ground Level (AGL) altitude, by placing AAA, SA-7 and Bofors MANPADS around the main objectives to be protected. NATO overcame this approach by flying at or above 15,000 feet and night missions, thereby staying out of the reach of GBAD. With their tactic the FRY did not accomplish their objectives in protecting high value targets or shooting down NATO aircraft.⁵

NATO Air and Space Power

OAF was a comprehensive coalition effort. Although the majority of the assets were provided by the United States, another 13 NATO Member States contributed aircraft for the operation, with 11 Allies participating in offensive and defensive air combat operations of all type. As of 19 June 1999, 731 attack aircraft (402 US and 329 provided by other NATO members) were involved. They operated from air bases located throughout Europe and aircraft carriers in the region. B-2 bombers operated from the continental United States. NATO executed 78 days of combat operations. In total, 38,000 sorties were flown during this time frame. The US flew 23,000 out of the total of 38,000 sorties, while the other nations flew the remaining 15,000 sorties.⁶

The Significance of Air and Space Power in OAF

Command and Control

Supreme Allied Commander Europe (SACEUR) delegated authority to the Commander in Chief, Allied Forces Southern Europe (CINCSOUTH), Naples, Italy.

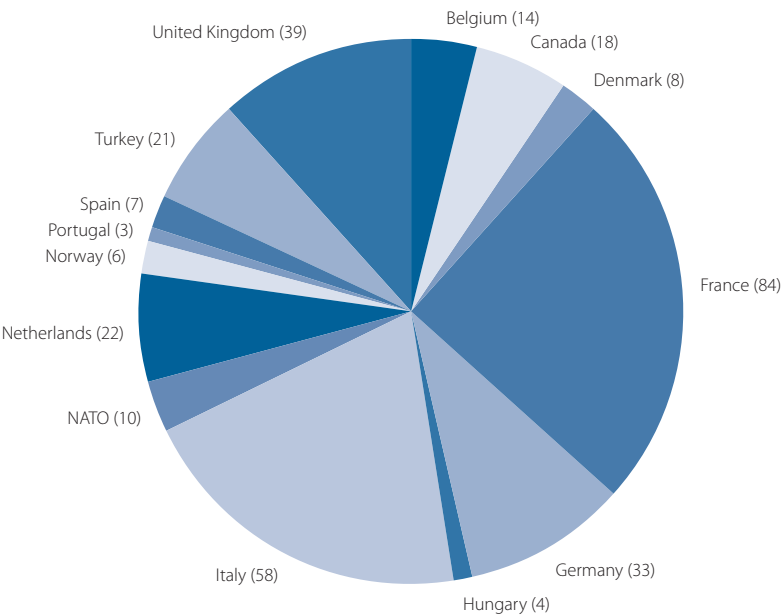


Figure 1-1: Non-US Aircraft Participating in Operation Allied Forces (U). Includes manned and unmanned aircraft.

CINCSOUTH delegated control of the Operation to the Commander, Allied Air Forces Southern Europe (COMAIRSOUTH), also based in Naples. Operational conduct of day-to-day missions was delegated to the Commander, 5th Allied Tactical Air Force, at Vicenza, Italy. NATO countries gave operational and tactical control over their forces to CINCSOUTH. The following NATO allies contributed forces: Belgium, Canada, Czech Republic, Denmark, France, Germany, Greece, Hungary, Iceland, Italy, Luxembourg, Netherlands, Norway, Poland, Spain, Turkey, United Kingdom, and the United States. Air missions for conventional aircraft were directed through a NATO-releasable

Air Tasking Order (ATO), prepared in the Combined Air Operations Centre (CAOC) in Vicenza, Italy. In addition, 16th Air Force prepared a US-only ATO for US stealth aircraft.⁷

Space support was instrumental. Satellite communications provided an important portion of the communications capability and were a major enabler of the integration of forces. Global Positioning System (GPS) satellites enabled highly accurate navigation necessary for synchronization of complex operations and guidance input to the recently fielded GPS-guided weapons. Weather satellites provided detailed and timely information necessary to exploit locally favourable environmental conditions for strikes. Space operations during OAF illustrated NATO's dependence on widely dispersed global capabilities that were effectively integrated. NATO's reliance on space continues to grow in military operations. Therefore, it is vital for all operations to maintain access to space assets to support strategic objectives.⁸

Attacks Against Strategic Targets

Strategic fixed targets included command, control, communications, and intelligence structures; FRY army infrastructure; Lines of Communication (LOC); petroleum, oil, and lubricants; defence industry; and electric power. Specifically, NATO attacked transformer stations and transmission towers in the FRY, disrupting electrical power throughout a wide region. Power was interrupted in Belgrade and Novi Sad for extended periods and was frequently disrupted across wider areas.⁹

NATO destroyed all three Danube bridges at Novi Sad blocking river traffic, but left six Danube bridges at Belgrade (three highways, two railroads, one highway/railroad) intact. NATO destroyed rail lines leading into Kosovo, damaged roads in five main corridors and partly destroyed war-related and dual-use (military and civilian use) industrial facilities.

While OAF began with precision strikes against strategic and operational level military targets, it was soon expanded to include FRY forces on the ground in Kosovo. Targeting was also expanded to include dual-use facilities such as bridges, power plants, and telecommunications infrastructure.¹⁰

NATO's air attacks clearly had an impact on military operations in the FRY. Air attacks on military forces in the field forced FRY forces to remain largely hidden from view, travelling only when necessary. Air attacks on selected infrastructure targets, such as bridges and electric power systems degraded the ability of the FRY military to C2 its forces and to resupply and reconstitute them.¹¹ The economy of the FRY was seriously affected by these strikes. Bombing the infrastructure and industrial targets caused unemployment and consequently disturbed the daily routine of FRY citizen. A growing unrest to support the Milošević Government was the effect.¹²

Ground Attacks

The use of Precision Guided Munitions (PGMs) proved to be critical for achieving the desired effects on targets during OAF. During the 78 days air campaign, 34 % of the munitions delivered were PGM, of which 81 % was released by US aircraft.

OAF saw the combat debut of the B-2 stealth bomber. They flew from the US on up to 32-hour missions and despite the bad weather delivered Joint Direct Attack Munitions (JDAMs) against hardened and Air Defence (AD) facilities. Of the 49 sorties launched, 45 were a success. It is estimated that 80 % of the assigned targets were hit.¹³

The heavy use of stand-off weapons and Laser-Guided Bombs (LGBs) to attack targets in the FRY and the introduction of new weapons and system, such as B2s equipped with JDAM, was remarkable. The majority

of direct attack weapons employed during OAF was LGBs. In addition, long-range, stand-off weapons such as the Tomahawk Land Attack Missile (TLAM) and the Conventional Air Launched Cruise Missile (CALCM) were employed extensively, especially during the initial stages of the operation and in periods of adverse weather.¹⁴

By mid-May NATO aircrews had grown increasingly familiar with Kosovo's terrain and with the tactics of the FRY Ground Forces. Aircrews increasingly knew where FRY forces were concentrated, which explained the change in the tactics of those forces. They operated in smaller and smaller units to make them harder to detect from the air. The downside of that tactic for the FRY forces was that this made them increasingly vulnerable to KLA ambushes. It also made them less mobile and lessened their ability to continue attacks on Kosovar Albanians. This meant that military action inside Kosovo and repression against the population was at least somewhat constrained.

Suppression of Enemy Air Defences

Strike packages received consistent support from Suppression of Enemy Air Defences (SEAD) platforms; EA-6B radar jammers and Hi-Speed Anti-Radiation Missile (HARM)-equipped F/A-18s, ECR-Tornados and United States Air Force (USAF) F-16C/J aircraft. On-board self-protection systems also proved their value. However, it was once again demonstrated that suppressing hostile ADs requires a comprehensive multi-platform capability.¹⁵

The FRY SAM operators chose to limit radar emissions, thereby enhancing their survival. As a result, they shot down only two NATO aircraft. On 27 March, a FRY SAM downed a US F-117 'Nighthawk' stealth fighter about thirty miles north-east of Belgrade. Near the end of the operation, a USAF F-16 was shot down north of Belgrade. NATO forces never completely suppressed the FRY IADS capabilities, but degraded its effectiveness by

making full-radar SAM operations too risky for the operators. The results demonstrate that FRY IADS were not able to deny NATO's air operations over their territory.¹⁶

Intelligence, Surveillance and Reconnaissance

Intelligence, Surveillance and Reconnaissance (ISR) assets, such as the U-2, E-8 'JSTARS', RC-135 'Rivet Joint', were in extremely high demand during OAF operations and provided a number of important capabilities to support commanders' ISR needs. OAF saw the first extensive use of sensor platforms deploying forward while their data reduction and analysis components remained at the home base. Unmanned Aerial Vehicles (UAVs) offered planners and commanders, for the first time, real-time video imagery. MQ-1 'Predators' supplemented the collection of information by satellites and other ISR assets. In addition to using UAVs in traditional roles, innovative employment tactics were developed whereby UAVs helped locate and target FRY forces in Kosovo in near-real time. By providing target-location data back to the C2 elements, the UAVs helped cue fighter attacks against forces in the field.¹⁷

Air Transport

Airlift is a vital means to demonstrate political will to an opponent. It enables rapid global deployment of personnel and equipment. For example, air transporters like the C-17 flew half of the strategic airlift missions required for OAF. Because of its small/short-field take-off/landing capability, the C-17 made the concept of direct delivery (strategic movement from port of embarkation to airfield closest to final destination) a reality. It was no longer necessary to transfer cargo from an inter-theatre airlifter to an intra-theatre airlifter for the final leg of deployment. In addition to being able to use small airfields, the C-17's average ground time was significantly less than planned enabling an increased pace of operations.¹⁸

Air Transport (AT) was also used to deploy construction and engineering units to Albania for humanitarian assistance. These units made road and air-field repairs to help support the overwhelming flood of refugees leaving Kosovo. An estimated 850,000 Kosovars fled to Albania and Macedonia after FRY forces stepped up their 'ethnic cleansing' campaign in Kosovo. More than 500 airlift sorties were flown to deliver nearly 3,100 tons of bulk food, humanitarian daily rations, tents and other shelters, bedding, medical supplies, and a variety of support equipment and vehicles. It was of strategic importance as it prevented mass starvation and helped to lessen the humanitarian crisis. This humanitarian assistance was successful in saving tens of thousands of lives and in preventing Serbian terror from undermining the NATO campaign.¹⁹

Air-to-Air Refuelling

A challenging Air and Space Power aspect of OAF was providing sufficient Air-to-Air Refuelling (AAR) support for transport aircraft delivering forces to the theatre, for combat aircraft deploying to the theatre and for conducting strike operations. Without this support, global attack sorties could not have been flown from the continental US by B-2s. Another key factor that increased AAR demand was the need to provide refuelling support for at least four Combat Air Patrol (CAP) stations. These CAPs were manned 24 hours per day, from the beginning until the end of the operation, thereby ensuring the ability to react swiftly if the need arose.²⁰

Effects in Halting Violence Against Kosovar Albanians

A principal goal of NATO air operations was to deter or halt violence against Kosovar Albanians. At the beginning of the Operation, NATO was ready to conduct only a few days of attacks against a limited target set. It had not deployed forces nor evolved procedures to conduct an effective effort against FRY ground forces in Kosovo. FRY forces conducted large-scale ethnic cleansing during April with little impediment from NATO.

As time went on, NATO was able to quickly increase its involvement by deploying more aircraft that were well suited to the ground attack role, including USAF A-10s and British Harriers. NATO improved surveillance against FRY forces using 'Predator' UAVs and human intelligence. As a result, NATO air attacks against deployed Serb forces in Kosovo became more effective. Attacks against FRY forces reduced combat effectiveness, forced them to move under unfavourable conditions by night or in small units and under permanent pressure to be detected and attacked. Despite pressure from the NATO Air Power, FRY forces still controlled Kosovo and continued their attacks on the KLA and civilian population there.²¹

NATO Air and Space Power was the only available means to deter violence, but it is difficult to measure how effective Air and Space Power was in stopping FRY violence against civilians. One could wonder however, what would have happened if Air and Space Power would not have been used?

Impact of Weather

During the first two months of air operations, the weather was unfavourable or marginal for a majority of the days. Persistent low cloud cover over Kosovo and the rest of Yugoslavia forced the cancellation of many planned strikes. NATO had some capability to operate 'under or through the weather'; however for a variety of reasons there were restrictions on operations in bad weather. The single biggest reason was the requirement for aircrew to PID their targets prior to weapons release. Additionally, ROE required aircrew in most cases to remain above 15,000 AGL, thus with low clouds obscuring their intended targets, aircrew could not PID their targets. The weather also provided cover for the FRY military to continue their attacks and conduct air operations.²²

Conclusion

Due to the fact that NATO nations were not willing to deploy ground forces, only Air and Space Power was available to deny and coerce the FRY Government. The rapid build-up of forces as a political demonstration aimed at gaining compliance with resolutions and/or arrangements could only be made by air assets. After termination of the Rambouillet talks on 19 March 1999 and the start of ethnic cleansing the next day, NATO was able to start air attacks four days later. The situation rapidly improved after NATO decided to deploy more aircraft.

Destruction of dual-use military/civilian infrastructure inside FRY and Kosovo was only possible from the air. Strikes against power plants, infrastructure and buildings caused unrest in the population and damaged the economy of Serbia. As a result support for the FRY Government shrank and increased the pressure on Milošević.

Disruption of the FRY LOC to and from Kosovo by air strikes reduced their ability to deploy reinforcements and replace supplies during the conflict. FRY armed forces were forced to disperse in smaller, more vulnerable units in order not to be destroyed from the air. Significant effort had to be made to camouflage their positions and threat from the air hampered movements by daylight. Small units were increasingly vulnerable to attacks and the destruction of equipment and supplies further reduced their effectiveness.

In this instance, reducing the threat to Kosovar civilians was only possible by the use of Air and Space Power. Locating targets with ISR platforms, communicating this data via air- and/or space-borne C2 means and finally destroying them on short notice with PGMs, most often without collateral damage, proved to be a unique capability of Air and Space Power. The prevention of collateral damage and unintended civilian casualties not only has tactical impact but also has strategic effect on the public's opinion.

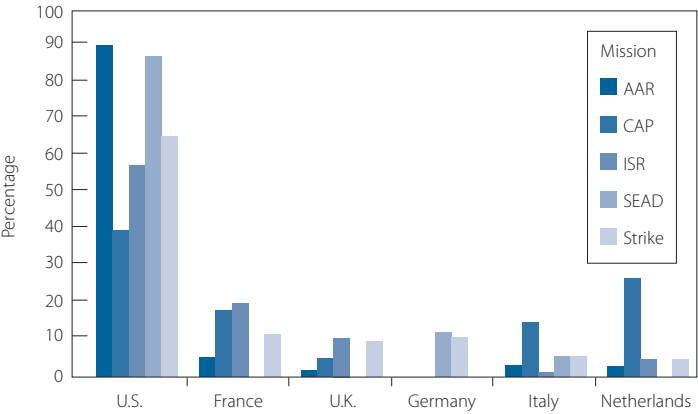


Figure 1-2: Percentage of sorties flown by nation. RAND (MR1391-2.1)

Continuous political pressure, a perceived threat of a possible build-up of ground forces by NATO, loss of support from Russia, growing unrest and economic problems inside Serbia, and use of Air and Space Power all combined to create enough pressure on Milošević to force acceptance of the Rambouillet Accords.

Looking at the percentage of sorties flown one thing remains clear, without the US, OAF would not have been possible.²³ Key enablers like AAR, SEAD and ISR were not available in sufficient numbers or even existed in the European NATO Nations' inventories. This meant that any similar conflict could not have been planned and executed by the Europeans alone. One cannot assume that access to and availability of US Air and Space assets will always be guaranteed for future operations. Therefore, it is very important that the European NATO nations develop, in a common effort, the needed capabilities to deal with situations when US support is not available.

Air and Space Power are able to achieve strategic/operational effects but also have limitations. First, Air and Space forces must be available in time, with the required capabilities and in sufficient quantities to be effective. Secondly, in general, Air and Space Power cannot effectively hold and control ground. Only in particular circumstances (flat, sparsely and or inhabited terrain with little vegetation) Air and Space Power can effectively control terrain. Air Power constrained violence against the population but it did not fully stop it. Thirdly, attacking land forces in difficult terrain, doubled by the impact of severe weather conditions remains a challenge, mainly because of insufficient ISR.

Overall, the success of OAF was not achieved by the use of Air and Space Power alone. But it can be argued that without Air and Space Power, OAF would have at worst failed or at best been a prolonged and possibly have forced a costly ground operation, which would likely have meant the death of NATO troops and of many more Kosovar Albanians.

Afghanistan and the International Security Assistance Force

Context

Afghanistan is situated at the junction of some challenging and complex regions: the Middle East, Central and South Asia. The recent history of these regions is marked by politico-military, religious and socio-economic tensions and complex relationship with regional neighbours. Enduring rivalries between nations and alliances have often developed into conflicts occurring on Afghan territory. The last 35 years proved to be especially volatile in political-military, religious and socio-economic developments in Afghanistan.

The Soviet Union's invasion of Afghanistan lasted from 1979 to 1989; after which a struggle between the different Mujahedin factions kept

the country in a situation of turmoil. The civil war continued after the emergence of the Taliban in Kandahar in the winter of 1994. The Taliban fought northward and finally into Kabul in 1996. The situation in Afghanistan deteriorated into a political crisis and an enormous suffering of the Afghan people in 2001. By 2001, Afghanistan's internal crisis had become a major threat to regional and even international stability.

11 September 2001, the day two planes flew into the Twin Towers of the World Trade Center, marked the beginning of an involvement of the international community which has now lasted for more than 13 years. Initial involvement was predominantly political and economic, however over time, involvement has turned emphatically into political-military involvement of NATO and the United States. As a response to the 9/11 terrorist attacks, and given Al Qaeda's presence in Afghanistan, the US and its coalition partners launched Operation Enduring Freedom (OEF). OEF was designed to destroy or disrupt terrorists' safe havens and dislodge the Taliban. For the first time in the history of NATO, its members unanimously invoked the core principle of the Alliance, Article 5 of the Washington Treaty.²⁴

Thus, many NATO nations were participating in their first 'out-of-area' mission beyond Europe.²⁵ NATO's involvement in Afghanistan gradually grew from a Kabul based focus towards a full ISAF involvement all over Afghanistan in October 2006. NATO's overarching objective is to make sure that Afghanistan will never again be a safe haven for terrorists and to support the Government of the Islamic Republic of Afghanistan (GIROA) in establishing a secure and stable environment thereby setting the conditions for reconstruction and development and establishing good governance. As of June 2013, 49 nations are contributing troops to the mission. They include 21 non-NATO partners, working alongside the 28 NATO Allies.²⁶

Conflict Summary

NATO took command of ISAF in August 2003, at the request of the UN and the G1RoA. Soon after, ISAF received the mandate to expand outside of Kabul. ISAF's mission consists of five phases: Phase 1: Assessment and preparation, including operations in Kabul (completed); Phase 2: Geographic expansion (completed); Phase 3: Stabilization (completed); Phase 4: Transition (to be completed 31 December 2014); Phase 5: Redeployment.

After an initial period of relative optimism and development between 2001 and 2005, the security situation began changing dramatically in 2006. The insurgent groups in Afghanistan, especially the Taliban, Al Qaida, Hezb-i-Gulbuddin, Laskar e Taib, the Haqqani network and Tehreek e Taliban Pakistan created a continuous asymmetric fight with the US OEF and ISAF troops. The tactics, techniques and procedures (TTP) of these insurgents were predominantly hit and run tactics, ambushes, kidnappings, the use of improvised explosive devices (IEDs) and 'high visibility' attacks in highly populated areas. Large scale force-on-force battles were more the exception than the rule.

ISAF expanded its command, initially to the Regional Command (RC) North in December 2003, to the RC West in February 2005, to the RC South in July 2006 and RC East in October 2006. From 2007, the situation in Afghanistan changed into a full-fledged counter insurgency campaign in which Air and Space Power continues to play an enormously important role. In June 2010, NATO split RC South in half (RC South and RC South-West) in a bid to improve security by focusing on smaller geographical areas and ensuring greater collaboration with Afghan forces.

Legal Framework

Laid down in the Bonn Agreement of 5 December 2001 and the UNSCR 1386 of 20 December 2001, ISAF is the UN's reaction to the situation in

Afghanistan. Although not a UN force, ISAF has a peace-enforcement mandate under Chapter VII of the UN Charter. Overall, there are fifteen UNSCRs relating to ISAF. A detailed Military Technical Agreement agreed between the ISAF Commander and the Afghan Transitional Authority in January 2002 provides additional guidance for ISAF operations. International law, the domestic laws of coalition forces, and the laws of Afghanistan (as applicable), govern ISAF operations.²⁷

NATO's Objectives and Mission

NATO's objectives and mission in Afghanistan are governed by the appropriate UN mandates, NATO Strategic Plans Afghanistan (NSPA), the Operation Plans released by SHAPE (OPLAN 10202), Joint Forces Command Brunssum (JFCB) (OPLAN 30302) and ISAF HQ in Kabul (OPLAN 38302), under the guidance of North Atlantic Council.²⁸

As stated earlier, NATO's primary objective in Afghanistan is to enable the Afghan Government to provide effective security and stability across the country in order to ensure Afghanistan can never again become a haven for terrorists.

The NATO military-strategic mission²⁹ is 'to conduct military operations in the assigned area of operations to assist the GIRoA in the establishment and maintenance of a safe and secure environment with full engagement of Afghan National Security Forces (ANSF), in order to extend government authority and influence, thereby facilitating Afghanistan's reconstruction and enabling the GIRoA to exercise its sovereignty throughout the country.'³⁰

The ISAF operational-strategic campaign strategy focuses on three main efforts:

- Gain the initiative by protecting the population in densely populated areas where the insurgency has had significant influence;

- Separate insurgency influence from the populace and support Afghan Government sub-national structures to establish rule of law and deliver basic services;
- Implement population security measures that connect contiguous economic corridors, foster community development and generate employment opportunities.³¹

After the Lisbon Summit in November 2010, it was politically decided to transition the lead and full security responsibility over time to the Afghan National Security Forces (ANSF). Therefore since 2010, ISAF's mission has gradually evolved from a primarily combat focus into that of an enabling Security Force Assistance (SFA). The latter role centres on training, advising and assisting the ANSF. ISAF's mission in Afghanistan will cease at the end of 2014. However, at the Chicago Summit in May 2012 NATO's Head of States and Governments and their ISAF partners agreed that NATO will lead a new mission that continues to train, assist and advise the ANSF after 2014.³²

The Complexity of the Battlespace

Afghanistan is a vast landlocked country (647,500 sq. km) having long borders with its neighbours (e.g. Pakistan 2,430 km). The terrain is dominated by rugged mountain ranges, which generally run from the north-east to the south-west. Afghanistan's climate generally is of the arid or semi-arid steppe type, featuring cold winters and dry, hot summers. An important impact to operations is caused by the temperature, which sometimes fluctuates enormously.

Currently, the country has a relatively poor road system and a very limited rail system. Among landlocked developing countries, Afghanistan has one of the longest distances to a seaport, over 800 kilometres; much of the distance is over harsh terrain. The Air Transport infrastruc-

ture is not well developed. The Afghan Compact of 2006 stated that its economic intent was to develop three International Civil Aviation Organization (ICAO) compliant international airports (Kabul, Kandahar and Herat), nine regional airports, and create a basic aviation infrastructure at the 41 local airports. These local airports often only consist of a dirt landing strip and meagre support infrastructure. Most of the airports do not have any navigation aids and only two of them provide sufficient parking, refuelling, and crash-fire-rescue capabilities.³³ The Afghan airspace represents a complex operational environment. Air traffic management only exists around the main airports and most operational air traffic is executed in a procedural, non-radar controlled manner i.e. 'see and avoid'.

NATO opponents consist of a range of disparate groups, which include the Taliban, the Haqqani Network, and the Hezb-i-Gulbuddin. These groups interact with other groups, the most important one being Al Qaida. The majority of them operate from the eastern region, bordering Pakistan. Their common strategic aim is re-establishment of an extremist Islamic state in Afghanistan.

The battlespace is nonlinear, with opponents organized in small groups and spread throughout the country. NATO forces deployment is based on a regional architecture. Thus, NATO operations take place in an asymmetric and irregular conflict environment.

Application of Air and Space Power

From the description of the battlespace, it is clear what the factors are that impact the use of Air and Space Power in Afghanistan: the size of the area of operations, extreme temperatures, mountainous terrain, poor basing conditions, and challenging airspace management and control means.

From an operational-strategic perspective, the opponent had no Air and Space Power at its disposal, nor any IADS. Therefore ISAF, while conducting its Air and Space Power operations, did not face a medium/high altitude AD threat. This meant that there was no need to execute an IADS 'take-down' campaign.

On a daily basis, four 'sub-campaigns'³⁴ are simultaneously conducted: AT; Close Air Support (CAS); ISR and Space. These sub-campaigns are enabled by tankers, Airborne Warning and Control Systems (AWACS), helicopter support such as Casualty Evacuation (CASEVAC), Medical Evacuation (MEDEVAC), and Electronic Warfare (EW) capabilities. AT focuses on intra-theatre and inter-theatre airlift support for all ISAF and regularly for ANSF as well. CAS focuses on pre-planned and dynamic Air-to-Ground (AG) operations either in support of the ground commander or independently targeting the insurgents' leadership. ISR is conducted to create strategic, operational and tactical SA and to provide information in support of the planning and targeting processes. Finally, space acts as a force multiplier by enabling communications, providing important mission related information like geo-spatial information, and navigation. AT and CAS are mainly carried out by ISAF or by nationally retained assets. ISR and Space operations are mainly conducted by US resources while the information is made available to ISAF.

Besides the four sub-campaigns, ISAF is also heavily involved in the rehabilitation and development of Afghan's civil aviation and is supporting US initiatives that achieve Air Power objectives established by the Afghan Ministry of Defence (MOD).³⁵

There was a realistic expectation that the insurgents had MANPAD systems at their disposal. Fortunately this threat has, to date, not materialized. However, to pre-emptively deny any potential MANPAD threat, departure and arrival procedures and specific tactics are employed for helicopters that conduct MEDEVAC missions.

An important aspect in the application of Air and Space Power is the prevention of fratricide, collateral damage and unintended civilian casualties. This means that strict ROE were drafted and are used for the use of Air Power in AG operations. Even with strict ROE it was not possible to completely prevent undesired effects. Civilian casualties especially proved to be a major strategic issue for ISAF, creating limitations in the use of Air Power.

In order to determine the significance of Air and Space Power in Afghanistan, it is important to reflect on key elements of the Air and Space Power campaign conducted in Afghanistan.

Air Transport

The AT campaign in Afghanistan ensures intra-theatre airlift provides logistic sustainment and manoeuvre capability to ISAF forces and Provincial Reconstruction Teams (PRTs), transport of regional Quick Reaction Forces (QRFs), commanders' mobility, ANSF mobility and ISAF force rotation.

For intra-theatre airlift, the aircraft maintain a quick response posture and are flexible with destination changes, often transmitted while in the air. This dynamic re-tasking capability ensures the required flexibility to meet changes in the situation or in ground forces priorities.³⁶

The inter-theatre airlift necessary for maintaining the effort in Afghanistan is also vital. Providing the resources necessary for supporting ISAF and their tempo of operations (fuel, food and ammunition) is a significant effort. The majority of this support is provided by air. Since 2001, inter-theatre airlift has been responsible for the transport of nearly 9 million passengers and over 3 million tons of cargo on more than 500,000 sorties.³⁷

An additional significant task for AT is the transport of visiting VIPs and Afghani Government officials, as well as supporting the electoral process in

isolated areas. The effect of the use of AT for these purposes is of strategic importance.

Air Transport also directly supports the strategic objective to gain the support of the population in countering the insurgency. Air Transport is used to support humanitarian efforts conducted by Afghan government organizations, international organizations and Non-Governmental Organizations (NGOs) by transporting personnel, food, and medicines across the country.

This massive mobility effort reflects a fundamental advantage for operations in Afghanistan. Without AT, the mission could not be properly conducted and the physical outreach out to the Afghan population would be nearly impossible. AT ensures force projection, mobility, and timely resupply.

Close Air Support

In support of ground forces, air assets conduct pre-planned, dynamic and time sensitive operations. Pre-planned operations directly support ground commanders in the execution of their operations. Dynamic and time sensitive support is conducted in support of Troops in Contact (TIC) situations as well as with targeting the insurgents' leadership.

Every TIC, while conducted at the tactical level, has the potential to become a strategic event. The vast distances and difficult terrain mean that ground forces often operate outside areas which can be supported by their organic fire support systems. Thus, they rely on CAS as their primary means of fire support. Without CAS, troops are in great danger of being killed or wounded when they come in contact with the enemy. Consequently, increased casualties will likely have a direct negative effect on the political and public support to the mission at home. Attack aircraft being

dynamically applied to target the insurgent leadership can achieve a positive effect by directly diminishing the planning and execution of adversary operations.³⁸ This effect is directly tied to the level of leadership targeted.

Because a TIC 'gone wrong' can have strategic repercussions, it is deemed critical that TICs be supported with the highest priority. This priority and focus ensures a very short reaction time (from the initial call for CAS until CAS assets are overhead) is maintained. In Afghanistan, almost 100 % of the TICs are supported to the extent that the life threatening situation on the ground is solved positively. The average reaction time is below 12 minutes.

The support of ground forces by Air Power in Afghanistan is both kinetic and non-kinetic. Non-kinetic applications of Air and Space Power include Electronic Warfare (EW) in terms of Counter-IED (C-IED) support; Combat Search and Rescue (CSAR); ISR, C2, Space Operations and show of force and show of presence. Show of force and show of presence actions as well as dropping of flares have enabled ground commanders to accomplish their missions without having to resort to kinetic effects.

CAS in Afghanistan emphasizes the principle of 'the indivisibility of Air Power'. This principle holds that the ultimate effect of the mission to be achieved determines the role of the platform. For example, a B-52 is traditionally labelled as a strategic bomber but it can provide tactical air support if the effect of the mission is at the tactical level. So, it is not the notion of tactical, operational or strategic that determines the capability of the platform but the effect to be achieved that determines if the mission is of a tactical, operational or strategic order.

The capability to employ scalable effects and to check for and mitigate collateral damage and reduce unintended casualties is very important to counter-insurgency operations. The ground forces commander tries to

balance the tactical-level focus of engaging and defeating opponents with the strategic-level focus of winning support of the population.

To conclude, CAS missions have proven to be of a strategic importance in Afghanistan. The rapid execution of the CAS mission proved to be and will be mission essential to the ground troops. Because of the possible implications of a TIC not correctly supported, coalition Air and Space Power support to TICs is of a strategic significance. The same applies to air support of targeting operations. The desired effect of such missions – killing the leadership of the insurgents – most likely have an effect on the level equal to the level of the leadership killed: i.e. killing an operational level leader will have adverse effects on the insurgents' operational capability. Similarly, killing strategic leadership will likely have adverse effects at the strategic level of the insurgency.

Intelligence, Surveillance, Reconnaissance and Space

As the unprecedented demand for UAVs and other ISR assets indicates, intelligence in Afghanistan is paramount. Air and Space Power provide highly capable, if not the most capable, collection methods. Most air platforms are equipped with an active electro-optical or infrared sensor/targeting pod. The pod's primary function is to provide SA, find targets and guide precision munitions.

Platforms such as the RC-135 'Rivet Joint' and 'Combat Sent', U-2 'Dragon Lady', MQ-1 'Predator', MQ-9 'Reaper', RQ-4 'Global Hawk', MC-12 'Liberty', as well as non-traditional platforms provide around-the-clock ISR coverage.

Since 2008, airborne ISR assets in Afghanistan have been tasked with over 1 million targets³⁹, provided support in numerous TIC situations, assisted in the capture of more than 160 high-value individuals and identified over 1,000 possible IEDs. These ISR assets provide the continuous coverage

necessary to protect coalition forces while opponents were detected hiding amongst the population.

The ISR effort in Afghanistan is augmented by space assets supporting operations in the region. US and Allies harness the power of space-based systems to extend the communications network across the globe. Combined with imagery, intercepted communications, and GPS, coalition forces have the most up-to-date information available to precisely target the insurgents.

Another important feature of ISR in Afghanistan is permanent electro-optical surveillance carried out from captive balloons. Using a Permanent Tracking and Display System (PTDS), these surveillance balloons are very efficient, easy to maintain, provide clear pictures in the visible and infrared spectrum, with a range of 10–15 kilometres. They are extremely efficient for the surveillance of small groups of people who are active on LOCs, near military and political objectives and on the access routes to them. Such a balloon network easily covers, with a minimum of resources, the areas of interest. Their only vulnerabilities are those related to visibility and wind.⁴⁰

Without ISR, ISAF and US troops would be blind and deaf and would largely be forced to react to their advisories. ISR provides information and SA, without which the effectiveness of the ISAF/US missions would have been heavily degraded. Therefore, ISR is a force multiplier of strategic order with strategic effects.⁴¹

Helicopters

Helicopters in Afghanistan are assets under operational control of the Regional Commanders. Helicopters were and are of strategic importance, in kinetic and non-kinetic application of Air Power. Despite the challenges posed by the weather conditions and terrain, helicopter provide support to ground forces by executing air assault operations, close combat attacks,

convoy escort, C-IED LOC patrols, AT, troops insertion and extraction, re-supply, MEDEVAC, CSAR, humanitarian assistance and disaster relief missions.

Rapid air evacuation is credited with saving hundreds of lives, both military and civilian, in the past decade of war and this is about a strategic effect on troops availability and morale.

Given the significant distances away from support bases that operations are conducted, helicopters are the only assets that can provide CASEVAC and MEDEVAC support. Helicopters ensure that a patient can be transported to the nearest medical treatment facility within one hour⁴² from the time he or she was injured.

Helicopters prove to be the most effective means in supporting Afghan elections. By transporting politicians and electoral materials in remote areas they aid in legitimizing the electoral process. In addition, the training of Afghan Air Force (AAF) personnel and the escort of AAF helicopters during their missions constitute other important tasks for NATO's helicopter crews and contribute to NATO's strategic objective of supporting GIRoA.

Air-to-Air Refuelling

Flying into and over Afghanistan requires a full network of AAR aircraft to support long-range missions. Tankers are operating from locations such as Karshi Kanabad in Uzbekistan, and Manas Air Base, Kyrgyzstan. Aided by tankers, fighter aircraft flew strike missions far into Northern Afghanistan. An F-15E set a record for the longest fighter combat mission at 15.5 hours. A B-2 crew set a record with a 44-hour combat mission. B-1s and B-52s armed with precision weapons fly high above the battlespace for hours.⁴³

Afghanistan's operational environment has shown once again that effective Air Power support depends nowadays more and more on directly

available AAR support. Thus, AAR is becoming a force multiplier able to circumvent the limitations imposed by poor basing conditions in a hostile environment.

Command and Control

Air C2 is exercised through one CAOC in Qatar, by using a single, combined, regional ATO encompassing all US Coalition and ISAF military air missions in Afghanistan. All ISAF assets are TACON delegated to the Deputy Combined Force Air Component Commander (DCFACC). The Coalition Combined Force Air Component Commander (CFACC) retains Airspace Control Authority (ACA). For ensuring the flexibility of actions, the DCFACC retains TACON for all fixed-wing and rotary wing assets delegated to Regional Commanders. The authority for Against Surface Forces Air Operations and MEDEVAC is delegated to the ISAF's Combined Joint Operations Centre.

A Regional Air Operations Coordination Cell (RAOCC) is established at each ISAF Regional Command to ensure that the air requirements/requests of each region are collected and prioritized. Additionally, the RAOCC provides air advice to respective regional commanders and their staffs.

Key US Central Command air capabilities (such as AAR, AT, and ISR) are retained in a pool of assets controlled by the DCFACC at the CAOC. The CAOC has the responsibility for the apportionment and allocation of these capabilities to support both ISAF and OEF.

Although two different operations are simultaneously conducted in one theatre of operations, having two military commands with two separate staffs, this does not affect the application of Air and Space Power due to its unique C2 system. The architecture of this system allows centralized command and decentralized execution with a high degree of flexibility, with a separately allocated pool of assets but with poor ATM.

Limitations to the Application of Air and Space Power

The limitations imposed to the application of Air and Space Power were early defined by the UNSCR, NATO Atlantic Council (NAC) guidance and the national caveats.

In executing Air and Space Power, ISAF is not allowed to conduct counter-terrorism operations. However, in-extremis situations and when requested ISAF is allowed to provide in-extremis support to coalition counter-terrorist and counter-narcotic operations.

The reasons for instituting caveats were generally similar among contributing nations: the risk of exposure for one's own troops and the potential for unintended civilian casualties. From an Air Power perspective, there are three main categories of caveats: geographical, operational and capability-related.

One of the most significant limitations is related to the air basing possibilities. This is caused by the harsh environment of Afghanistan: reduced dimensions of runways, limited parking and refuelling facilities, no navigation aids, limited support personnel and hours of operation, low level of security. The limitation impacted the strategic mobility capability of ISAF⁴⁴.

After 2008, unintended civilian casualty incidents generated additional limitations when attacking insurgents from the air. Severe restrictions were placed on the use of Air Power to the extent that in populated areas, engagement from the air was restricted to the protection of US, NATO, and Afghan forces in imminent danger.

The caveats and restrictions harmed the flexibility of C2 and force application, even in extreme situations when the troops came under fire. They have generated friction between NATO's political and military leaders.

On the other hand, the restrictions encourage innovation and dynamism in assigning targets and planning as well as for a re-balance of the actions with regard to employing kinetic or non-kinetic effects.

The Role of Technological Advances

In Afghanistan, the impact of technological advances is remarkable. One example is the step from single mission UAV, mostly used for ISR, to armed UAVs capable of supporting both ISR and CAS missions. The use of UAVs brought a new feature for AT; the introduction of unmanned helicopters for transport missions in high-risk areas. The US Marines successfully tested the K-MAX system, a UAV helicopter, capable of lifting a payload of 3.5 tons and transporting it over 250 miles.⁴⁵

A great innovation in Afghanistan is the optimized interaction between the JTACs and the CAS aircrew. The introduction of a direct video linkage between aircraft and JTAC through 'ROVER' (Remotely Operated Video Enhanced Receiver) offer ground troops a real time aerial image for target assessment. This 'common view' shortens the talk-on time and optimizes precision.⁴⁶

For ground forces resupply and support to local populations, the use of GPS-guided Joint Precision Airdrop Systems (JPADS) has become the norm. Precision airdrops brought the strategic advantages of rapid and secure support to fulfil immediate needs on the ground.

Conclusions

Air and Space Power in Afghanistan is constantly changing and adapting to provide the kind of capabilities needed for successful operations in the Afghan operational theatre. The changes brought by the application of Air and Space Power in Afghanistan are many and varied. At least five aspects

have a profound impact on the current Air and Space Power roles in joint operations: precision; nonlinear battlespace; UAVs; ISR fusion; and targeting. Within this context, Air and Space Power represents the asymmetric advantage of ISAF in Afghanistan, being able to provide kinetic or non-kinetic, manned or unmanned support nearly anywhere and anytime needed by ground forces.

What makes the Afghan air war so singular in nature is not only the volume of air strikes or airdrops; but the precision, persistence, flexibility, and sophistication of the effort. Nearly all routine resupply of land forces in tactical fighting positions is carried out via the use of precision airdrop. All aircraft dedicated for AG operations, manned or unmanned, now carry targeting pods. Close to 100% of all weapons carried and employed by aircraft in Afghanistan are precision guided. 100% of CAS and ISR aircraft take off equipped with a video downlink. The Afghan air war has become a truly digital air war, achieving unprecedented levels of precision and control.

Air and Space Power provides an asymmetric superiority to counterinsurgency operations by significantly contributing to the achievement of strategic objectives through actions at tactical and operational levels. This holds true for the almost 100% support that was provided in under 15 minutes to TICs and for continuously targeting insurgent leadership. This is well illustrated by a communication that was intercepted from a Taliban commander where he said, 'Tanks and armour are not a big deal – the planes are the killers. I can handle everything but the jet fighters.'

The mechanics of Air and Space Power in Afghanistan are different from those seen in other recent conflicts. Distance was a major challenge. As emerging targets came to dominate the tasking, the key was to react in a flexible manner. Prioritization is key, but flexibility was paramount when pre-planned Air Power had to be redirected to higher priority targets or

highest priority TIC support. This led to a situation whereby Air and Space Power planners and commanders created flexibility in asset allocation and reallocation, better known as the concept of 'dynamic targeting', thereby significantly reducing reaction times of engagement and avoiding the waste of resources in the classical CAP tactic.

The majority of coalition aircraft in Afghanistan carry ordnance loads that provide a range of kinetic effects from small, such as 20 mm gun rounds, up to large, such as 2,000-pounds bombs. No other fire support element can provide such a range of effects from one source.⁴⁷ This capability is crucial in counter insurgency operations. Of all the elements of joint fire support, Air and Space Power is the element best suited to support ground forces in this operational environment making it a significant contributor of the execution of the counterinsurgency strategy.

Progress was made in the areas of air-ground synchronization and integration, to such an extent that it has become standard use for timely combined-joint planning meetings to be held in preparation of upcoming operations. The principle of air asset employment was to provide timely support for the entire duration of a ground operation when needed. Even so, further optimization of synchronized and integrated combined-joint thinking in the area of planning, fine-tuning and execution of operations remained of vital importance.

Overall, Air and Space Power in Afghanistan remains a force multiplier, which allows the support across a huge non-linear battlespace. In Afghanistan, with its specific harsh environment and the asymmetric response of opponents, Air and Space Power, including helicopters, are able to provide effects at the tactical, operational, but above all at the strategic level. Additionally, they provide logistic support in areas where ground forces are difficult to reach via land transport, thereby significantly reducing the footprint of supporting ground forces.

An important question for the future is the following: 'Is the way Air and Space Power is applied in Afghanistan a blueprint for the future?' The answer is most probably 'No'. Air and Space Power played important roles in Afghanistan, but fighting to gain and maintain air superiority was not one of them. The total absence of aerial combat has led some to claim that its day is gone forever, that expensive air superiority fighters and highly trained aircrew are no longer necessary. Given the FSE this view is most likely wrong. Worse than that, Afghanistan has generated at least temporarily a reorientation towards a nearly exclusive focus on direct ground forces support. Furthermore, future theatres of operation will differ according to the specific circumstances. With the advent of emerging powers that will likely be able to employ anti-access and aerial denial capabilities, it might be necessary in the future to conduct Air and Space Power operations that again cover the whole spectrum of Air and Space Power roles and tasks. It is recommended that the future application of Air and Space Power is a subject of analysis for a follow on work. Rethinking current Air and Space Power strategies might be appropriate in order to be best prepared for the future.

Operations in Afghanistan reveal once again the gap that exists between US and Europe in terms of Air and Space Power capabilities. Europe lacks the necessary stocks of PGMs, heavy bombers and strategic enablers that are so critical in environments like Afghanistan. Taking into account the shifting of US strategic interest from Europe to Asia, it is recommended that the strategic force realignment options for NATO are addressed to ensure that the Alliance regains the right balance of Air and Space Power capabilities and remains fit for purpose in the future.

It can be concluded that in all four sub-campaigns – AT, CAS, ISR and Space operations – Air and Space Power achieved strategic, operational and tactical effects.

Libya Operation UNIFIED PROTECTOR

Conflict Summary

In February 2011, a peaceful protest in Benghazi in eastern Libya against the 42-year rule of Colonel Muammar Gaddafi met with violent repression, claiming the lives of dozens of protestors in a few days. As demonstrations spread beyond Benghazi, the number of victims grew. In response, the UN SC adopted Resolution 1970 on 26 February 2011, which expressed 'grave concern' over the situation in Libya and imposed an arms embargo on the country.

Following this, NATO stepped up its surveillance operations in the Mediterranean in March 2011, by deploying AWACS aircraft to the area. Two days later the Alliance moved ships to the Mediterranean Sea. After the situation in Libya further deteriorated, the UN SC adopted Resolution 1973 on 17 March 2011. It introduced active measures, including a NFZ, and authorized member states, acting as appropriate through regional organizations, to use 'all necessary measures' to protect Libyan civilians and populated areas. The United States, France and the United Kingdom took immediate military action to protect civilians under three interrelated military operations.

On 22 March 2011, NATO responded to the UN's call to prevent the supply of 'arms and related materials' to Libya by agreeing to launch an operation to enforce the arms embargo against the country. NATO ships operating in the Mediterranean began cutting off the flow of weapons and mercenaries to Libya. In support of UNSCR 1973, NATO then agreed to enforce the UN-mandated NFZ over Libya on 24 March 2011. The Resolution banned all flights into Libyan airspace in order to protect civilian from air attacks, with the exception of flights used for humanitarian and aid purposes.

The Alliance assumed command of operations in the Libyan Area of Responsibility (AOR) on 31 March 2011. NATO air and sea assets began to take military actions to protect civilians. Throughout the crisis, the Alliance consulted closely with the UN, the League of Arab States and other international partners. NATO and non-NATO partners agreed to continue OUP until all attacks on civilians ended, the Gaddafi regime withdrew all military and para-military forces to bases and the regime permitted immediate, full, safe and unhindered access to humanitarian aid for the Libyan people.

On 20 October 2011, after opposition forces captured the last Gaddafi regime stronghold of Sirte and killed Colonel Gaddafi, the North Atlantic Council took the preliminary decision to end OUP at the end of the month. During the transition period, NATO continued to monitor the situation and retained the capacity to respond to threats to civilians, if needed. At midnight on 31 October 2011, a NATO AWACS concluded the last sortie; 222 days after the operation began. The next day, NATO maritime assets left Libyan waters for their home ports.⁴⁸

Legal Context

The UNSCR 1973 (2011) authorized the member states to enforce an arms embargo, to establish a NFZ over Libya and to protect civilians with all necessary measures.⁴⁹

Arms Embargo

As of 23 March 2011, NATO warships and aircraft were patrolling the approaches to Libyan territorial waters as part of OUP. Their purpose was: 'to reduce the flow of arms, related material and mercenaries to Libya, as called for in UNSCR 1973.' This was part of NATO's contribution to the broad international effort to help protect civilians in Libya from threat of attack.

NATO NFZ Over Libya

From 25 March 2011, NATO conducted the NFZ operation over Libya, one of the three main tasks encompassed in OUP.

Under the command of Joint Force Command-Naples (JFC-N), air operations were managed from NATO's Air Command Headquarters for southern Europe, in Izmir, Turkey. Real-time tactical control was exercised by NATO's CAOC located at Poggio Renatico in Northern Italy.

The purpose of the operation was:

'To fulfil UNSCR 1973's call to close Libya's entire airspace to all flights except humanitarian ones and therefore prevent any air assets from attacking civilians.'

As part of the operation, naval vessels and surveillance aircraft, including NATO's AWACS, provided real-time monitoring and commanded/controlled air activity over the Libyan airspace. They were also responsible for detecting any aircraft entered the NFZ without prior authorization.

NATO fighter aircraft stood ready to intercept any aircraft which violated the NFZ and engage it if it presented a threat. In enforcing the NFZ, lethal force would only be used as a last resort. As is standard in military operations, NATO's fighters had the right to self-defence against attacks from the air or the ground.

Protection of Civilians and Civilian Populated Areas

UNSCR 1973 mandated 'all necessary measures to protect civilians and civilian populated areas under threat of attack'.⁵⁰ In line with this authorization, NATO conducted ISR operations to identify those forces which present a threat to civilians and civilian-populated areas. Acting on this

information, NATO air and maritime assets could engage targets on the ground or in the air.

Targeting depended on the decisions of operational commanders. NATO made every effort to prevent harm to the civilian population and was always guided by the principle of using the minimum necessary force.⁵¹

The Opponent

Libyan AD units were equipped with a variety of Soviet supplied SAM, AAA, radars, and aircraft. The Libyans did not show an ability to integrate these systems into any comprehensive AD network. The organization of their AD Command was unclear.

The Libyan Air Force consisted of one medium bomber squadron, three fighter interceptor squadrons, five forward ground attack squadrons, one counterinsurgency squadron, nine helicopter squadrons, and three AD brigades deploying SA-2, SA-3, and Crotale SAM systems. The three SA-5 sites may have been operated by army units.⁵²

The first waves of attacks flown by the USA/GBR/FRA knocked out the Libyan AD and grounded the air force. After that NATO flew unopposed within the first few days.⁵³ Nevertheless, ground based AD was still a point of concern. It was stated, that in August and September 2011, Government supporters tried to move SAM units from the south to the north. This was finally denied by destroying them from the air.⁵⁴

NATO Air and Space Power

NATO implemented all military Air and Space Power aspects of UNSCR 1973 related to the protection of civilians, the NFZ, and the arms embargo. Once authorized, the Alliance, within one week, assembled a complete

package of capabilities to execute operations at sea and by air. By 31 March 2011, NATO was in complete C2 of the UN mandated missions.

Except for the enforcement of the arms embargo, where maritime assets were heavily involved, the enforcement of a NFZ over Libya and the use of all measures to protect Libyan civilians and civil populated areas under OUP was the first major NATO air-centric operation since 1999's OAF in the Balkans. It was also the first time that Europeans took the lead role, while the US agreed to assume a supporting role.

OUP suffered from a lack of strategic cohesion insofar as fewer than half of the NATO member nations contributed to the operation. Apart from US and Canadian participation, only six European countries delivered offensive capability⁵⁵. Besides the NATO allies, Sweden, Qatar, the United Arab Emirates (UAE), and Jordan took part in the operations⁵⁶.

A German decision to pull out caused a disruption of AWACS operations over the Mediterranean at a time when the AWACS support was critical to air operations. This was compensated by the decision of the German Parliament to shift resources to Afghanistan and to free up NATO personnel for Libya.⁵⁷ The Swedish Government committed fighter jets, a transport aircraft and a reconnaissance aircraft to the operation, but underlined the fact that the Swedish force would not be involved in AG strikes. Members of the Arab League actively participated in OUP. Jordan provided six fighter jets for logistic and escort support, while UAE sent several fighter jets to join the mission. Qatar contributed with six fighter jets and support aircraft to assist with NFZ operations and delivering humanitarian assistance.⁵⁸

In OUP, air operations ranged from Defensive Counter Air (DCA) to Offensive Counter Air (OCA) missions. Approximately 8,000 troops, over 260 air assets (fighter aircraft, ISR aircraft, tankers, UAVs and Attack Helicopters (AHs)) and 21 naval vessels (supply ships, frigates, destroyers,

submarines, amphibious assault ships and aircraft carriers) were employed. During the air campaign over 26,500 sorties destroyed more than 5,900 military targets including over 400 artillery or rocket launchers and over 600 tanks or armoured vehicles. The arms embargo covered a maritime surveillance area of approximately 61,000 nautical square miles and resulted in over 3,100 vessels being hailed, around 300 vessels being boarded and 11 ships being denied transit to or from Libyan ports for potentially posing a risk to the civilian population. For humanitarian assistance, over 2,500 air, ground and maritime movements into Libya were de-conflicted by NATO. Also, it is important to note that over 600 migrants in distress at sea were rescued directly by NATO maritime assets during this operation.⁵⁹

The Significance of Air and Space Power

NATO's assumption of operations over Libya on 31 March 2011 coincided with the adaptation of Gaddafi Regime Forces (GRF) to the air strikes by shifting to un-conventional tactics. GRF started to blend in with civilian road traffic and to use civilians as a shield for their advance. On many occasions, they used pick-up trucks instead of main battle tanks and armoured personnel carriers. Moreover, weather conditions deteriorated for a few days. Yet, the GRF's gradual shift to un-conventional tactics was a natural consequence of the air strikes, insofar as they aimed to mitigate the effectiveness of NATO Air Power.

About a month after NATO had taken charge of the air operations, it claimed to have degraded Gaddafi's military machinery by one-third. The target sets consisted of military headquarters; communications nodes; ammunition bunkers; defence radar sites; artillery pieces, including multiple rocket launchers; tanks; armoured personnel carriers; armed vehicles; and other military assets.⁶⁰ Space assets provided continuous support for a wide range of NATO Air Power missions.

Command and Control

OUP was a NATO led operation. Political direction was provided by the North Atlantic Council to SACEUR. The chain of command went from SACEUR through the Commander of Joint Force Command Naples (JFC-N) to the Commander of the Joint Task Force of OUP, Lt Gen Charles Bouchard and then to the Commander of Air Component Command Izmir, Lt Gen Ralph Jodice for all air operations and to the Commander of Maritime Command Naples, Vice Admiral Rinaldo Veri for all naval operations.

C2 of the campaign transitioned from a US Air Force Air Operations Centre (AOC) with a robust C2 and communications capability to a NATO CAOC without the required equipment for an operation of this size and scope. The coalition's few secure radios (only two rudimentary satellite communications radios with handsets were available to conduct operations) compounded the NATO CAOC's equipment problems. Additionally, equipment interoperability issues emerged. Secure telephones in the CAOC operations section could not communicate with US secure phones of participating units and neither side could access the other's capability. The ad hoc facility constructed for US liaison officers gave them access to US secure computer networks, satellite communications, and secure phones enabling communications with their US counterparts but still did not allow the US contingent to communicate with the CAOC a few hundred yards away.⁶¹ Critics assumed that this was a reason that a NATO CAOC designed to C2 300 sorties a day, struggled to manage 150 per day. That a very small operation strained the Alliance appears troubling for NATO.⁶²

Air Strikes

In order to enforce the NFZ and to protect civilians, NATO conducted OCA and DCA missions. 2,000 missions were executed to gain and maintain control of airspace.⁶³

Airpower operations were aimed at destroying communications nodes, the GRF's military assets, but also boosting the population's morale. Because NATO did not have troops on the ground, it was hard for NATO to give an impulse to the population to fight against the regime. However, NATO attacked locations symbolic for the regime's power (for example, the state security headquarters in Tripoli) and dropped leaflets.⁶⁴

One particular area of concern was the shortage of precision weapons in this relatively low intensity air campaign. By early June, it was reported that several nations were running out of AG weapons and had to replenish their depleted stockpiles.⁶⁵ Eventually however, although Denmark and Norway were reported to have depleted their stocks, other NATO countries were able to replace the shortage enabling continued operations.⁶⁶ Stockpiling adequate numbers of ordnance was a problem but in the end was solved by other nations. Although this clearly shows the vulnerability of NATO's capabilities, one may also conclude that this demonstrates the value and importance of being interoperable and standardized.

In order to further restrain the ground manoeuvres of the GRF, attack helicopters were employed to engage GRF targets. Army Apache helicopters launched from a carrier helped to break the deadlock in eastern Libya. AHs operated in close cooperation with fixed-wing aircraft, the latter provided intelligence both to select targets and to provide assessments of potential surface-to-air-missile threats. AHs also remained on stand-by to launch complementary strikes. AHs showed that they were an important Air Power asset and provided needed capabilities in this sustained and protracted air campaign.⁶⁷

As stated above, air strikes against the IADS and airfields significantly reduced the threat to NATO's assets enabling the enforcement of the NFZ to be achieved early in the operation.

Despite the fact that Air Power reduced the number of GRF military equipment, reduced their ability to move and forced them to disperse their units, GRF were able to fight until October against the Opposition. NATO's primary goal was to enforce the UNSCRs. As a secondary effect it gave the Opposition a morale boost.

Intelligence, Surveillance and Reconnaissance

ISR operations were key Air and Space Power aspects of the campaign. NATO nations kept ISR assets on station after Non-Combatant Evacuation Operation (NEO) in February 2011. When combat operations began on 19 March 2011, the intelligence picture of Libya was still not well developed. Even as NATO aircraft were committed to action, it took time to deploy the full spectrum of ISR support to the theatre. Minimal off-board ISR support was available to assist early strikes. In this environment, NATO strike aircraft attacking Libyan targets in the first days of the operation had to rely almost exclusively on on-board targeting pods to locate and identify targets.

As the air campaign gathered momentum and GRF dispersed into urban areas to reduce their exposure, NATO air forces had to deploy additional ISR assets to find and identify concealed vehicles, artillery pieces, multiple rocket launchers and armed 'technical' (pick-up trucks). NATO then began employing a multi-layered ISR constellation with Ground Moving Target Indicator radar providing wide-area coverage, Synthetic Aperture Radars and area photography narrowing the focus to specific locations before UAVs and fighters with Advanced Targeting Pods (ATPs) identified specific targets for attack. Almost all fighters flying over Libya were equipped with ATPs. Aircraft from nations that had not committed their units to dropping bombs were diverted for ISR purposes.⁶⁸

In the aftermath of OUP, ISR capabilities were assessed as a core capability shortfall during the Operation. Assets had to be shifted from one area to

the other to get a 24/7 coverage.⁶⁹ OUP highlighted – again – that NATO nations lack ISR capabilities in sufficient quantities for even a relatively small operation like OUP.

Clearly ISR played a vital role in enabling the implementation the UNSCRs, supporting targeting processes against both fixed and mobile targets, support of the enforcement of the NFZ and protecting civilians. In monitoring the maritime surveillance area of approximately 61,000 nautical square miles to support the arms embargo, manned and unmanned ISR assets were essential. It took time to build up a complex ISR network and these assets had to be handled flexibly. Therefore, it can be imagined that on-board ISR capabilities will become more important in future. Especially in operations where the enemy will be dispersed in small units, more ISR assets will be necessary to track them and build SA. This puts an even higher priority on NATO's efforts to mitigate the current lack of sufficient ISR platforms in European NATO nations. This development also points to increasing complexity and will put a premium on platforms that can do all (or most) of the targeting cycle process to simplify this very complicated and technology dependent process.

Key Enablers and Shortfalls

On 19 March 2011, US Navy ships operating under Operation ODYSSEY DAWN and a Royal Navy submarine under Operation ELLAMY launched 124 Tomahawk Land Attack Missiles (TLAM) at more than 20 targets in Libya's Integrated Air Defence System (IADS). These TLAM strikes were followed by three B-2 sorties that dropped 45 GPS-guided JDAMs on other IADS targets. These strikes were aimed at targets that either posed a direct threat to the coalition aircraft or, through use by the regime, posed a direct threat to the people of Libya.⁷⁰

OUP exposed significant limitations in the Alliance's military capabilities. In general, many European leaders utilized NATO as a means of securing US

involvement and obtaining 'unique capabilities' not found elsewhere in the Alliance. The US filled gaps in ISR, AAR, SEAD and Unmanned Aerial Systems (UASs) capabilities. Flying only 25 % of the sorties, the US still supplied half of the aircraft; flew 80 % of the AAR and ISR missions; and augmented airborne C2 with 25 % of the coverage and control.⁷¹

Beside military actions the coordination of International Humanitarian Assistance Movements had an important impact. NATO reported on 20 October 2011, that a total of 2,139 air and maritime movements were coordinated.⁷² This had a huge impact on the acceptance and the public support for this NATO operation.

OUP proved that NATO European nations lacked much of the inventory of needed capabilities. ISR, AAR and SEAD as already stated were mostly US supplied. Although some of these capabilities were available amongst European NATO forces, national interests prevented the use of them. As long as the US is still willing to support NATO operations, this may seem not a matter of great concern. However, if this support is not delivered by the US, European nations will definitely face significant problems.

Conclusions

OUP consisted of three elements: an arms embargo (UNSCR 1970), a NFZ and actions to protect civilians from attack or the threat of attack (UNSCR 1973). The latter UNSCR forbade the deployment of ground forces. In order to get compliance with the UNSCRs, NATO had to rely solely on air, space and maritime assets.

Monitoring the arms embargo was primary the responsibility of deployed naval assets. The presence of Air and Space ISR assets significantly decreased the need for a much larger number of maritime vessels (unsustainable) and

created a sustainable efficiency to successfully execute the embargo mission. Therefore, the contribution of Air and Space Power to the arms embargo operation was mission essential.

To support the arms embargo, enforce the NFZ, and to protect civilians, Air and Space Power were instrumental in achieving the associated objectives. Enforcing that could not have been done without Air and Space Power given the prohibition against the deployment of ground forces. Given the size of the country only monitoring by air offered this capability. After the first attacks against the Libyan IADS were launched by naval and airborne stealth assets, the remaining IADS were successfully suppressed by conventional SEAD assets supported by ISR. As some targets were far from the coastline, only air had the range and delivered effects to degrade them. Battle damage assessment and continuous ISR appeared a unique capability of air.

Protection of civilians, the 2nd pillar of the UNSCR 1973, was primarily conducted by air assets. Given their mandate, NATO did not support opposition forces directly but acted against their opponents. This was a clear benefit for them because GRF were not able to deploy the full spectrum of their capabilities without risk of their destruction. GRF air capability was neutralized or destroyed in the early stage of the campaign and GRF were targets often without any cover. This forced GRF to disperse and made them vulnerable to attacks from their Opponents. In a later stage, Air and Space Power forced GRF to relinquish their normal equipment and to use improvised materiel. Whenever required, NATO's Air and Space Power was able to launch major attacks against GRF which further reduce their capabilities. It must be doubted if the Opposing Forces would have been able to do this with their own mostly improvised or captured means. Finally, coordinating and protecting humanitarian assistance movements into Libya was a valuable effect delivered by air.

After roughly seven months the Gaddafi-regime was toppled. This was finally done by the opposition forces. Although Air and Space Power did not fully prevent harm to civilians, the effects delivered by Air and Space Power should not be underestimated. Apart from direct military effects, the impact to have a 'friendly airspace' boosted Opposition Forces morale and underlined NATO's reliability. However, it is also fair to mention that terrorists could slip away from Libya and start destabilizing the region elsewhere. A combination of 'boots on the ground' and the application of Air and Space Power might have prevented this from happening.

OUP underscored NATO's reliance on the United States. Key enablers were still not available in sufficient numbers especially in the European inventory and/or nations were not willing to provide them or had caveats to on their use.

Again, it was proved that PGMs are the weapons of choice. The remaining question is still: 'Do NATO nations have the right ordnance in sufficient numbers on stock or are they able to get them in short term? This leads to another question: If NATO runs out of stocks during a peace enforcement operation what will happen when ...?'

Finally, while clearly beyond the scope of this paper, it would nonetheless be interesting to compare the costs of this air campaign with that of a ground campaign executed to achieve the same effects. Also must be noted that the use of Air and Space Power during OUP didn't cost a single life from participating nations.

Overall Assessment of the Significance of Air and Space Power in Recent Crises and Conflicts

Based on UNSCRs all three assessed Operations were conducted either as a dedicated NATO operation or as a NATO-led coalition. Common was that

Air and Space Power was the first choice of capabilities applied in FRY and Libya. Simply, because there was no political will for a deployment of ground forces or 'boots on the ground'. NATO's engagement in Libya was the first case where the implementation of a UN Resolution (UNSCR 1973) was enforced by Air and Space only.

All three Operations showed that Air and Space Power were instrumental in achieving tactical, operational, but above all strategic effects. However, the measured use of kinetic means could in the end not fully avoid civilian casualties or that stated objectives could be fully achieved through the application of Air and Space Power alone (except for the enforcement of the NFZ in OUP). It showed however, that Air and Space Power can deliver and achieve strategic effects and that these effects, together with other key aspects, like political consultation and internal strife and unrest, can set the conditions for success. Use of Air and Space Power is a key tool for politicians to demonstrate to an opponent the willingness to react. The capability of a fast, flexible, responsive deployment and employment is a unique characteristic of Air and Space Power.

All three Operations showed that space support was instrumental to the effectiveness of the operation. Space enabled communications and provided essential information such as weather, navigation and targeting information. For the future, it is vital to maintain assured access to space information and space assets to support strategic objectives as well as to enable operational and tactical execution.

All three Operations showed that there were limitations to the application of Air and Space Power. Caveats (geographical, operational, and capability oriented) restricted the operational commander in maximizing operational effectiveness. Other factors that limited the full use of Air and Space Power were related to initial shortcomings in the deployment of air assets, basing opportunities, the non-availability of essential manpower (targeteers,

analysts, public affairs officers, etc.), interoperability issues, shortages in intelligence support (partly due to a lack of preparation time), precision AG weapons; and too few key enablers like ISR, SEAD and AAR assets.

OAF showed that the for the desired end state to be achievable, Air and Space forces must be available in time, with the required capabilities and in sufficient quantities to be effective. Sometimes capabilities were not available in sufficient numbers because NATO nations were not willing to commit themselves to deliver them. Sometimes the needed capabilities were simply not available due to existing capability gaps.

Each of the three assessed operations showed there is a huge gap in Air and Space Power capabilities between the US and the European NATO nations. ISR, AAR, helicopters (combat and transport), strategic airlift, PGMs, EW, and SEAD are the predominant capabilities lacking in European inventories. The reliance on US capabilities in this case brings Europe into a dependency situation. As long as the US is willing to provide the needed assets it will not be problem, but what if the US is engaged elsewhere? There is a clear need to think about alternatives and far reaching options for cooperation in order to mitigate the existing and still widening capability gap.

All three Operations showed the opportunities created by technological advances. Whereas OAF for the first time showed the use of forward deployed sensor platforms while data deduction and analysis remained at the home base, this concept proved to be the norm in Afghanistan. Where OAF showed a 30% use of PGM's, in Afghanistan and especially in OUP this proved to be close to 100%. Furthermore, the use of satellite information for ISR and for GPS guided weapons has taken an enormous step forward. Finally, increased data exchange and robotization have proven to be strong force multipliers with a promising outlook for further future developments.

Airlift capabilities served not only military purposes but also offered decision makers a possibility to react immediately in support of humanitarian assistance missions. Inter-theatre and intra-theatre airlift was instrumental in deploying troops and cargo. Afghanistan and OUP showed airlift aircraft flying directly from the airport of embarkation to the planned airport of debarkation, without the need of offloading and onward movement by intra theatre airlift.

UNSCR 1970 enforced an arms embargo into and out-off Libya. Maritime assets played the most important role in executing this task. But also Air and Space based ISR capabilities played an important supporting role in achieving the desired end state.

ISAF and OUP revealed the unique value that helicopters have for the achievement of NATO's strategic objectives, in an asymmetric environment. Helicopter's tactical level actions generated strategic effects, safeguarded troops or individuals in distress and supported the electoral process with crucial influence on governance and security. Therefore, NATO must ensure that helicopters form an integral part of NATO's Air and Space Power including doctrinal approach, capabilities procurement and employment.

A simplistic evaluation of the role played by Air and Space Power in the FRY, Afghanistan and Libya may wrongly lead to the conclusion that there is no longer a need for AD capabilities in order to establish air superiority or execute DCA operations. The reality, however, is that in the contemporary world powerful and emerging states continue to invest in air and ground means dedicated for gaining and maintaining the air superiority. Thus, any of the three evaluated Operations cannot constitute a model for future application of Air and Space Power. The FSE will be complex and unpredictable and future conflicts and crisis might require the full spectrum of Air and Space Power capabilities.

Whatever it will be, NATO has to cope with situations where it might face an opponent that has the full range of Air and Space Power capabilities and is able to conduct operations throughout the entire conflict and mission spectrum. It is for this reason that tomorrow's Air and Space Power organizations must have the capabilities, doctrine, training, exercise and experience to cope with this full range of possible operations and threats. This demands a solid assessment of the consequences of these developments⁷³.

The goal of NATO Forces 2020 is 'modern, tightly connected forces equipped, trained, exercised and commanded so that they can operate together and with partners in any environment.'⁷⁴ NATO operations in OAF, Afghanistan, and OUP provided a test of these capacities and the NATO Allies willingness and commitments for their building and consolidation. To achieve the NATO forces 2020 goal, a fundamental question should focus on the force structure of the NATO Air Power inventory. Is that inventory at the forefront of what NATO needs and not still too much Cold War driven? Is there a need for force realignment and getting rid of surplus and legacy capabilities that are very expensive in terms of manpower and maintenance costs and which are operationally not state of the art, nor contributing to NATO's needs? How do we mitigate the negative effects of not having the full spectrum of needed capabilities? While trying to maintain our level effectiveness the question arises if there are cheaper solutions, manned or unmanned? It is recommended that this issue is addressed in the comprehensive vision on Air and Space Power towards 2040.

Endnotes

1. Throughout the chapter, the term 'Air and Space Power' is used. It can be argued that each is a separate and distinct domain. However, the two domains are closely intertwined and for the sake of brevity and to argument is that the concept is unitary covering the two different domains which enable air component operations.
2. <http://www.nato.int/Kosovo/history.html>
3. Global Security.org
4. Kosovo/Allied Force After-Action Report, 7.
5. Benjamin S. Lambeth, NATO's Air War for Kosovo: A Strategic and Operational Assessment (RAND, 2001).
6. Report to Congress: Kosovo/Allied Force After-Action Report, Department of Defence (31 Jan. 2000), 32, 78f.
7. Bruce R. Nardulli, *Disjointed War: Military Operations in Kosovo* (RAND, 1999), 25.
8. *Ibid* 4, 124.
9. *Ibid* 7, 45 f.
10. *Ibid* 7, 82.
11. *Ibid* 7, 80.
12. Lambeth, 41 ff.
13. *Ibid* 11, 89 ff.
14. *Ibid* 4, 78 f.
15. *Ibid* 4, 79.
16. *Ibid* 5, 29 f.
17. *Ibid* 14, 54 ff.
18. *Ibid* 4, 39 f.
19. *Ibid* 17, 100 ff.
20. *Ibid* 18, 33 f.
21. *Ibid* 4, 80.
22. <http://www.GlobalSecurity.org>.
23. John E. Peters, *European Contributions to Operation Allied Force: Implications for Transatlantic Cooperation* (RAND, 2001), 30.
24. NATO treaty article 5: The Parties agree that an armed attack against one or more of them in Europe or North America shall be considered an attack against them all and consequently they agree that, if such an armed attack occurs, each of them, in exercise of the right of individual or collective self-defence recognized by Article 51 of the Charter of the United Nations, will assist the Party or Parties so attacked by taking forthwith, individually and in concert with the other Parties, such action as it deems necessary, including the use of armed force, to restore and maintain the security of the North Atlantic area.
25. Paul Belkin and Vincent Morelli, *NATO in Afghanistan: A Test of the Transatlantic Alliance* (17 Apr. 2009).
26. http://www.NATO.int/cps/en/NATolive/topics_8189.htm.
27. http://www.NATO.int/cps/en/NATolive/topics_69366.htm.
28. SACEUR OPLAN 10302 was approved on 14 Apr. 2004 and revised several times. The ISAF OPLAN 38302 implements the NATO CSPMP and the JFCB OPLAN 3032.
29. Starting with the political 'guidance' NATO's mission planning cascades from the Military-strategic mission into the operational-strategic campaign planning.
30. http://www.NATO.int/isaf/docu/epub/pdf/isaf_placemat_081201.pdf.
31. <http://www.NATO.int>, ISAF's Mission in Afghanistan.
32. *Ibid* 6.

33. <http://www.silkroadstudies.org/new/docs/publications/GCA/GCAPUB-02.pdf>; <https://www.cia.gov/library/publications/the-world-factbook/docs/notesanddefs.html>.
34. In reality there were no defined 'sub-campaigns', however one can identify four main areas of Air and Space activities in support of the overall campaign.
35. The objectives and the mission presented are deducted from planning documents and official ISAF webpage information.
36. MG (AF) Dr. Victor Strimbeanu, Case Study: Afghanistan, Air and Space Power Aspects of Airpower In The Asymmetric Conflict.
37. General Norton A. Schwarz, *Air Power in Counterinsurgency and Stability Operations* (NDU Press, 2012).
38. Lt Gen (ret.) Freck Meulman, *Air Power Over Afghanistan: The Quest for Strategic Effect*.
39. Ibid 37.
40. Ibid 36.
41. Ibid 38.
42. When wounded personnel receive hospital level quality medical treatment within one hour of their wounding, their chances of survival increase dramatically.
43. <http://www.lexingtoninstitute.org/library/resources/documents/Defence/modernizing-aerial-refuelling-fleet.pdf>.
44. COMISAF OPLAN 38302, revision 6.2.
45. Ibid 36.
46. Benjamin S. Lambeth, *Air Power Against Terror* (RAND).
47. <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA494289>.
48. NATO and Libya (2012) <<http://www.nato.int/cps/en/SID-B5C67440>>.
49. UN Security Council Resolution 1973 (2011).
50. UN Security Council Resolution 1973 (2011).
51. Unified Protector Mission 'Fact sheet', Joint Force Command-Naples webpage.
52. <http://www.globalsecurity.org/military/world/libya/af-qadaffi.htm>.
53. Unified Protector Mission 'Fact sheet', Joint Force Command-Naples.
54. Jason R. Greenleaf, 'The Air War in Libya', *Air and Space Power Journal* (Mar. 2013).
55. Ibid 48.
56. Christian F. Anrig, 'Allied Air Power over Libya: A Preliminary Assessment', *Air and Space Power Journal* (Dec. 2011).
57. Daniel F. Baltrusaitis and Mark E. Duckenfield, 'Operation UNIFIED PROTECTOR: Triumph or Warning Sign?' (2012), v 14, 33 f.
58. Ibid 54.
59. Ibid 53.
60. Ibid 56.
61. Ibid 54.
62. Ibid 48.
63. Ibid 48.
64. Bosilca, Bunovara, Rosu, Sava, Case Study: Operation UNIFIED PROTECTOR, *Airpower in Contemporary Interventions: Stabilization, Coercion, Peace Enforcement and Peace-making*.
65. Ibid 48.
66. Ibid 57, 38.
67. Ibid 56.
68. 'Analysis Libya: ISTAR's Future Following Unified Protector', *Jane's Defence Weekly* (24 Nov. 2011).
69. Georg Mader, 'Interview: Lieutenant General Ralph Jodice, Combined Forces Air Component Commander for Operation UNIFIED PROTECTOR', *Jane's Defence Weekly* (17 Apr. 2012).

70. Ibid 57, 29.

71. Ibid 48.

72. NATO press release (20 Oct. 2011).

73. Ibid 38.

74. Ambassador Alexander Vershbowi, NATO Deputy Secretary General, 'Closing the Gap: Keeping NATO Strong In an Era of Austerity'. Speech, 48th Annual Security Conference of the Norwegian Atlantic Committee, Oslo, Norway.



Diminishing Air Power Capabilities

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Many NATO Member States are reducing their military expenditures at a pace that is threatening the ability for NATO to maintain its stated LoA and the capabilities to conduct related operations. One might even argue that we are at a critical level for the Alliance as Air Power capabilities all over NATO are diminishing. This means that the ability for NATO to continue to employ and sustain both Air and Space Power to safeguard our populations and enable NATO operations is at risk.

Widening gaps with NATO's LoA and between US and NATO European defence capabilities clearly indicate that NATO Member States are not on the right vector. The impacts from diminishing budgets and capabilities are unmistakably evident in the downward trends of the numbers of platforms and personnel. Although these downward trends ask for a common sense of urgency, political leaders currently appear unwilling or unable to work together to slow, halt or resolve the Air and Space Power inadequacies. Ultimately this will mask and potentially accelerate the vulnerability of NATO.

The purpose of this chapter is to demonstrate that NATO capabilities are declining to a critical level. First, the current situation will describe that NATO has shortfalls that affect its ability to conduct operations. Second, trends will point out what we may expect for the future for the

development of NATO's capabilities. Third, the current instruments to solve the problem will be addressed and an alternative will be explained. Finally, it will be assessed what this means for Air and Space Power capabilities in NATO.

Shortfalls

One of the key elements of the NDPP is the determination of the Priority Shortfall Areas (PSAs), which are linked to NATO's Minimum Military Requirements (MMRs). As clearly demonstrated in the previous chapter, recent operations and planning require Air and Space Power capabilities which are unfortunately becoming critical shortfalls. PSAs in the air domain also include:

- Theatre and Ballistic Missile Defence;
- Counter-Improvised Explosive Device Technologies;
- Joint Intelligence, Surveillance and Reconnaissance;
- Cyber Defence;
- Deployable Medical Support.¹

Some other evidences of shortcomings are:

- Lower operational rates for equipment;
- Flying-hour levels below Allied Force Standards Volume III prescribed hours standards;
- Failure to replenish critical munitions;
- Units being short of required personnel;
- Cancelled or reduced participation in multinational commitments such as the NATO Response Force (NRF).

To underpin the shortcomings mentioned above, the latest NATO assessments of military suitability and risks are strongly recommended to the reader.² These assessments were aimed to inform the NAC at ministerial level on the military suitability of the Alliance-wide defence planning.

They contain a compilation of individual Allies' defence plans and all NATO capabilities, whether national, multinational or NATO-owned, in relation to NATO's LoA, including the degree of military risk associated with it. In addition, the NATO assessment identifies major trends and areas of concern as well as capability shortfalls.

Economic Crisis

In line with numerous other reports and scientific analysis in this area, it is clear that the global economic and financial crisis has severely impacted the amount of resources designated for defence, and subsequently reduced the scale and pace of transformational efforts within the Alliance. Seventeen Member States reduced defence spending in real terms in 2010, and it was estimated that nearly half of the 28 NATO nations would implement further budget reductions in the near future.³ To cope with these defence budget cuts, nations have applied a number of different measures primarily aimed at sustaining current operational commitments. But this sustainment comes at the expense of future transformation capabilities. The wish to develop a set of full spectrum capabilities has become even more challenging since the aspiration in NATO is that no single Allie should provide more than 50% of certain capabilities.

To achieve immediate savings, reductions in investments have led nations to postpone capability development plans up to 2018, delay major procurement programmes outside the planning period or completely cancel some projects. This has been compounded by the need to modernize equipment much earlier than planned due to its extensive use in current operations. In some instances, plans to decommission obsolete capabilities have been amended to extend the service lives of major equipment, consuming financial resources originally planned for modernization.⁴ It has also resulted in the reduction or refocus of training on most likely or low intensity tasks, imposing a risk on the readiness of forces to execute

the full spectrum of missions. Further measures observed are cuts in personnel costs, suspending recruiting for up to two years, and reductions in salaries and/or allowances.⁵

Nearly half of the nations will continue to have unbalanced force structures for different reasons (e.g. dedicating forces to purely national requirements), with the effect of taking up financial and human resources that could otherwise enhance expeditionary capabilities for Article 5 and non-Article 5 crisis response missions.⁶

Risk

Continued over-reliance on a few or even a single nation for the provision of costly capabilities represents an unacceptable risk to meet the LoA. To avoid this risk a greater number of Member States must reallocate a sufficient level of resources in favour of transformational priorities and modernization. They must identify and implement measures for more effective use of resources (including via multinational approaches), consider cooperation along all feasible lines of capability development, and continue the restructuring and rebalancing of their forces.

In NATO's assessment of military suitability and risks, a number of shortfalls across the domains will likely impede achievement of the LoA. Specifically, shortfalls that diminish Air and Space Power will adversely impact functional areas related to the planning and execution of operations such as to project, engage, sustain, protect and inform.

Sub Conclusion

The pace and level of transformation and modernization have been severely impacted by the downturn of defence budgets resulting in diminishing capabilities. There remains a disproportionate reliance on a

few Allies or even a single Allie. In fact, one can identify two gaps in capabilities. The first one, and most worrisome, exists between the NATO LoA and the reported existing capabilities. The second (and increasing) gap is between the US and other Allies capabilities.

So far, NATO assesses that the Alliance is currently able to execute the full range of the Alliance's missions while incurring significant risk.⁷ If the trend of declining defence budgets and diminishing capabilities continue, there is a serious risk that NATO will not meet its defined LoA. The real concern is not that there is risk involved in not properly addressing the shortfall areas and the increasing capability gap. The real concern is how NATO defines significant and acceptable risk and what impact the shortfalls will have on meeting NATO's LoA and needed capabilities, and the challenges as depicted in NATO's Strategic Concept.

Trends

Downward Spiral

In August 2011, NATO Secretary General, Anders Fogh Rasmussen, stated, 'Since the end of the Cold War, defence spending by the European NATO countries has fallen by almost 20%. Over the same period, their combined Gross Domestic Product (GDP) grew by around 55%. The picture is somewhat different in Asia. According to the Stockholm International Peace Research Institute (SIPRI), between 2000 and 2009, India's defence spending grew by 59%, and China's tripled. This led to a double leap forward: a transformation of these countries' armed forces and their acquisition of new weapons systems. If one compares Europe's defence spending with that of the United States, the contrast is also large. By the end of the Cold War, in 1991, defence expenditures in European countries represented almost 34% of NATO's total, with the United States and Canada covering the remaining 66%. Since then, the share of NATO's

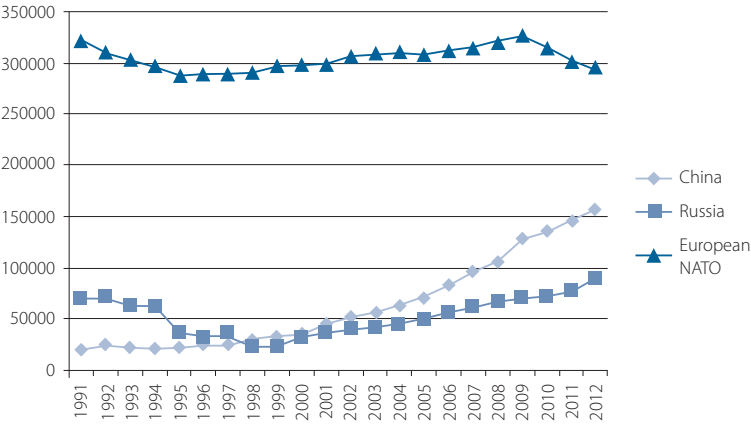


Figure 3-1: Defence Expenditure comparison between European NATO nations and Russia, China in last 20 years (numbers X 1,000,000 \$).⁹

security burden shouldered by European countries has fallen to 21 per cent.⁸ If this trend continues, burden sharing within the Alliance will be even more unbalanced in the future.

In the coming decade, NATO faces growing fiscal austerity and declining defence budgets. The global economic crisis has forced most European governments to trim their defence budgets. In the charts below, a comparison of NATO European nation's defence spending with respect to some other nations is depicted (see Figure 3-1).

A RAND study¹⁰ in 2010, assessed the impact of the current and planned austerity measures and reforms on NATO's ability to meet the security challenges of the 21st century. This study does not include all NATO Nations but focuses on seven Alliance members who have the highest proportion

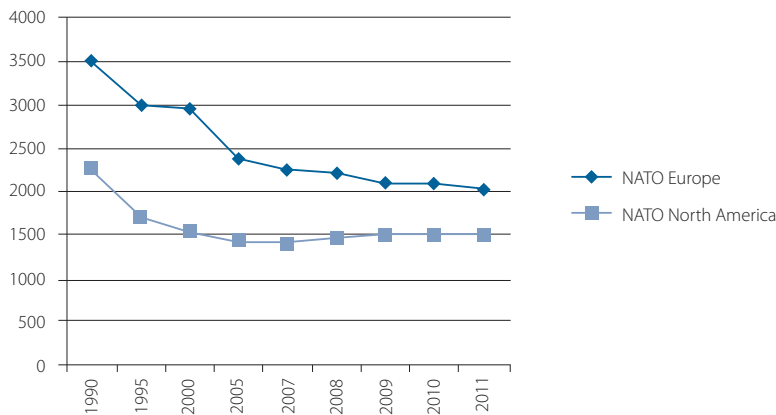


Figure 3-2: Military personnel numbers comparison between NATO Europe and NATO North America in last 20 years (numbers X 1,000).

of deployable forces in the Alliance and have some of the most advanced weaponry and technological capabilities in the Alliance (the United Kingdom, France, Germany, Italy, Spain, the Netherlands, and Poland). The outcome of this RAND study show the similar message as figures from other sources, such as those in Figure 3-1 and 3-2: a downward trend in defence spending and in military personnel numbers (see Figure 3-2).

Other studies in this area (e.g. World Bank) may provide slightly different percentages and include/exclude different elements however, they all point in the same downward direction.

A downward spiral of capabilities can be identified and under economic pressures, NATO Member States are making cuts to their national budgets. Some cuts can be described as vertical, that is, the complete removal of a

major capability or the foregoing of a major acquisition. The need for 'quick and significant' savings comes at a cost of losing hard to replace experience and expertise at all levels and eliminate capabilities that will be very costly to rebuild. In cases of 'vertical cuts' it is sometimes impossible to regain the capability in a reasonable short time frame when needed again. The ripple effect of such decisions will delay improvements in core capabilities such as power projection or force protection.

A few more visible 'vertical' cuts have been made that forego or eliminate entire national capabilities – these are harbingers of the future as the crisis persists. The results of vertical cuts are growing self-selection of roles and missions, which is likely to create gaps in meeting NATO's Core tasks.¹¹ In the future, more cuts will likely be vertical as nations realize this is the only way to achieve real savings and to protect their most desired capabilities.

'More common than vertical cuts, nations are slicing existing capabilities threatening to make them unready or unavailable. These are across-the-board horizontal cuts in essential functions: maintenance, spare parts inventories, on-hand fuel and munitions (in particular, PGMs), training and education required to fill units with qualified personnel, flying-hour reductions, and exercise curtailment. These measures cause lower readiness and eventually units that are not combat capable. The result is increased response times for all affected forces and enabling units and/or increased risk to mission accomplishment.'¹²

Traditional cutting of training and exercise budgets of non-deploying operational forces allowed resources to be concentrated on deployed or forces preparing to deploy. However, the impact has become substantial across NATO: more and more forces becoming less ready or not available at all; a slow, insidious hollowing out of the overall force; and a widening 'invisible' gap across the Alliance.¹³

Interdependency

Many budget cuts are increasing NATO's dependency on the US, just as the US is rebalancing toward Asia. Ultimately, European NATO nations will have to spend more on defence and spend it more wisely, to arrest this trend of dependence.¹⁴ The US has made it very clear that it wants European Member States to take on a bigger share of the burden for Alliance defence in general, and for European defence in particular. Achieving the goal of NATO Forces 2020, set at the Chicago Summit¹⁵, and developing an Allied Force with a full spectrum of capabilities will require real burden sharing and should include the notion that no single ally should provide more than 50 % of the certain capabilities. As a result, Europe's unhealthy dependency on the US further intensifies the risk in its own backyard and raises the demand for NATO to resolve its diminishing Air Power capabilities.

Related to this is the fact that European NATO Nations, especially the smaller ones, are investing in tailored capabilities. This will enhance the interdependency between countries, and therefore put even more pressure on their political willingness to participate when called for. NATO lacks a mechanism that guarantees nations will deliver what they commit to an operation.

Sub Conclusion

The Transatlantic capability gap is simply not sustainable in the long term. First, the fiscal crisis has hit the US as well, and it will be cutting defence expenditure in the coming years. The US also has a revised defence strategy that shifts the emphasis of its force posture from Europe to the Middle East and the Asia-Pacific regions. In order to ease the current over-reliance on the US, and ultimately to end it, the Alliance should be aiming for a situation where capability gaps are mitigated and

ensure that the European NATO Nations can adequately act, even in situations where no single Allie provides more than 50 % of certain critical NATO capabilities.

Instruments

At the Lisbon Summit, NATO adopted a new Strategic Concept for the Alliance.¹⁶ It describes the risks and threats that NATO is facing and it highlights three essential core tasks to meet the Allies' individual and shared interests – collective defence, crisis management, and cooperative security.

But in order to carry out these tasks successfully, NATO needs the right forces and the right capabilities. Unfortunately for many Member States, acquiring those forces and capabilities has become a formidable challenge in this time of financial difficulties.

Therefore, it is required that NATO fully exploits the instruments at hand to build and maintain the right tools for its military toolbox. In the following sections the effectiveness of these instruments (NDPP, SD, CFI and Multi-national Cooperation) will be examined.

NATO Defence Planning Process

The NATO Defence Planning Process (NDPP) is used to build and maintain the right capabilities. This instrument is effective in establishing the military requirement for NATO's LoA. However, NATO cannot demand that nations procure and contribute the required capabilities to meet the LoA, nor is there any binding agreement on a nation to provide the capabilities needed. Therefore, there it is highly likely that existing shortfalls will remain and remain to the extent that they threaten NATO's ability to achieve its LoA.

'National cuts in defence budgets are hard to anticipate and measure at NATO. The process has no mechanism that calls for early consultation on national cuts and no method within the NDPP to track, manage and measure them at NATO.'¹⁷

The consequence of uncoordinated national cuts has and will continue to increase the risk to NATO. As a result of uncoordinated execution, investments and defence budgets will be spend on tailored capabilities, without a real 'check and balance' against what tools are needed in NATO's toolbox.

Smart Defence

At the NATO Summit in Chicago May 2012, the Heads of State and Government set the goal of 'NATO Forces 2020'. In order to reach this goal, NATO also agreed at Chicago to pursue two separate initiatives: SD and CFI¹⁸.

SD focuses on efficiency and is meant to be a new guiding principle for capability development. The aim of SD is to encourage multinational solutions to both maintaining and acquiring defence capabilities – in other words, nations working together to deliver capabilities that they cannot afford alone.

SD is first about cooperation between nations bilaterally and multilaterally. By coming together, nations can achieve significant economies of scale, avoid costs and gain capabilities they could not afford alone. Cooperation can encompass the many layers of capability delivery. It can include research and development, production, maintenance, logistic support, training, weapon stockpiling and even multinational forces.

SD is also about focusing on priorities. Effective and valuable cooperation is focused cooperation – so prioritization is really an enabler of cooperation.

The challenge is to help align nations' priorities with NATO's collective priorities. Currently a number of measures, focused on the development of capabilities, are being pursued to achieve the capability goal.

Especially for Air and Space Power, the SD approach could be potentially of significant importance, as capabilities in this domain tend to draw on scarce resources for production and maintenance. The past has shown some successful examples in this domain, such as the European Participating Air Forces group of F-16 users. However, despite the good intentions at the operational-military level, such an approach can only bear fruit with genuine political commitment and close cooperation with industry, and where these players demonstrate readiness to make concessions to the benefit of the 'greater cause'. Especially in times of austerity, where politicians turn inward rather than outward, this seems hard to achieve.

SD is thought of as 'old wine in new bottles' and political will of the Member States is still needed to put this initiative forward. This initiative is essential for Air and Space Power because of the high cost to develop, produce and sustain leading edge capabilities. Only if national defence industries of NATO Member States would get together for SD Projects, backed up by their politicians, a win-win situation could arise. In the current political and financial climate this seems very unlikely.

Connected Forces Initiative

CFI has garnered fewer headlines, but it's just as important as SD. Its objective is to maintain and strengthen the readiness and interoperability of NATO forces, even as NATO operations draw down. CFI has an effectiveness-focus. It helps Member States effectively use capabilities together, to maintain and enhance interoperability gains in view of a decreasing operational tempo.

The identified 'ways' for CFI currently include:¹⁹

- Increased emphasis on live exercises. A high-visibility live exercise in 2015 and consideration for live exercises every year afterwards, possibly based around the NRF;
- Bolstering the NRF taking all DOTLMFPI²⁰ aspects into account;
- A well balanced NATO Training Concept that addresses the full range of Alliance missions;
- Enhancing NATO Special Operations Forces (SOFs) and better use of technology as a broad connecting enabler;
- Overall review of NATO's related doctrine and documentation.

For CFI to work, 'Allies must be willing to give up certain (national) capabilities so that the Alliance can collectively fund and maintain them. However, this creates the risk that a shared capability will not be available or authorized for use when other Member States need it for use in less than fully authorized NATO operations. Hence, the major challenge of CFI is to align nations' priorities with NATO's collective priorities as they develop during NATO operations.'²¹

This will especially impact Air and Space Power as the capabilities in this domain can only be brought together in a real collective effort. In the Cold War period this was actually the case and was collectively supported. Since then however, the planning, tasking and execution of Air and Space capabilities have become part of a complex, globalized 'system of systems'. This poses a real challenge in 'connecting the forces' in this domain. So in times of austerity, NATO Member States should align their priorities with the Alliance's priorities.

Bi- and Multinational Cooperation

We are living in a time of financial difficulties. Meeting the 2 percent threshold is becoming harder for most of the NATO Member States. As US

Defence Secretary Gates summarized the existing situation below eloquently, bi- and multinational cooperation may be used as an effective instrument to acquire the right forces and capabilities.

‘Though we can take pride in what has been accomplished and sustained in Afghanistan, the ISAF mission has exposed significant shortcomings in NATO, in military capabilities, and in political will. In addition, while every Alliance member voted for Libya mission, less than half have participated at all, and fewer than a third have been willing to participate in the strike mission. Frankly, many of those Allies sitting on the side-lines do so not because they do not want to participate, but simply because they cannot. The military capabilities simply are not there.

Regrettably, but realistically, this situation is highly unlikely to change. The relevant challenge for us today, therefore, is no longer the total level of defence spending by Allies, but how these limited (and dwindling) resources are allocated and for what priorities. For example, though some smaller NATO members have modestly sized and funded militaries that do not meet the 2 percent threshold, several of these Allies have managed to punch well above their weight because of the way they use the resources they have.’²²

Although bi- and multinational cooperation in theory may be a solution, the majority of European NATO nations do not have the full range of capabilities to project power, nor defend their homeland on their own. Each of them is focusing on and planning for tailored capabilities, resulting in an increasing interdependence.

The problems depicted above might not be as gloomy as it first looks. The United Kingdom, France, Germany, Italy, Spain, the Netherlands, and Poland have the highest proportion of deployable and sustainable forces

from Europe. Together they represent somewhat more than 80 % of NATO Europe's defence spending. If these seven nations and maybe a few others, like Norway, establish a group of willing and able nations and take the lead in organizing themselves with a focus to the future, there might be avenues of cooperation that are really promising in solving shortfalls and concerns. This implies however, that traditional limitations linked to the Air and Space Power aspect of sovereignty, assured access and assured availability must be open for discussion and consequently be solved. For example, if the current European Participating Air Forces (flying the F-16) organize themselves towards the replacement of the F-16 with the F-35 there are very good opportunities for economy of scale and a reasonable burden sharing in mission, roles and tasks. However, this approach can only be successful if national interests no longer prevail over Alliance interests. But that is exactly the issue!

Sub Conclusion

The NATO Alliance has been based on bi- and multinational cooperation and has created a successful Alliance for more than 60 years. Although bi- and multinational cooperation may be a solution for mitigating NATO's capability shortfalls, it seems realistic to conclude that ultimately it will not solve NATO capability problem. This is linked to the fact that the security interests of NATO Nations tend to prevail over the interests of the Alliance as a whole. If this situation continues, it likely may leave NATO unable to achieve its LoA.²³

Task Specialization

When existing instruments are not working, what alternative can be used to solve diminishing Air Power capabilities issue? One possibility is the farther reaching form of bi- and multinational cooperation: role or task specialization. Therefore, we will briefly focus on task specialization.

Specializing in specific areas could be a viable alternative. Today, this is mostly happening by default. Cost-cutting is forcing some Member States to opt out of certain capabilities entirely, without any prior coordination with other Allies or NATO force planners. In the future, if specialization by design can be encouraged, we can not only avoid creating new gaps, but also promote a more rational division of labour, whereby nations can ensure a balanced set of capabilities across the Alliance. Specialization could be described as an attempt for nations or groups to build specific strengths in capability sets. The combination of these capability sets should enable NATO to achieve its essential core tasks.

The entrenched issues of national priorities, protectionism, sovereignty and historic national biases are the primary impediments to closer bi- and multinational cooperation, a reality that will not go away. Air Power cuts and reductions are also driven more than before by non-military national priorities; maintaining capabilities promised to NATO is often secondary.

Although it is possible for the European NATO nations to develop a comprehensive and integrated Air and Space Power capability through task specialization, it is also a political reality that the required assured availability & access seems unlikely. Much like coordinating even a simple event such as a pot-luck dinner, the planners need to ensure that all of the individual items are brought by the respective guests and that the actual guests RSVP with firm attendance to manage expectations, to meet requirements and to ensure success.

NATO, at present, can not specify tasks for its Member States and cannot coordinate the capabilities to be provided by its members. So success of task specialization is doubtful if Member States continue to specialize by default, not by design and are not willing to open up the discussion on the issue of assured access and assured availability.

Conclusion

Shortfalls

The trend of reducing Air Power capabilities began at the end of the Cold War and continues, and is cause for increasing concern. The evidence is clear that the investment in future Air and Space Power capabilities will be under heavy scrutiny and most likely further reduced. Shrinking budgets make addressing shortfalls all the more difficult and less probable, while operational risk remains high to very high regarding the adequacy of all these assets.

With the current shortfalls, NATO has a challenge in meeting its LoA. Given the trends the gap between capability and ambition will only become worse. NDPP is not going to solve the growing gap as nations are not willing to address and provide the full list of capability requirements. In reality, nations seem to continue to focus on the development of tailored capabilities, the less expensive alternative. This means that interdependency between nations will grow. NATO, in order to be successful in addressing crisis and conflicts therefore requires a guaranteed 'commitment to deliver'. So far this seems politically untenable, although this might be the only option for meaningful NATO Air and Space Power in 2040. The tailored capability approach of the European NATO Member States also leads to greater dependency on the United States. Although bi- and multi-national cooperation in theory could be a solution, in its current form it will not lead to mitigating the capability problem in NATO. This means that there is an increasing risk that the role Air and Space Power played in the past, can no longer be guaranteed in the future and thus can no longer remain a strategic military pillar.

As long as the shortfalls are not properly addressed and the capability gaps across the Alliance are widening, NATO Members are creating greater vulnerabilities throughout the spectrum of operations and thus will be

forced to accept significantly increased risk. Capability investment programs are seeing reductions and stretch-outs; others are being cancelled to generate greater savings from mission areas where more risk is seen as acceptable. The real concern is not that there is risk involved in not properly addressing the shortfall areas and the increasing capability gap. The real concern is how we define significant and acceptable risk and what impact the shortfalls will have on meeting NATO's LoA and needed capabilities, and the challenges as depicted in NATO's Strategic Concept.

Collective Effort

The required capabilities in the Air and Space domain can only be brought together in a real collective effort. In the Cold War Period this was actually the case and was collectively supported. Since then this collective support diminished. Many NATO Member States have invested less to defence capabilities and increasingly have set own priorities. This trend creates interdependence and needs cooperation among the Allies.

Interdependence can only work if there is a commitment to deliver when needed. 'Assured availability' must be a reality and actually the norm, but the political reality brings this into question. Europe's unhealthy dependency on the US further intensifies the risk in its own backyard and raises the demand for NATO to resolve the diminishing Air Power trend.

During its more than 60-year-lifetime, NATO proposed and created many initiatives to foster bi- and multinational cooperation and to improve defence capabilities of its members. However, national interests of the Member States occasionally prevailed over the interests of the Alliance and these instruments did not fully achieve the desired objectives. In the post-Afghanistan period, these instruments will be essential to keep the Air and Space Power ready for future and to sustain interoperability between Allies.

The problems of diminishing defence budgets and diminishing Air and Space Power capabilities are real and the trends tend to be more negative for the future. This will definitely have an impact on NATO and in particular the European NATO Member States who must have the right capabilities ready to operate when the need arises in the future. Not having the required Air and Space Power capabilities threatens NATO and its Member States.

Risk

There is no defined critical level for NATO's capabilities. Such a level is dynamic in nature as it also depends on the capabilities that will challenge NATO. One thing is clear, in the post-Afghanistan period it will be very hard to keep NATO militaries fit and ready to execute at NATO's stated LoA.

Some of the reasons are:

- NATO Member States have many capability shortfalls and this threatens the Alliance's ability to achieve its LoA;
- There is a downward trend in defence spending which will lead to further diminishing of capabilities and to an increase of interdependency;
- NATO's instruments to solve these shortfalls are not effectively working because NATO Member States interests are not always aligned with the Alliance's priorities. This problem remains as long as there is no political will to overcome this situation;
- For the same reason it seems highly doubtful that alternatives such as task specialization will be implemented successfully.

This means that the drivers that should or could improve capabilities actually don't generate sufficient force to solve the problem at hand. Consequently, capabilities will further diminish towards a minimum critical level. Only future conflicts will tell when that level has been breached. Can we afford to wait for that to happen?

The problem at hand is highly political. Thus far, the deliberations in NATO have not led to a common political sense of urgency to really take adequate steps to readdress the budget and capability problems. If NATO wants to maintain its role as a credible security provider, it is of great importance that NATO Nations, take the steps needed to ensure the Air and Space Power strategic military cornerstone of NATO remains fit for purpose.

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Future Security Environment

IV

The security environment in the world is changing rapidly. In a world that is increasingly challenged by rapid changes it is necessary to analyse the current megatrends, developments and challenges that will have or might have an impact on our FSE. Although there are a number of megatrends impacting the FSE such as; advances in technology; extended socio-network communication; cyber operations; geo-political developments; redistribution of power; changes in the nature of warfare; climate change; changes in demographics; threats to regional stability, etc., it is not intended to give a complete overview of these trends. Nor will this chapter attempt to determine the full range of possible conflicts or develop illustrative scenarios. The aim is to identify the parameters, characteristics, challenges and opportunities of a FSE that will or might have an impact on the planning, tasking and successful execution of Air and Space Power.

Furthermore, we must take into account situations that are unheeded and therefore simply unexpected but could heavily impact on a FSE, e.g. 9/11 and the financial crisis. So, taking the unpredictable future into account, this chapter focuses on existing or likely future developments and challenges that will impact the success of Air and Space Power development and application.

This chapter will first describe the most important megatrends, predominant developments and challenges that might define our FSE, including

their impact on Air and Space Power. Next an analysis of the findings of each of the megatrends, developments and challenges will be made. Finally, the chapter concludes with recommendations, which likely will have an impact on the use of Air and Space Power in the future.

Megatrends and Predominant Developments

Geopolitical Changes

The famous prediction by Goldman Sachs-banker, Jim O'Neill, in 2001, that Brazil, Russia, India and China (the BRIC countries) will in 2040 form the largest economies has become obsolete.¹ The rise of economies, especially China's and India's economies, have surpassed all growth scenarios of early 2000. China took over the position of Japan in 2010 as the second economy in the world and Brazil rose to fifth place.²

The BRIC countries are not an economic or ideological bloc, but join each other on a number of points with regard to international politics. First, they are opposed to what they see as interventionist international politics of Europe and the United States. **They see this intervention as a way to protect western dominance.** The willingness of emerging powers to support international political interventions is very low.³

The current global financial crisis will accelerate the shift of power in the world, especially now that the European Continent needs the emerging powers to solve the debt crisis. The call to China and the other emerging countries (via the International Monetary Fund) to contribute to the European emergency fund was unthinkable in 2008 and is a clear illustration of the new balance in international relations.

Although Brazil belongs to the BRIC countries and is an emerging economy showing substantial growth since the beginning of the 21st century,

Brazil is not seen to contribute to the shifting of power to the east. Therefore, the next paragraphs will focus on China, India and Russia only.

India and China are apparently not allies, but the relationship between the two countries seems good. 'A country can choose its allies, but not its neighbours', said the Chinese Premier Li Keqiang during a recent visit to India, his first foreign trip since he took office in March 2013. Li spoke even about 'the beautiful sun rays of our friendship'. The trade volume fluctuated around the 50 billion Euro mark in recent years and should increase by 50 % over the next few years. Intensive cooperation brings about a market of 2.5 billion people, which is the largest of the world.⁴

For the first time since the fifteenth century, Chinese warships sail in the Indian Ocean and cooperate and coordinate their anti-piracy operations with India and a host of other countries. The Chinese involvement in anti-piracy operations began in 2006 when China deployed their first Navy ships off the Somali coast.

However, apart from these economic, trade and military opportunities, India is apprehensive about the string of Chinese bases, and naval establishments in the Indian Ocean.⁵ Also troubling are the incidents between Indian warships and Chinese submarines. For both India and China, Burma and Nepal are of strategic importance, primarily because of the presence of raw materials. On 15 April 2013, an old border dispute flared up when Chinese soldiers set up their tents in Ladakh, which is controlled by India, but is contested by China.

To the east, tensions between China and almost all countries around the South China Sea are rising. Here the conflict is about gas, oil, raw materials and fishing areas. Further north, tensions between China and Japan in the East China Sea are over the control of uninhabited islands. This again is

about gas, oil and raw materials. Yet a bit further, the situation with China's neighbour, North Korea, remains high on the international security agenda.

Focusing on military developments, several Asian countries are rapidly undergoing militarization. India has one of the largest marine engineering programs of the world and has today a potent and capable force which is highly regarded for its professionalism and competence.⁶ At the same moment the US, driven by power politics and financial need, is changing its focus of attention from Europe to Asia, which in turn invokes Chinese reaction in the form of further military development. Be it high speed missiles, aircraft or even an aircraft carrier, developed to expel the US fleet from the Pacific when needed. In addition, America is an ally of India. Li Keqiang sought with his charm offensive in India to disrupt that relationship.⁷

Relevance to Air and Space Power, China

Much like the Chinese Army, the People's Liberation Army Air Force (PLAAF) has been undergoing significant change over the past decade, transforming itself from a poorly equipped and trained organization into an increasingly capable fighting force. Dramatic changes have occurred, and continue to occur, in the areas of mission, organizational structure, equipment, personnel, education and training.⁸

Transformation of the PLAAF began with a change in mission and expectations; from a force focused only on territorial AD, to a force with growing regional capabilities, and within the next 10 years being able to perform out of-region missions supporting Chinese national objectives. This is underlined by China's intention to build a carrier fleet by latest 2018 to be able to deploy air assets to regions that support China's national interests.

To help accomplish this growing mission set, the PLAAF has focused on increasing the education and training levels of its officer corps and

enlisted force. The PLAAF has become a much more professional force, still working to deal with monumental organizational, cultural and hardware changes.⁹

Regarding China's Space and Cyberspace capabilities, China conducted 18 space launches in 2012. This resulted in the expansion and upgrade of China's intelligence surveillance, reconnaissance, navigational, metrological and communications capabilities. In parallel, China is developing a multi-dimensional program to improve its capabilities to limit or prevent the use of space-based assets by adversaries during times of crisis or conflict. China frequently conducts exercises to demonstrate its advances in this domain.¹⁰ China has also created an impressive and capable military cyber capability. It is the general understanding throughout the PLAAF, that successful war-fighting is a precondition for the ability to exert control over an adversary's information and information systems, often pre-emptively.¹¹

This means for NATO that measures have to be taken to get a continuously updated picture of any outside Cyber warfare capabilities, and to create capabilities to prevent NATO from any foreign military cyberattack.

The PLAAF is transforming from an overly-large technologically inferior force into a well-equipped and increasingly well-trained force. Although, it still possesses identifiable shortcomings and weaknesses such as its C2 structure, all indicators point to the continued improvement of the PLAAF over the next decade. China is expected to have one of the world's foremost air forces by 2020.¹²

Relevance to Air and Space Power, India

As the Indian Air Force (IAF) celebrates its 80th anniversary, the power and exuberance it exhibits has never been seen before. From a mere auxiliary arm of the British Royal Air Force, at its birth in 1932, the IAF has now grown

into the fourth largest air force in the world with a strategic reach that is transcontinental. Much of its present transformation is the result of decades of planning and modernization. This modernization encompasses the induction of state-of-the-art aerial platforms, weapons, sensors and radars; upgrading of necessary infrastructure; and training at par with the best in the world. All these have been accomplished with C4ISR in mind in order to achieve shared awareness, increased efficacy of the command structure and higher tempo of operations.

In the words of Air Chief Marshal Norman Browne, former Chief of the Air Staff (CAS) of the IAF, the 'IAF is witnessing an unprecedented phase of modernization and capability enhancement witnessed across the capability spectrum'. The most vital capability enhancement is perhaps the IAF's modernization of its fighter fleet. India has signed contracts for the purchase of 42 additional Sukhoi Su Mk30I's, bringing their total to 272. IAF has selected the Dassault Rafale as their next Multi-Role Combat Aircraft and plans to purchase 126 aircraft. Last but not least, the IAF is planning to buy 200 to 250 fifth generation aircraft for which the Sukhoi T-50 is the main contender. In order to enhance its transport capability, India has purchased 10 Boeing C-17s and 6 Lockheed C-130Js.¹³

Being a technology-dependent organization, the IAF has been in a state of transformation for most of its existence.¹⁴ However, the recent tempo of technological advancements has led to greater emphasis on its current transformation. This process, over the coming decade, appears poised to add to the IAF's combat potential in a major way through induction of advanced weapon and combat support systems. These changes span the induction of new aircraft, radars, and networking equipment to organizational and manning changes. All the Air and Space Power aspects of this transformation share the common characteristic of being tailor-made to make the IAF **more efficient and effective in execution of the tasks** entrusted to it by the nation.¹⁵

In comparison with the RF and China, India's Space and Cyberspace capabilities are developing at a slower pace and are of less sophisticated standards than in the RF and China. However, in May 2013 India has established three service commands for space and cyberspace and the US offered support to establish a space command on the military side, because at the moment almost all space activities in the country are commercial.¹⁶

Relevance to Air and Space Power, Russian Federation

The Russian Federation (RF) still is the preeminent regional power in Eastern Europe and should be expected to play this dominant role in the future. Its economic strength from exploitation of its natural resources, especially its oil and gas reserves, will continue to provide significant revenues, which are reflected in its rising economy. The RF's economic strength, coupled with its geographical position, membership of the UN Security Council (UNSC) and vast size, continue to provide the RF with a powerful position in the world. Although, one also has to acknowledge that this puts great demands on its foreign politics across the world. To the west, the RF maintains relationships with Europe. The fact that many European countries continue to be dependent on oil and gas imports from the RF, give RF politicians a strong political card to play. For Europe this means that its future relationship with the RF must be approached cautiously in order to preserve Europe's interests, especially in the area of energy assurance and economic interdependencies. In the south, the RF has to cope with the difficult region of the Caucasus, which presents challenges related to religious, ethnical, cultural and resource issues. Further to the east, China remains another economical giant with its challenges and maintains a close but complicated relationship with the RF. Finally, up north, the RF's interest in the Arctic is growing.

Against this background, it should be no surprise that the RF continues to be of strategic importance to NATO as the RF still possesses both strategic-

and vast amounts of sub-strategic nuclear weapons, which are subject of the ongoing START-negotiations.

The NATO-RF relationship started officially by becoming a member of the North Atlantic Cooperation Council in 1991 (which was replaced by the Euro-Atlantic Partnership Council in 1997). Until now it has not yet produced much fruit at the military level. In the past, some military cooperation initiatives were attempted, e.g. missile defence but these efforts have been terminated for various reasons.

Looking at the military development of Russia, it is clear that since Vladimir Putin became President of the RF for the second time, more money has been allocated to the Armed Forces. In 2009, the RF Air Force's structure has been completely changed.

The fighter-bomber and assault regiments of the RF Air Force will be upgraded and modernized to increase their capabilities in the near future. According to various media reports, the RF MOD has decided to purchase modernized aircraft by 2020, to include next generation fighters, new transport and long range bomber aircraft as well as attack and utility helicopters. These new capabilities have entered service as of 2013.¹⁷ Also, radar and C2 systems are being upgraded. The pilots of the RF Air Force are assessed to be well trained. On average they fly 150 hours per year, which is more than some NATO nations are able to execute as a result of military budget restrictions. Despite these upgrades, the backbone of the RF combat aircraft fleet remains comprised of aircraft which are 25+ years old.

The RF Air Force currently has about 2,600 aircraft, including nearly 1,400 combat aircraft. Once the RF Air Force finalizes its upgrade and modernization programmes in 2020 Russia will most likely become the most modern and capable Air Force in Europe with a massive fleet upgrade conducted.¹⁸ A comparison of these statistics with other air force modernization data

shows that the RF still will retain the world's second-largest air force after the US in the next 10 years.

During the late 1990's and the first decade of this century, RF space activities were drastically reduced. Over the last several years however, RF space power has been gradually recovering, although the level of budget allocation of the RF is still behind the leading spacefaring nations. New satellites were placed in orbit (early warning, communication, and reconnaissance systems), new space launchers are under development and the Plesetsk space and missile launching range is being modernized. Presently, there are 99 RF satellites in space of which most are for military and dual-purpose and this number will be increased by the launch of 11 additional satellites by 2015.¹⁹ For its development, the RF is heavily dependent on international cooperation in space exploration and exploitation, both as a donor and as a recipient.

For the development of NATO Air and Space Power this means that in the future NATO will likely have to reckon with a modernized, well trained and capable RF Air Force, probably capable of operating worldwide, in all types of war scenarios. Yet, this also could provide opportunities to enhance the cooperation with RF through the NATO Russia Council.

Traditionally, NATO was focused on a potential East-West conflict and the predominant doctrine was to defend NATO territory against a threat from the Soviet Union. Over the past twenty years this has changed dramatically and NATO has been deeply involved in operations, in all different kind of scenarios, all over the world. With regards to Air and Space operations however, opponents were not able to counter NATO aircraft significantly in the air because the opponent's air forces were largely destroyed or even non-existent. After the collapse of the Soviet Union the air threat from the east also diminished. However, with the recent technological developments and military investments, made by the BRIC countries, this is very likely to change.

Coupled with increased global interests from these countries, any future conflict NATO will be involved in could challenge NATO's Air Power capabilities to the maximum extent, both in terms of air, space and cyber dominance.

The Middle East

Apart from the BRIC countries, another area is of significant interest to NATO. Due to the huge economic interests coupled with ongoing instability, which is able to pose a direct threat to NATO countries, the Middle East is and will remain one of the focus areas for NATO for the foreseeable future. To maintain a strategic view, this section will address the Middle East as a region, without addressing the specifics of each nation in that region. The Middle East²⁰ is facing a wide gamut of possibilities from fragile growth to chronic instability and regional conflicts. The youth bulge – a driving factor for the recent 'Arab Spring' – almost certainly will give way to a gradually ageing population. New energy technologies and production elsewhere will mean Middle East economies will need to diversify. Gulf countries could face hard challenges if their oil supplies diminish while increasing substantially elsewhere as a result from the exploitation of shale gas and oil deposits, which would undercut high energy prices and change the 'playing field'.

Political Islam, after the false start of the Islamic Salvation Front election in Algiers 20 years ago, is becoming empowered in the Sunni World and may change the political landscape in the Middle East in profound ways. However, if corruption and chronic unemployment persist, or if large segments of the working population feel their lives have failed to improve with the election of democratic governments, they may choose to turn to political leaders who offer a more radical approach. Then the growing weakness of the states in the region may provide fruitful ground for chronic instability, facing challenges of sectarianism, Islam and tribalism. Over time, on-going violence could undermine support for democratic governance and could

on the other hand lead to dictatorships moving the countries away from liberalization and democracy.

In the region, Iran's influence is linked to its nuclear aspirations, which seems to be under control following the decision taken in Geneva in November 2013, to scrap Tehran's nuclear ambitions in exchange for sanctions relief.²¹ Even if Iran actually doesn't currently possess nuclear weapons, it might retain the ability and knowledge to develop them in the future. This could lead to a break-down of the non-proliferation of these weapons into the region. Israel will most likely remain the strongest military power in the region but also faces a large number of challenges like the Israel-Palestine conflict. Finally, it remains to be seen if Saudi Arabia and other Sunni Persian Gulf governments can preserve their immunity from regime-threatening protest-movements that have transformed the Arab world recently.

As for military capabilities in the Middle East, there are some 2,000 combat aircraft, some 13,000 tanks (including the paramilitary forces of Palestine) and more than 1.5 million soldiers in active duty, not including reserve forces.²² These figures do not take into account the military cooperation contracts these countries have with the United States, France, Russian Federation, China, Pakistan, etc.²³ These contracts not only increase military capabilities in the region, but also complicate the political landscape in solving its problems.

In conclusion, the Middle East faces a highly unstable future. Other critical variables include the rising of the influence of Al Qaeda in the region, the ongoing instability in the government of Egypt; and fragmentation in Iraq and Syria, which could lead to unravelling of the current borders.

Against the background of the challenges for the development and application of future NATO Air and Space Power, related to the Middle

East, one should acknowledge that the situation in the Middle East potentially could threaten the stability of NATO or its Nations. NATO will have to take into account the size of the region in general, possible unexpected changes in coalitions, the proliferation of weapons into the region, including possibly nuclear weapons and the threat of capable air and AD systems.

Maghreb

Further to the west is another area of interest. Major political changes²⁴ have swept the Maghreb²⁵ in the past several years. Tunisia and Libya experienced revolutions and formed new governments. Morocco has undertaken constitutional and political reforms. And Algeria has grappled with popular discontent through a public spending strategy. New opportunities have emerged for the people of the region to build more representative and accountable political institutions. At the same time, major challenges remain and the future of the region is uncertain.

Weak governments in Libya and Tunisia continuously struggle to stabilize their power, at least along the Mediterranean coastline. The lower Maghreb and Sahel regions²⁶ have a high risk of destabilizing further as regional Al Qaeda forces, operating from Mali, may intervene into these territories. Algeria has struggled with popular discontent, as a result of government spending, recently but endowed with substantial energy resources may emerge to become the regional leader of the Maghreb. The key to Algeria's stability seems to be its ability to maintain a balanced and carefully crafted containment strategy against Islamist militants. This strategy could be at risk of unravelling as western forces attempt to pursue and displace local Jihadist forces in Mali.

Related to military capabilities, Algeria is the only country in this region whose arms policy has led to consistent and overlapping deliveries of

major systems over the 1994–2009 period²⁷. Algeria's acquisitions of new and replacement of ageing systems is significant, both for Algeria and the regional military balance. With sanctions now lifted, Libya is once again on the market, but efforts to recapitalize its forces through minor and major purchasing schemes have yet to materialize. Morocco shows a significant increase in new policies and organizations related to its political and military stability between 2006 and 2009, while Tunisia has made no major political improvements in the period 1994–2009. Since 2009, the development of military capabilities in Tunisia seems to have increased somewhat. North African militaries remain 'ground-forces-heavy' and as such continue to maintain large pools of armoured systems. Algeria has the most significant air capability in the region, but many of its aircraft are ageing. Both Algeria and Morocco have taken steps to upgrade or replace their combat aircraft while Libya and Tunisia have yet to do so.

The Maghreb is of strategic importance to the security of Europe, especially in the sub Saharan Area. This area reflects the challenges to deal with many global megatrends and game changers, such as human trafficking and the demand for and control over natural resources.²⁷ Therefore, in 1994 the North Atlantic Council took the initiative to launch NATO's Mediterranean Dialogue. It currently involves seven non-NATO countries of the Mediterranean region: Algeria, Egypt, Israel, Jordan, Mauritania, Morocco and Tunisia. The focus of this initiative is to build and maintain security in the area and has resulted in increasing levels of cooperation with NATO. One of the most important areas of Maghreb-NATO cooperation is maritime security in the Mediterranean Sea.

The development of NATO Air and Space Power in relation to this region could focus on the areas of surveillance and reconnaissance, and advise and assist rebuilding air forces where applicable, e.g. through the US Aviation SFA program.

Analysis and Sub Conclusion

The Geopolitical situation in the world is changing. The economic and political rise of China and India might over time lead to conflicts over either scarce natural resources or political influence. Also Brazil is developing at a high rate. The hunger of these countries for natural resources combined with their massive industrial power and the decline of financial resources in the west might shift the global balance of power from the western – to the eastern hemisphere. The increase of financial resources gives the BRIC countries the ability to invest heavily in the further development of military resources, Air and Space Power included. As demonstrated in chapter three, western countries are struggling to finance the development and sustainment of new weapon systems. The current financial crisis has already lead to substantial budget cuts by NATO Member States with the result that air forces are actually shrinking. This development leads to a further shifting in the balance of power from western (NATO) countries to the east.

The investments in Air and Space Power by the Russian Federation, China and India have made over the past decade and are continuing to make, combined with decreasing budgets and lower investments in the west, point to a likely shift of military dominance/supremacy from NATO to Russia, China and India. It is especially the emerging Chinese and Indian Assured Access/Aerial Defence (A2/AD) capabilities that need proper assessment in terms of capability requirements for NATO Air and Space Power. However, also opportunities to establish or increase cooperation between NATO and the BRIC powers could be investigated.

Technological Developments for the Application of Air and Space Power

Technological developments have always been the driving factor behind the development of Air and Space Power. Starting at a slow pace

around the First World War, recent developments have led to many new applications of technology while at the same time composing new threats to security. This subchapter provide an overview on the predominant technological developments and challenges that will have an impact on the planning, tasking and execution of Air and Space Power.

Space and Cyberspace

Space is both an environment of interest and concern to NATO. NATO has used space-based capabilities for more than 30 years and will increasingly depend on space in the future. Space-based capabilities provide ISR, communications, missile warning and tracking, GPS for navigation and precision guidance, environmental and weather data, friendly force tracking, UAS control and many other services. Space-based capabilities are vital to nearly all military activities.

The space and cyber domains have become integral to operations in every other domain. The cyber domain empowers commanders to rapidly make decisions, communicate intent, and enable forces to deliver effects at speeds that were previously unimaginable. Superiority in this domain offers tremendous advantages at all military levels over adversaries. Because of the importance of the space and cyber domains it likely will become more and more a contested environment. These domains are heavily used by military systems and applications which are increasingly the victims of cyberattacks. Western nations and their military organizations such as NATO or the European Union (EU), as well as their opponents, terrorist groups and criminals, non-state actors, all use the cyber domain heavily which makes it increasingly lucrative for attacks. Both the space and the cyber domains will be regarded in the future as the most challenging domains that Air Power has to protect due to Air Power's ever increasing reliance on these two domains.

Space and cyber superiority are key elements of power projection. Most important in the future could be the sustained integration of all three – air, space and the cyber domain. By enabling airmen to employ all three domains simultaneously, air forces could greatly improve the probability of mission success.

The US has realized this and understands the challenges in its force development programs to build up offensive and defensive manned and unmanned, space and cyber domain power projection capabilities.

Although NATO has excluded offensive cyber operations for the time being, it draws heavily on systems that use these domains for planning and execution of strategic, operational and tactical operations. Examples are the NSWAN, NATO Integrated Air and Missile Defence System, Shared Early Warning, Air Command and Control System (ACCS) or Interim CAOC Capability (ICC).

Space and cyber domain superiority is not guaranteed. As the technology gap in this field between the US and other actors narrows, adversaries will contest the air force's pre-eminence in the air, space and cyber domain. Today's freedom of action in the space and cyber domain will encounter direct threats.

Looking at the 2008 RF – Georgian conflict where the RF launched a cyber-offensive, the STUXNET intervention in Iran or the highly effective Chinese capabilities for computer network operations and cyber espionage, they all show that possible adversaries have invested in cyber capabilities and are already 'fighting' in the cyber domain. They will continue to seek access to commercial, third party space supported cyber capabilities or will build up their own independent satellite based networks. The high speed in which China deployed satellites in 2012 and 2013 to build up their independent GPS system is a case in point.²⁹

AD Systems are anticipated to be developed in the near future into much more capable IADSs. These future IADS will see ground based missile defence systems engaging ballistic missiles at all levels and traditional air force supporting SA capabilities and conduct counter force operations. The competition for controlling Air and Space, based on or using integrated denial strategies, supported by space- and cyber-based surveillance and reconnaissance, will be coupled with high-performance, radar and missile systems designed to defeat high-technology adversary capabilities including those equipped with stealth technologies. The threat of conventional militarization and the weaponization of space are increasing and is connected to advanced technologies in the counter air domain.

In the future, cyberattacks against Air and Space Power will not be much different from those against land and maritime forces. The cyber domain is a new domain where NATO is forced to protect its own interests, while at the same time seeking ways and capabilities to exploit it.

The electromagnetic spectrum allows cyber domain operations to be conducted rapidly and nearly anywhere. The cyber domain offers new options to deliver effects, reduce risks, and potentially create non-kinetic and non-lethal alternatives. The integration of cyber domain operations with Air and Space operations will offer both improved effectiveness and economy of force. However, complete reliance on the cyber domain must be avoided as adversaries may easily employ asymmetric tactics to target its vulnerability. Hence, the economies' and defence forces' dependence on the cyber domain renders it a high-value target.

Technological Developments of Air Power

Technological developments, coupled with greater information availability, have allowed Air Power to become a dominant force in many occurrences of war. Ever since World War II, Air Power has provided the US and Allied

ground forces with a certain level of freedom to operate undisturbed by adversary Air Power. The past decades have seen many Air Power systems evolve from advanced development to operational use, for example, in the areas of stealth, precision attack and enhanced information sharing and processing. These capabilities were brought together for the first time in combat in the 1991 Persian Gulf War. In an unprecedented convergence of technology, doctrine, concepts of operations, and leadership, the coalition promptly reached an unquestioned control of the air. Today, new aerospace technologies, either existing or emerging on the horizon, promise to generate even more dramatic changes, widening the gap between states that possess them and those who don't. Over the past decade, UAVs have proven their worth in operations around the world. New data links have provided high-bandwidth connectivity for C2 and data transfer.

Situational Awareness is seen by both military leaders and individual warriors, like fighter pilots, as the vital difference between winning and losing in combat. It determines combat outcomes more than all other factors combined, including previous combat experience. As a result major upgrades for Airborne Warning and Control System and Joint Surveillance and Target Attack Radar System aircraft are under development.

Another benefit from the technological development of Air Power is synergism stemming from greater efficiency in joint operations. Military leaders are able to use the right assets in the right place at the right time using assets from other service branches. Technology is permitting movement towards true combined-arms and multinational operations.

To date, no replacement for the supersonic passenger aircraft Concorde has materialized. There is no clear idea yet of what is going to supersede the jet engine, although it seems acknowledged that for future air/space travel there is a need for a 'total conceptual renewal' of the current

propulsion technology. That said, in due course the challenge to find an alternative source of power and to replace traditional jet engines and rocket propulsion with completely new technologies will have to be solved and will have great impact on Air Power capabilities.

Some advanced technological developments are particularly noteworthy, like propulsion, nanotechnology, robotization and miniaturization. It is generally agreed³⁰ and noted that advances in nanotechnology will drive the next paradigm shift in science and technology. Many commercial applications of nanotechnology still remain theoretical, but there is now the capability to manipulate and reshape materials at nano scale³¹. Military applications of that nanotechnology are likely to be at the forefront. Actually, the main aim of military research in this field is to improve medical and casualty care for soldiers on the battle field, to produce lightweight/strong/multi-functional materials and to enhance sensors. According to many studies it is likely that in the longer term nanotechnology will have great impact on military applications in a wide range of areas such as mimic human muscle action in an exoskeleton, stealth coating, self-healing/self-repair material, smart skin materials, adaptive camouflage, and adaptive structures. As with any new technology it also comes with the concern that it will provide 'opponents' the same technology and thus new and potentially devastating weapons.³²

Throughout the world, military and aerospace engineers are concentrating on efforts to modernize existing capabilities and to take advantage of cutting edge technology for new developments such as robotized and miniaturized systems.³³ UAS technology is rapidly evolving. Actually, ground troops already operate a nearly unlimited variety of UASs differing in size (micro, mini), in range (close-medium range), operational endurance capabilities, penetration capabilities and operational altitude.³⁴ To date, mini-UASs are used mostly for SA purposes, but development of miniaturized systems could also provide the opportunity to use them kinetically.

Eventually, developments in propulsion, nanotechnology, robotization and miniaturization will fuel new and innovative Air and Space Power capabilities. Furthermore, they are likely to significantly lower costs while vastly increasing potential opportunities to gain a strategic advantage.

Projected advances in aerospace technology out into the next decades do not expect changes of a disruptive nature. However, some technologies will have large consequences for (emerging) civilian and commercial sectors. The aerospace industry will capitalize on many incremental improvements, including smaller, lighter and faster electronic equipment. Consequently, existing aircraft fleets will realize tangible improvements in many of their systems. Semi-autonomous and intelligent systems will revolutionize the way air forces operate.

In the future, the technology-based air force will require recruits that are well versed in and comfortable with technology. Fortunately, the current generation, which is well experienced in video gaming and comfortable working in cyberspace, will be at ease with simulators and synthetic environments. Cooperative approaches with learning institutions and industry are likely to yield considerable mutual benefits.

Sub Conclusion

Space and the cyber domain are environments which provide NATO and its Member States, as well as possible adversaries, environments in which important supporting systems can be placed for all kinds of essential operations. Military operations without space and cyber support would be incredibly difficult or even impossible and some of the capabilities we currently use would be unavailable. The fight to control and influence both domains is increasing. The electronic nature of the cyber offers many opportunities to interlink/hack systems with significant impact on the security environment. Emerging powers are closing the technology-gap

with western nations with unexpected high speed and even have overcome the western states, especially when looking at the Chinese cyber/cyberattack capabilities³⁵. Especially high technological capabilities like air forces could be hampered in successfully deploying their capabilities. Technology has enabled a combination of capabilities which are foundational for the employment of Air and Space Power, ultimately giving NATO an advantage over adversaries. Air and Space Power can simultaneously operate across an entire theatre or globally to achieve effective kinetic and non-kinetic effects through lethal or non-lethal actions in the pursuit of desired effects at the strategic, operational and tactical levels. The combined Air and Space Power capabilities can be applied across the entire spectrum of operations such as: providing a wealth of information to help build SA; spearheading a humanitarian response; delivering deliberate interventions through strategic attacks; putting entry forces in place; or establishing the elements of a coercive or deterrent posture. This is accomplished by manned and unmanned airborne or space-based platforms utilizing those capabilities to perform multiple roles like ISR, C2, attack functions and logistics, potentially all during the same mission. Continued close cooperation with research organizations and agencies, scientific and technology institutions as well as with industry will be required in the future and is the key to meet the technology challenges.

Proliferation of Technology/Anti-Aircraft Weapons

The proliferation of technology is a result of the multinationality of mega-industry companies in the technology area. The supply chain and fabrication for network routers and their component integrated circuits offer a representative example of the issues and potential vulnerabilities faced broadly in the telecommunications and micro-electronics hardware sectors. A review of the semiconductor industry, the router supply chain, compromise opportunities, and operational challenges presented to the potential intruder, highlights the vectors and possible motives of state

sponsored adversaries seeking to penetrate or corrupt a supply chain, and potential obstacles these adversaries may face in attempting to operationalize such attempts.³⁶

One development in this area is of particular importance to Air Power, specifically future Ground Based Air Defence (GBAD). Two major developments on 360° GBAD Systems will play a significant role in the future IADS world; The western MEADS³⁷ system and the RF's future multi-layered aerospace defence network systems, with the intention to defeat any foreseeable air threat over the next 20 to 30 years.

With the current rapid technology developments it is to be foreseen that new systems will be fielded, with increased performance against stealth technology. These systems will be characterized by multifunctional radars and sensors (ground, air- and space-based), integrated and network capable Battle Management Command, Control, Communications, Computers and Intelligence (BMC4I) systems, high performance autonomous detection and targeting systems (active and passive), and simultaneous engagements beyond line of sight, only limited by the numbers of systems available. These systems will also be available to non-peer competitor states due to the proliferation of these weapons. It cannot be foreseen if high sophisticated GBAD systems will be available to non-state actors. Availability may only be a question of money.

Simple advancements in technologies, supported by simple designs, have unfortunately encouraged the proliferation of weapons around the world. For Air Power in particular, dangerous threats are the increased proliferation of MANPADSs and accurate AD systems offered and deployed by the RF and China. Further shipments have been made into African nations in the Maghreb area or states, like Iran, Syria, Somalia, and North Korea, which are fighting western standards and/or democracies; but also to upcoming powers like India, Pakistan and Brazil.

Even terrorists and terrorism groups supporting nations are reported to have access to MANPADs. The fight against Jihadist Insurgency, as actually on-going against terrorist networks and groups in Afghanistan, Iraq and West Somalia³⁸, requires a strong detailed SA on this matter.

Sub Conclusion

Currently, NATO's ability to dominate the air provides its fighting forces with a highly asymmetric advantage over adversaries. Command of the air prevents adversaries from conducting sustained operations in this domain while allowing NATO forces to exploit numerous advantages. Unfortunately, the advanced development of AD systems and the proliferation thereof is leading to new systems which are more and more effective against NATO. Even more problematic is that these systems are increasingly becoming available to non-peer competitor states and other actors due to nearly unchallenged proliferation resulting from feeble non-proliferation and control regimes. If this issue is ignored in the future, either in establishing requirements or policy, the Alliance's strategic advantage may be significantly eroded as even small, non-state actors may possess capabilities to challenge NATO's air superiority.

The Changing Nature of Warfare

War and conflicts will undoubtedly be an element of the future and will continue to be characterized by violence, volatility, uncertainty, and increasing complexity. Non-state actors and terror networks using asymmetry will create a unique demanding challenge for military joint operations. This continuously evolving security environment requires uninterrupted awareness and assessment of strategic challenges. The means, capabilities and tools with which to react in a highly flexible manner against these challenges will be an additional test for NATO.

The occurrence of military action between the western powers and other prosperous and liberal democratic states and developed countries is very unlikely but cannot be completely ruled out. This is a result of the convergence of political ideologies, economic interdependence and substantial integration of western military institutions. This leads to the point where smaller nations are relying on military capabilities of stronger partner nations to guarantee their own national security, partially through the benefits of international security cooperation, either in the form of being a member of an international security framework, or through bilateral or regional cooperation activities.

The end of the Cold War was greeted by theorists who heralded an international system of peace and prosperity. However, since then the world has seen numerous conflicts. Crises and conflicts have not disappeared and it is certain that it will not do so in the future. The question for the FSE is not whether war will arise, but in what form and where? What will be the changed nature of warfare? Which are the ways we can expect conflict to change in and how will it influence Air and Space Power?

Main and Inter-State Wars

From a strategic planning perspective, it seems reasonable to regard large-scale global interstate war – like the two world wars of the twentieth century – as a remote possibility, particularly as many states are intimately linked within the international system, both economically and politically. ‘The minimal likelihood of such a conflict in the wake of the Cold War’, insists Michael Mandelbaum, ‘sets the twenty-first century dramatically apart from the two preceding eras.’³⁹

There is now general consensus that it would take a substantial and prolonged breakdown in the global economy to create the circumstances that might lead to the renewal of the intense rivalry among the great powers that produced the global conflicts of previous centuries.

The current absence of a major great power conflict does not exclude, in itself, the possibility of inter-state warfare, which will remain a feature of the FSE. There are many regional hotspots in the world which afford the possibility of a regional state-on-state conflict.

Non-State Actors

States are no longer the only main actors in war. The power to wage war has been increasingly privatized. States are joined by communities, networked transnational organizations and other de-territorialized networks of political and economic power. The Iraq war provides a relevant example of a model of future wars involving state forces of a coalition, domestic non-state actors such as Muqtada al-Sadr's Mahdi army, foreign forces from neighbours such as Iran and transnational terrorist groups such as Al-Qaeda.⁴⁰ All have fought a chaotic and integrated conflict involving civil war, inter-communal violence, insurgency, pervasive criminality and widespread disorder.

Non-state actors are expected to play a larger role in the FSE, and their presence will further complicate traditional military operations, primarily because they operate outside the international laws and norms governing the use of force by which state militaries are bound. Thus, non-state actors have, and will continue to enjoy, unrestrained freedom of manoeuvre, and continue to exploit opportunities at the boundaries of a framework of international law which states must adhere to. The inability of failed or fragile states to ensure the security of their citizens is expected to increase the complexity of future operating environments by causing a proliferation of armed non-state groups.

A growing feature of the complex security environment of the future will be the rise of meta-national corporations. Meta-nationals are companies who view the world as a global canvas dotted with pockets of

technology, market intelligence and capabilities. They see untapped potential in these pockets of specialist knowledge, scattered around the world. By sensing and mobilizing this scattered knowledge, they are able to innovate more effectively than their rivals⁴¹. Since meta-nationals operate outside traditional geographically bounded bases of operations, they are able to operate outside national or even international laws. The presence of these entities in operational theatres may further complicate future crises. This will be particularly true if these meta-nationals employ private military firms to protect their interests. Private military firms which are used not only by meta-nationals but also by governments, militaries, and NGOs will become increasingly important players in operational theatres.

There is also a growing tendency in the developed and the developing world to employ armed civilians to perform some of the security or military functions previously provided by military personnel. The fact that their members are civilians raises legal or ethical questions for traditional militaries that operate alongside or against such entities.

Terrorism

Terrorism will be a major factor in the FSE. Globalization is the means through which terrorism becomes super-empowered. Just as multinational corporations have evolved in response to globalization by distributing functions and resources, transnational terrorist groups have followed a similar path. Al Qaeda and its network, for instance, has become one of the most infamous and powerful terrorist groups because it has generalized its strategy and architecture enough to enable individuals throughout the world to claim attacks in Al Qaeda's name and occasionally with the group's assistance. This networked and distributed structure is one characteristic of transnational terrorism that has made these insurgency movements more difficult to isolate and remove.

The desire of terrorists to kill more people, along with their globalized and hyper-modern and networked structures, means that the chances are that terrorists will increasingly desire Weapons of Mass Destruction (WMDs). Based on technological availability and historic examples, chemical, biological and radiological elements will be viable possibilities for terrorist attack throughout the world. Combining these capabilities with i.e. IED attacks, information and cyberattacks, could give terrorist networks the ability to conduct hybrid operations in the future.

The possible nexus of terrorism and rogue states therefore lies at the heart of one of the key challenges in the FSE. The opportunities for terrorists to obtain WMDs will increase as technology cascades through the state system and nuclear- and radiological weapons in particular threaten to proliferate. Prospects for the use of chemical and biological agents by non-state actors are especially unsettling. In the near term, highly adaptive use of low-cost, highly accessible off-the-shelf technologies both for enabling plans of attack and for conducting them will be more likely.

Terrorist tactics employed in the past have included assassinations, bombings, hostage-takings, kidnappings, hijackings and sabotage. Typically, the specific method chosen will attempt to exploit a perceived psychological weakness within the adversary. Given this situation, it is impossible to set limits on how terrorist groups will adapt new or old technologies to attain their desired ends. Over the coming decades, the tactics of terrorism will continue to evolve in tandem with changes in technology, the availability of weapons, the political environment and in response to preventive measures taken by governments. Security enhancements to public transportation systems may discourage attacks, but will also encourage terrorists to search for other targets, such as power generation facilities.

Asymmetric War

The majority of conflicts at the beginning of the new millennium is a complex mixture of civil and inter-state wars containing elements of both which interact in complex dynamics. It is anticipated that non-state actors will adopt asymmetric means to circumvent conventional military strengths and take advantage of weaknesses.

Asymmetric threats and asymmetric techniques in warfare will include the use of conventional weapons in unexpected ways, the acquisition of weapons of mass destruction by non-state actors and rogue nations, the exploitation of non-military technologies and platforms in a manner incongruent with their original design.

Asymmetric threats can also be of the low-tech variety, such as rudimentary IEDs and assassination and ambushes carried out by small arms. Non-state actors will likely target the civil sectors of state adversaries by attacking such targets as critical infrastructure, including power distribution systems, bridges, electronic information and banking systems, in an effort to undermine a state's legitimacy, leadership and governance structure.

It is true that not only the actors, involving terrorism and asymmetric warfare, but also the methods employed are becoming more unconventional. Terrorist groups and non-affiliated sympathizers will likely target civilians, businesses, and government computer networks as a means of disrupting normal societal behaviour in the targeted regions. Cyberattacks can offer an adversary maximum anonymity and a low risk of personal injury. The infrastructure required to conduct such attacks is relatively small, which makes this type of operation extremely attractive. Malicious cyber activity can have political and economic consequences. The overall sophistication, volume and degree of coordination of these attacks have increased, which means that there will be a continuing demand for improved protection and countermeasures.

Asymmetric warfare⁴² is not new, although certain specific methods of attack have emerged only recently. New means of aggression will be found as technology continues to evolve. Asymmetric warfare does not preclude or replace more conventional methods of attack. Actually, these two forms of warfare should not be considered as separate and mutually exclusive, since all types of tactics could possibly be employed in the same conflict and perhaps at the same time in a hybrid fashion.⁴³ Hybrid wars can be fought by both state and non-state actors, and may incorporate conventional capabilities, irregular tactics, terrorist acts and criminal disorder.

Sub Conclusion

The future battlespace will be global and highly congested. All areas, including densely populated and poorly governed urban spaces, will be contested by a wide variety of actors such as traditional state actors, NGOs, and problematic or non-state actors such as irregular forces, mercenaries, meta-nationals, and private military firms. The future battlespace will be increasingly complex, multi-dimensional, non-linear, uncertain, and lethal. Conflicts will occur on a variety of fronts included military, economic, moral, socio-political, abroad and at home or even in cyberspace. Asymmetric warfare will be the tactic of choice for those who want to exploit state vulnerabilities, avoid direct confrontation with conventional armed forces and they operate outside the boundaries of national and international law.

Demographic Developments

One of the challenges that air forces will face in a FSE is the access to and availability of its most strategic asset: manpower. The warning bell for developed countries has rung, as birth rates are declining. The replacement rate – the reproduction rate that keeps a population stable – for developed countries is 2.1, yet nearly half the world has birth rates lower than that. The European countries differ in their rates between 1.4 and 1.9.

The manpower consequences for air forces in the future will be a strong competition with other technologically advanced organizations to attract young men and women to join the ranks. The success of this is very much dependent on the image of air forces as attractive employers: culture, role and tasks, career opportunities, etc.

Especially for smaller NATO nations' air forces it is becoming increasingly difficult to offer promising career paths to young men and women. There is a strong concern, that if NATO is not able to ensure the availability of well trained, interoperable personnel, Air and Space Power cannot sufficiently and successfully be applied in NATO operations. Therefore, there is a need for NATO to enhance its Air and Space Power education, training and exercise capacities and to develop a coordination mechanism, which will guarantee in the future the timely availability of Air and Space Power specialists fit for their jobs.

Relevance to Air and Space Power

Taking the key characteristics and challenges of the FSE into account, it is obvious that the level of uncertainty and unpredictability for using Air and Space Power will increase. Air and Space Power must be prepared for missions across the full spectrum of operations. Air forces must be capable of conducting and countering conventional, as well as asymmetric tactics. They must be prepared to fight states and coalitions as well as non-state actors. They must also be prepared to share the battlefield with a broad range of unconventional forces. Additionally, Air and Space Power must work with a variety of partners, be they allied militaries, other government departments, or NGOs. Moreover, the increasing difficulty of discrimination between combatants and non-combatants is likely to require more extensive targeting preparation. There will likely be increased legal and moral requirements to take all feasible precautions in avoiding, or at least minimising, collateral damage. This will lead to the greater use of precision

weapons. This increased complexity of the conduct of operations requires well educated and trained personnel. Apart from offering young professionals a challenging working environment which also offers sufficient career opportunities, this is a huge challenge for NATO and its nations.

Sub Conclusion

Demographic developments predict that many countries will be faced with a shrinking working population in the future. This means that armed forces will have to compete more severely with other actors in the labour market. Especially air forces have seen an enormous rise in the complexity of systems and operations over the past decades. A development that is most likely to continue for the foreseeable future. Acquiring and keeping sufficient personnel is one huge challenge, educating and training them is another one that has to be dealt with in the years to come.

Energy Security and Climate Change

Without exception, governments express the need for a secure energy sector and for the 'lights not to go out'. Electoral and economic cost of prolonged interruption in energy supply is enormous and therefore politicians strive, often above all other policies, for a secure energy supply.

In recent years the rapid growth in the demand for coal, oil and gas in Asia and other growing, developing regions, coupled with the depletion of conventional reserves, have resulted in fluctuating and often significantly higher energy prices. This has increased concern on the need for a secure energy sector.⁴⁴ This concern is not only about the resources themselves, but also about the world-wide main supply routes running through narrow passages like the Strait of Hormuz, the Gulf of Aden and the Suez Canal or pipelines running over thousands of kilometres through unstable states and regions, possible misused as

means of exerting pressure by governments, insurgents and terrorists. Closing these routes will have grave consequences.

NATO has recognized the impact of this development and has discussed for some years now its potential role in coordinating responses to the future energy security challenges and problems. At the April 2008 Bucharest Summit, NATO Member States agreed on a set of priority areas in which NATO could add value in the field of energy security. Senior NATO personnel have since elaborated on and invested in these priority areas by assessing military possibilities to protect critical energy infrastructure and supply routes.

The dependencies of NATO/EU countries and the US on imported fossil fuels have been recognized. A 2008 NATO Parliamentary Assembly Report noted threats to energy infrastructure from four sources: terrorists, pirates, the consequences of interstate warfare and insurgent groups.⁴⁵ Military Courses of Action (COAs) were discussed that involve and activate QRFs, maritime task forces, and gain SA via Air and Space capabilities.

To conclude, scarce resources and long supply lines between energy providers and customers require a secure energy environment which takes natural disasters and unpredictable disturbances into account. The supply routes and the political options to use the energy sources for power projection, provide the biggest threat options. Especially important are Air Power capabilities which are highly dependent on an uninterrupted and secure energy supply. NATO should be ready to create reliable means, capabilities and procedures to counter any threats to the energy security.

The Impact of Climate Change to the Application of Air and Space Power

Multiple countries now regard climate change as a national security concern and are taking steps to assess their ability to manage new threats.

That is the key finding of a new report by US analysts American Security Project (ASP) who also warn that many African and Middle East nations have not fully appreciated the potential risks of rising temperatures. 'Climate change and its effects should no longer be treated purely as an environmental threat, but rather a full-blown national security issue',⁴⁶ says author Xander Vagg. Based on analysis of 155 countries' defence strategies, the study reveals a growing concern among military experts over conflicts that could break out as a result of drought, resource scarcity and various extreme weather events.

The UK's 2010 Strategic Defence Review and USA's Quadrennial Defence Review warn that unchecked rises in temperatures will have a devastating impact on the global economy. China's 2010 Defence White Paper lists global warming as one of several 'non-traditional' security threats, while Russia's 2009 National Security Strategy refers to constraints on biodiversity and water.

The UK's new chief climate diplomat, Neil Morisetti (also a Rear Admiral in the Royal Navy), recently stated: 'climate change will act as a potential threat multiplier in the sense that it will add stress in parts of the world where people already have problems in terms of food and water shortages and health problems.' He further stated, 'The consequences of a changing climate add to the stresses, particularly in a belt that runs north and south of the Equator – Africa, Middle East and on into Asia. You could argue in Northern Europe it does not affect us, but the reality is we live in a globalized world, and we are dependent on what happens in other parts of the world for our own wellbeing and prosperity.'⁴⁷

A report by the Australian Strategic Policy Institute (ASPI)⁴⁸ indicates that even the most advanced forces can struggle when faced with extreme weather events. Earlier in 2013, the Australian Defence Force (ADF) was brought in to help combat bushfires sweeping through parts of the country

as a result of searing temperatures. In 2011, it was called upon to help evacuate citizens stranded as a result of the floods in Brisbane. One of the points the report is that defence will need to factor in concurrent disasters.

One of the most interesting observations was the connection between China's dreadful wheat harvest in 2010 and the toppling of President Hosni Mubarak. 'Government legitimacy and civil society in Egypt were upset by protests that focused on poverty, bread, and political discontent', author Troy Sternberg contends. 'The doubling of global wheat prices significantly impacted the country's food supply and availability.' This is particularly pertinent to Egypt; a country that spends 3% of its GDP on wheat subsidies and experienced the 1977 'bread intifada' that killed 77 people and the bread riots in 2008.⁴⁹

Unabated climate change could bring an increase of extreme storms, drought and flooding, rising sea levels, melting glaciers and the rapid spread of life-threatening disease. The US Military Advisory Board views these from the perspective of national security assessments and has identified them as serious risk factors for:⁵⁰

- Massive migration;
- Increased border tensions;
- Greater demands for rescue and evacuation efforts;
- Conflicts over essential resources including food and water.

Other Climatic Impacts on Regional Stability

Europe: Tensions may rise as immigration from Africa and the Middle East is exacerbated by climate change and places additional social and economic pressures on countries. Some of America's strongest allies may be distracted as they struggle to protect their own borders. Such an inward focus may make it more difficult to build international coalitions, or engage in exercises to ensure readiness.

Africa: Climate change will contribute to shortages of food, drinking water and arable farmland, adding strain in a region that is already the source of 30% of the world's refugees. Such changes will add significantly to existing tensions and can facilitate weakened governance, economic collapses, massive human migrations, and potential conflicts.

The Middle East: Water resources are already a critical issue and will become even more critical. Competition for increasingly scarce resources may exacerbate the level of conflict. 'The existing situation in the Middle East makes this place more susceptible to problems', General Zinni, a former commander of US Central Command stated. 'Even small changes may have a greater impact here than they may have elsewhere. You already have great tension over water. These are cultures often built around a single source of water.'⁵¹

Latin America: Rising sea levels will threaten all coastal nations. Caribbean nations are especially vulnerable in this regard, with the combination of rising sea levels and increased hurricane activity potentially devastating to some island nations and a likely increase in immigration from neighbour states. In addition, the loss of glaciers will strain water supply in several areas, particularly Peru and Venezuela.

Asia: Many factors may affect the continent. Potential sea level rise would have a severe impact with almost 40% of Asia's population of nearly four billion living within forty-five miles of coastlines. In addition, the reduced availability of farmland and drinking water and the increased spread of infectious disease would destabilize the region.

North/Arctic: Estimates vary as to when the Arctic is likely to be ice free during the summer. Some snow and ice data centres expect it earliest by 2060. Nonetheless, the potential riches and advantages of this area are already recognized amongst others by the US, Canada, the RF, Denmark and

Norway – as evidenced by the emergence of competing territorial claims, such as between the RF and Norway, and Canada and Denmark.

Ocean warming and melting ice packs will potentially allow increased exploitation of natural resources in previously inaccessible regions. Seasonal ice may no longer restrict the use of Arctic maritime trade routes, significantly reducing transit time between Europe and Asia. More activity in the Arctic will raise issues over their environmental impact, search and rescue responsibilities, resource competition, as well as supporting infrastructure and capabilities.

The changes in the Arctic will cause a rising water level, with a high probability of impacting populated areas and its infrastructure. This will change the living space and potentially create displacement of people through mass-migrations. On the other hand, the changing landscape from unproductive and unfruitful into productive and promising regions will change the strategic importance of those areas and therefore its related interests.

Sub Conclusion

Both the challenges in energy security and the climate change can be causes for potential conflicts or large scale military operations. It is becoming clear that climate change could alter the strategic environment by necessitating more frequent responses to natural disasters and relief missions. Air forces in the past have played a significant role in disaster relief operations. Notwithstanding the fact that Disaster Relief is one of the possible scenarios where the NRF could be employed, NATO nations are not fully prepared nor have they invested in specific capabilities to deal with these kinds of operations. Even while many air forces recognize the importance of addressing climate change and support all objectives in tackling this global problem, the effects that climate change may have on strategic

and operating environments and how climate change could affect facilities, capabilities and missions in ways that go beyond a capacity to adapt, has not been fully conceptualized.

Analysis

The security environment in the world is changing. The world is facing a rapid shifting in the balance of power due to emerging economies and the financial crisis in the west. Solutions must be found with regards to climate change. It is in the midst of technological changes and the application of these that Air and Space Power forces will likely to be confronted with a completely changed nature of warfare.

The rise of new economies in Asia is leading to a shift in the balance of power to the Eastern Hemisphere. Not only in financial terms, but there is also a substantial risk that this shift of power will occur on a military level and particularly within in Air and Space Power domains. The investments in Air and Space Power that both China and India have made over the past decade, and are currently making, combined with decreasing budgets and lower investments in the west are instrumental for this change.

Space and cyberspace will be future contested environments. This is important since they provide NATO and its Member States, as well as future adversaries, domains where significant supporting systems are placed that provide all kinds of tactical, operational and strategic information. Future military operations without space and cyber support will be incredibly difficult or even impossible if some of the capabilities we currently use would be unavailable. The fight for uninterrupted access and information superiority, to control and influence the domain is increasing. The electronic nature of these domains offers a large number of unpredictable opportunities to interlink/hack systems with significant impact on the FSE. The technology gap between western states and emerging powers is

closing rapidly with an unexpected high speed. Partially, the predominance has been lost as China has created a cyberattack capability which will interrupt the 'freedom of movement' by NATO in that domain. Especially high technological capabilities like the air forces could come to harm if they were successfully employed.

Technology has enabled a combination of capabilities which are foundational for the employment concepts of Air and Space Power, ultimately giving NATO an advantage over an adversary. Air and Space Power can simultaneously operate across an entire theatre or globally to achieve effective kinetic and non-kinetic, lethal or non-lethal actions in the pursuit of desired effects at the strategic, operational and tactical levels. The combined Air and Space Power capabilities can be applied across the entire spectrum of operations such as: providing a wealth of information to help build SA; spearheading a humanitarian response; delivering deliberate interventions through strategic attacks; putting entry forces in place; or establishing the elements of a coercive or deterrent posture. This is accomplished by manned and unmanned airborne or space-based platforms utilizing those capabilities to perform multiple roles like ISR, C2, attack functions, and logistics, potentially all during the same mission.

Currently, the ability to operate in the air gives NATO's fighting forces a highly asymmetric advantage over adversaries. Command of the air prevents adversaries from conducting sustained operations in this domain while allowing NATO forces to exploit numerous advantages. Unfortunately, the advanced development of AD capabilities is leading to new systems which are more and more effective against NATO. Even more problematic is that these systems are increasingly becoming available to non-peer competitor states and other actors due to nearly unchallenged proliferation resulting from feeble non-proliferation and control regimes. If this issue is ignored in the future, either in establishing requirements or policy, the alliances strategic advantage may be significantly eroded.

The future battlespace will be totally different from what we have experienced over the past decades. Technological developments, the rise of non-state actors, proliferation of new technology and weapon systems, demographic and climate changes all contribute to an increasingly complex, multi-dimensional, non-linear, uncertain, and lethal environment. Wars will occur on a variety of fronts included military, economic, religious, socio-political, abroad and at home or even in cyberspace. Asymmetric warfare will be the tactic of choice for those who want to exploit state vulnerabilities and avoid direct confrontation with conventional armed forces. Non-state actors will operate at the bounds of national and international law, further complicating the NATO's response.

Furthermore, the level of uncertainty and unpredictability for using Air and Space Power in a FSE has increased. Air and Space Power must be prepared for missions across the full spectrum of operations. It must be capable of conducting and countering conventional, as well as asymmetric tactics. It must be prepared to fight states and coalitions as well as non-state actors. It must also be prepared to share the battlefield with a broad range of unconventional forces, and Air and Space Power must itself be prepared to work with a variety of partners, be they allied militaries, other government departments, or NGOs. Moreover the increasing difficulty of discrimination between combatants and non-combatants is likely to require more extensive targeting preparation, and the legal and moral requirement to take all feasible precautions in avoiding, or at least minimising, collateral damage will lead to the greater use of precision weapons.

Even while many air forces recognize the importance of addressing climate change, and support all objectives in tackling this global problem, they have yet to fully conceptualize the effects that climate change may have on its strategic and operating environments. Similar to the challenges facing the other services, air force officials are not clear about how climate

change could affect their facilities, capabilities and missions in ways that go beyond their capacity to adapt.

NATO has to adapt to these changes and face the challenges that result. Otherwise military forces of NATO, and consequently Europe, run the risk of becoming irrelevant which might destabilize the world even more. Taking into account the description of the developments, characteristics and challenges of a FSE the key question remains what actually needs to be done to overcome limitations and restrictions that might prevent Air and Space Power from being successfully applied in the future. Some suggestions:

- NATO nations must accept a proportional burden, related to the GDP, of obligations in funding and fielding of required capabilities. No more words, but real political will and deeds to solve the most pressing requirements, especially in the realm of Air and Space Power capabilities which play an important role in every crisis and conflict. NATO nations underline the need for a common commitment to deliver, not only in terms of collective defence, but also for crisis management and cooperative security (tailored capabilities/assured access/assured availability/assured participation: how to organize?);
- A proper assessment of the characteristics of the FSE is necessary to determine what new requirements can be defined in order to keep Air and Space Power fit for purpose;
- NATO must collectively possess Air and Space Power capabilities that can deal with the broad range of future security threats and challenges. Only then can the Alliance be a credible player as a provider of security to its Member States and reach out in terms of humanitarian assistance, disaster relief and crisis management operations;
- Air and Space Power must have capabilities to reach out operationally, to project (deliver) and to survive;
- NATO must reckon with developments where competitors strive for and gain anti-access and area denial capabilities;

- NATO therefore must have the Air and Space Power capabilities that can incapacitate or overcome a competitor's anti-access and aerial denial capabilities;
- NATO must strive for cyber resilience (info dominance) so that its use of electronic networks, C2 and weapons systems etc. is uninterrupted and sustainable. It is about a NATO strategic and operational decision-making capacity to include an Air C2-organization that can continuously support the planning, tasking and execution of Air and Space Power;
- The uninterrupted access to space capabilities and therefore space information (communications, navigation/GPS, weather, targeting, and geospatial info etc.) must be safeguarded and controlled against directed energy weapons/jamming. NATO must develop and maintain anti-interference capabilities;
- Partnerships are of utmost importance in building cooperative security and provide collective capabilities if the need arises.

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Final Assessment and Food for Thought



The intent of this Start Paper is twofold: to substantiate the 'Air and Space Power paradox'; and to conduct an initial identification and assessment of factors which have the potential to influence or define the FSE. Ultimately then, the intent met, this analysis would serve to 'vector' and bound important follow-on work; to define options and a way ahead to steer NATO Air and Space Power towards a future 2040.

The Premise of an Air and Space Power Paradox

Proving the existence of such a premise was fundamental to any follow-on study and engagement of the NATO and national decision-makers regarding the critical need for action. The Air and Space paradox is quite simply: 'The increasing importance of Air and Space Power as the military tools of choice for NATO and political decision-makers to successfully impose their collective will, yet these same decision-makers seemingly unwilling or unable to act collectively to maintain and evolve this executive tool necessary to effectively intervene.'

First Half of Premise: Recent History as Indicator

As shown in Chapter 2, Air and Space Power were instrumental and decisive to the Alliance's imposition of the international will in Kosovo, Afghanistan and Libya conflicts. Air and Space Power were the primary

capabilities of choice for Kosovo and Libya. Afghanistan as a land locked country was and is extremely dependent on the availability of a broad range of Air and Space Power capabilities to support the execution of ISAF's ground operations, the work of the PRTs and the deployment of Afghan National Security Force units. Execution and enabling support were provided not only at the tactical and operational level, but especially at the strategic level; Air and Space Power were critical in achieving the desired effects within the shadows of political constraint and sensitivity. In short, Air and Space Power played a leading role without which these operations were 'doomed to fail'. At the same it is fair to say, that normally Air and Space, by itself, cannot achieve politico-military strategic objectives. Ultimately the desired overall political outcome, i.e. Alliance, will come as a result of inter-dependent play between the key contributors to the campaign. But as said, Air and Space Power are extremely important capabilities to set the conditions for ultimate success. The same will hold true for future operations as long as Air and Space Power are available in sufficient quantity and quality.

No matter what the crisis or conflict, Air and Space Power capabilities are unerringly called upon to meet political and Alliance aims. Chapter 2 provided a number of recent examples over the past 15 years of the growing reliance on and increasing impact Air and Space Power capabilities have had in achieving the collective political will. This demonstrated trend shows no likelihood of abatement; principally due to the stand-off and low political risk engagement capabilities that NATO Air and Space Power offer.

Another important aspect of Air and Space Power is that it has increasingly become a critical enabler to war fighting by the other services. Both from a hard and soft power perspective, Air and Space Power capabilities are essential to: support joint/combined operations; setting conditions and creating the circumstances for follow-on action; support to the joint

forces and strategic commanders in achieving their objectives; and support the achievement of politico-military strategic objectives in relation to Alliance and/or national objectives.

Second Half of Premise: Diminishing Capability

In Chapter 3, it has been demonstrated there is clear evidence that the lengthy run of defence budget cuts is starting to impact Air and Space Power capabilities and jeopardize its continued effectiveness. Real concern exists for more budget cuts and the further diminishing of Air and Space Power capabilities. Recent operations revealed shortages in a broad range of enabling Air and Space Power capabilities like JISR, AAR, Strategic Airlift, SEAD and Joint Precision Strike (JPS) Capabilities to include Precision Guided Munitions (PGMs). NATO's NDPP has made it clear that the defined MMRs are not properly met and the Priority Shortfall Area's in terms of target apportionment are not fully achieved either. This implies that essential shortfalls will remain and that the associated implications must be understood with the risks to the Alliance knowingly accepted. It also implies that these shortcomings limit the application of Air and Space Power in NATO and threatens the full achievement of NATO's LoA. It is for these reasons that any follow on work from this paper should address this strategic circumstance and develop options to cope with and reverse this dangerous trend.

Although Air and Space Power have been shown to be critical and therefore mandatory capabilities in every crisis and conflict, thereby setting the conditions or independently creating tactical, operational and/or strategic effects, it is a fact that in times of financial austerity, military and political decisions are taken that diminish the Air and Space Power capabilities. These diminished capabilities will be unable to achieve tactical-operational and strategic effects and thereby success in the light of the challenges that NATO faces in the years and decades to come. It is for this reason that

there is real risk that NATO will not have the right and/or the sufficient air and access to Space Power capabilities to cope with the security challenges as depicted in NATO's Strategic Concept and beyond. That is to say for the current and following decades till 2040.

Future Security Environment Considerations

The initial assessment of a FSE makes clear that there are developments, challenges, trends and threats that will impact the effectiveness and survivability of Air and Space Power in a FSE. Important aspects of the FSE that need to be addressed in any follow-on study are the implications of and recommended actions to address:

- the shift in balance of power to the Eastern Hemisphere;
- climate change on future strategic and operating environments;
- climate change on the execution of Air and Space Power operations;
- developments in the space and cyber domains and the need for assured, uninterrupted access and resilience;
- technological developments on the availability and effectiveness of Air and Space Power (e.g. precision strike and robotization);
- Existing and new AD and aerial denial capabilities in the hands of potential adversaries that over time would alter or impede access to operational battlespaces.

Current Efforts

NATO is currently trying hard to meet its NATO Forces 2020 goal as stated in the Washington Summit Declaration on Defence Capabilities.

This goal is defined as:

'The need for modern, tightly connected forces, equipped, trained, exercised and commanded so that they can operate together and with partners in any environment.'

To meet this goal three interconnected initiatives are currently being worked:

- SD: defined as prioritization, specialization and cooperation in support of national defence efforts (with a focus on efficiency);
- CFI: an enhanced focus on force preparedness and readiness, through more robust education, training, exercising and evaluation processes (with a focus on effectiveness and consisting of several sub-initiatives like bolstering the NRFs, developing a joint NATO Training Concept, strengthening NATO SOF etc.);
- Lisbon Capability Initiative: moving forward NATO's ten most pressing capabilities, like Joint Intelligence Surveillance and Reconnaissance and Missile Defence etc.;

The key question is: 'Will these initiatives, together with NATO's Defence Planning Process achieve the NATO Forces 2020 goal?' To a certain extent the answer will be 'yes', but at the same time the answer is most probably 'no'. The question is why?

The collective Alliance political will, commitment and ability remain significant. But so are the potentially insurmountable hurdles to the coherent design, development and fielding of the required force packages. The expected effect of bi- or multinational initiatives to close the current capability-resource gap through cooperation, sharing and specialization, etc. will instead result in likely failure should these hurdles remain in place. If the Alliance cannot close current force gaps, then the fielding of required future force capabilities envisaged to fight in the FSE will with great certainty not be attainable.

Especially in times when nations, because of budgets cuts and other limitations, cannot afford any longer to pursue the full spectrum of capabilities, they will develop a tailored capability organization based on a strategy of capability-oriented planning. This implies that mutual inter-

dependencies are increasing. The commitment of being a member state to NATO does not extend to the commitment to deliver. This leaves NATO with a situation that there is a need to politically address the situation of assured access and assured availability and the notion of 'commitment to deliver'.

Smart Defence, although a new initiative, is actually nothing more than 'old wine in new bottles'. What is different is the fact that the need for co-operation is much more present than in the past and therefore the will to cooperate is greater than ever before. The problem however, is that the capability gap will not decrease. This has to do with the fact that as long as Alliance interests do not fully match national interests, nations will not pursue the cooperation options to the fullest extent possible. It is not NATO that drives the SD initiatives from the top-down, but rather it is still a predominantly bottom-up approach whereby two or more nations, often regionally and culturally oriented, show the will to cooperate more directly and as a result try to achieve savings instead of reinvesting the saved budgets in new capabilities. A limiting factor or current restriction to cooperation is directly linked to the issue of sovereignty and maintaining the national political prerogative to decide on embarking on a mission and assigning forces accordingly.

So, SD will definitely solve some issues, but predominantly linked to the so called 'low hanging fruit' and will exclude the real complex and expensive capability programmes. It implies that the already existing capability gaps, especially linked to the strategic enablers, will remain in existence.

Will the NDPP solve the capability gaps, especially in the realm of Air Power capabilities? Again, the answer is most probably 'no'. The NDPP is a rather complex methodology to determine NATO's MMRs and its existing PSAs. The PSAs are developed into targets sets which will be apportioned as national targets, multinational and NATO targets. It is clear that the NATO

Member States are not willing to meet all the apportioned national targets, leaving NATO with residual shortfalls and associated risks. Although NATO properly assesses the associated risk, it is clear so far that the outcome of that is not politically translated into relevant political-military direction and guidance in order to mitigate the negative effects. It seems as if the 'collective sense of urgency' with regard to the existing and widening capability gaps does not exist. This leaves NATO vulnerable with regard to the spectrum of especially Air and Space Power capabilities needed to embark on future missions. Especially, in the realm of Air and Space Power this force planning and generation approach and the growing gaps are of great concern.

Will the CFI solve the problems? CFI focuses on force preparedness and readiness through more robust education, training, exercising and evaluation processes. Especially with ISAF's mission coming to an end, the expectation is that NATO must transform from a combat posture into a posture of education, training and exercising, thereby keeping up its preparedness and readiness. It is not clear yet if CFI will bring the expected outcomes. It will be very much dependent on the nations to see if they are politically and militarily willing to fully embark on the full spectrum of the CFI, including the needed sense of urgency and therefore the will to live up to its consequences like commitment, cost, etc. An important related question will be 'how long will nations be ready to invest in keeping up preparedness and readiness without having to commit these forces to actual crises and conflicts?'

NATO, in order to be successful in addressing crisis and conflicts requires a guaranteed 'commitment to deliver'. So far, this seems politically unfeasible, although this might be the only option for meaningful NATO Air and Space Power in 2040. What is also missing in NATO is an integrated, comprehensive analysis of what really needs to be done to tailor NATO for the future. What is needed is a NATO wide orchestration and will to fully

understand the ramifications of the problems at hand and the need to keep Air and Space Power fit for purpose for the future. Can we really live up to an expectation that NATO can meet its LoA? Do the nations really want to close the capability gaps? If not, do they really know what risk they are taking? Are they willing to open up the politically sensitive Pandora's Box: i.e. the discussion on assured access and assured availability? How well are the NATO Commands and Force Structures trained, equipped, exercised and validated to ensure that NATO can meet and sustain its LoA? Does NATO have sufficient and qualified manpower to meet the requirements to sustain NATO's C2 missions, roles and tasks? Is the Air C2 structure sufficiently mature, trained, equipped, exercised and validated to make sure that the requirements will be met?

Finally, the Lisbon capabilities initiative; again, a good initiative but so far not fully meeting the expectations. How much more money, time and knowledge do we have to invest to meet the requirements and are we willing to do so? And do the nations know what the consequences are if they don't have the will to finalize this initiative to the fullest extent possible?

The significance of Air and Space Power in recent conflicts is clear. However, we face a worrying situation with the declining defence budgets and the diminishing Air Power capabilities. Furthermore we have to be aware of the developments, challenges and threat that impact on the use and survivability of Air and Space Power in a FSE. Finally it should be acknowledged that current work in progress in NATO most probably does not solve the existing capability gaps. Against this background it is fair to say that there is a real need for NATO to start working a comprehensive study of Air and Space Power towards 2040. Ignoring the problem is not an option if NATO wants to stay fit for purpose with Air and Space Power capabilities that play such an important role in crisis and conflict.

Follow-on Study

It is time to take a holistic approach in determining what can and must be done to stop further budget cuts and mitigate the effects of the existing and still widening Air and Space Power capabilities gaps. Furthermore, it is very important to determine what needs to be done to keep Air and Space Power in NATO fit for purpose based on the major developments, challenges, trends and threats in a FSE. The initial assessment of a FSE provides sufficient opportunities for a renewed emphasis on key Air and Space Power capabilities and on force preparedness and readiness.

The paradox proven and the FSE considerations identified, a follow-on study should be commenced to provide sufficient body to address viable options, policies and strategies to guarantee that Air and Space Power continues to contribute to the three Core Tasks of NATO, thereby ensuring that NATO can adequately deal with the security challenges of the future. Stemming from this follow-on study a number of future vectors can be determined. It is important to acknowledge that there are vectors for the short term and vectors for the longer term.

Short-term Focus Area Considerations

First the short term, this covers the period from now until 2020. In this time frame it is of great importance to make sure that Air and Space Power in NATO retains its operational preparedness, readiness and effectiveness, transforming from a combat posture into an exercise and training environment. Furthermore, it is of great importance to stem the negative tide in a way that the existing gaps will not widen and that the existing shortfall areas are properly taken care of. NATO Forces 2020 must have the capabilities as well as the operational and logistical resilience to meet the future challenges as depicted in the 2010 NATO Strategic Concept. Initiatives like CFI, SD and the Lisbon most pressing capabilities initiative form

the backbone for meeting these requirements. It is important however to pursue additional avenues of approach alleviating the current situation. For the short term it is advised to address the following:

At the political level:

- The need for an Air and Space Power narrative that capitalizes on the meaning and importance of Air and Space Power in crises and conflicts. Thoughts and ideas on how to 'market' this narrative, taking into account the existing Air and Space Power paradox;¹
- Based on the need for a common sense of urgency, it is advised to clearly address the problem of the diminishing defence budgets and the diminishing Air Power capabilities impacting on NATO's ability to meet its LoA and to cope with the challenges described in the Strategic Concept. There is a tendency for political leaders to minimize or ignore the advice of military leaders. What levers can be moved to ensure that there is an increased level of awareness, understanding and action from leaders to reverse the diminishing Air and Space Power trend and how to get those involved who are the real decision makers. Based on this narrative it is advised to develop innovative strategic ideas on how to instigate and create the political will to mitigate existing NATO Air and Space Power shortfalls;
- It is advised to raise concern about the inability of the NDPP and the SD initiative to solve the problem of diminishing Air and Space Power capabilities. What changes to the NDPP are required and what creative alternatives exist to ensure that NATO Nations meet their requirements? There is a need to develop thoughts and ideas on the optimization of the capability development planning and consultation process? How can national planning processes and the NDPP be better harmonized?;
- In terms of connecting Air and Space capabilities in a complex, globalized 'system of systems', it must first be determined how NATO Member States can align their priorities with those of the Alliance;

- Develop thoughts and ideas for the pressing need of addressing the issues of sovereignty, commitment to deliver (not only in an Article V situation), assured access and assured availability;
- Innovative ideas for bi- and multinational cooperation, e.g. using the opportunities based on a lead group of willing and able European NATO nations. Including innovative thoughts on force transformation and packaging.

At the military level:

- Assess the current state of work for keeping up preparedness, readiness and effectiveness of Air and Space Power in NATO and develop innovative thoughts on how to optimize preparedness, readiness and effectiveness for the future;
- Taking demographic trends and developments into account, NATO air forces must assure their attractiveness as employers in order to guarantee the availability of manpower in sufficient numbers. This attractiveness will require a sound and functioning mechanism to ensure coherent education, training, exercising and validation of these personnel in the NATO Command and Force Structures as well as national Air and Space Power institutions;
- There is a sincere doubt if tomorrow's Air and Space Power organizations have the capabilities, doctrine, training, exercise and experience to cope with full range of possible operations and threats. Develop thoughts and ideas for rectifying this situation²;
- In terms of getting to our 2020 goal, a fundamental question should focus on the force structure of our future Air and Space Power inventory. Is that inventory at the forefront of what we need or is it still too Cold War driven? Is there a need for force realignment, ridding of surplus capabilities that are very expensive in terms of maintenance cost and/or which are operationally no longer state of the art? How do we mitigate the negative effects of not having the full spectrum of needed Air and Space Power capabilities? While trying to maintain our level

of effectiveness the question arises if there are cheaper solutions, manned or unmanned?

Research and Development (R&D), Science and Technology (S&T) and Industries:

Develop thoughts and ideas on how to optimize the involvement of R&D, S&T and defence industries in creating opportunities for the optimization of Air and Space Power capabilities. How to turn R&D, S&T and defence industries into strategic partners and therefore force multipliers in the realm of Air and Space Power.

Partnerships:

Taking into account the positive experiences of partner countries involvement in recent Air and Space Power operations, develop thoughts and ideas on how to operationalize the NATO Forces 2020 approach towards partnerships.

Long-term Focus Area Vectors (or Considerations)

Second, there is a planning horizon beyond 2020 looking out toward 2040. A horizon that will see new developments and megatrends that definitely will impact the FSE. Exactly in what way might not be completely clear, but it is safe to state that the FSE remains unpredictable, complex and risky. In order to meet the Alliance interests, NATO must make sure that its fundamental potential of Air and Space Power remains fit for purpose. It is for this reason that the trends, developments and challenges need to be further assessed for their implications on the future application of Air and Space Power.

In order to keep Air and Space Power in NATO fit for purpose a number of questions are of interest that should be considered:

- The shifting of power to the east might lead to the question about NATO's LoA; Do we assume that NATO's LoA (and in particular its Air and Space Power requirements) remains valid and sustainable for the coming decades? Do we see the need to invest more in Air and Space Power resources in order to be able to counter any threat in a future conflict?;
- Notwithstanding the fact that the implications of climate change to the world's air forces are not entirely clear yet, NATO could start with a study on a range of potential short- and long-term operational and strategic challenges linked to climate change. The questions could be aimed at determining which specific effects that current scientific climate change models indicate are likely to occur. It should be identified where NATO can build synergies with the climate science community to help improve its understanding of climate changes. This should include potential changes to atmospheric conditions that could impact the application of Air and Space Power. In other words, how these impacts could affect air force's ability to conduct missions at the strategic and operational level; what trade-offs are involved with focusing time and funding on climate change; and what interagency and joint partnerships would further its understanding of, and preparation for climate change;
- Has NATO the capabilities and tools to strive for cyber resilience (info dominance) so that its use is uninterrupted and sustainable to guarantee Air and Space Power the freedom of planning, tasking and execution?;
- Is NATO willing and how can nations be motivated to invest into the uninterrupted access to space capabilities, to share and upgrade their military and economic capabilities to safeguard and control their dominance against directed energy weapons/jamming?;
- Does NATO possess in the future the right interference capabilities, and under which conditions could NATO nations be motivated to participate in these developments?;
- Does NATO possess the right capabilities to control and keep SA of the proliferation of anti-aircraft systems to possible future adversaries and

- terrorist networks? What is needed to maintaining assured Air and Space Power entry capabilities in denied airspace environments?;
- Does NATO have the right capabilities and tools to enhance or at least to keep the technological superiority in the realm of Air and Space Power capabilities? How do we want to involve R&D, S&T and defence industries in developing thoughts and ideas on how to keep Air and Space Power fit for purpose for the future?;
 - What role can or should NATO play to solve the dilemma that political military short-term decisions and intentions can be shifted to the long-term SA with the essential understanding that technology is the enabler for Air and Space Power?;
 - How can NATO nations be influenced to collectively invest in technology security and safeguarding it against adversaries like China?;
 - What is needed in terms of Air and Space Power capabilities to counter the threats of irregular warfare, terrorism and at the same time to be able to operate in different environments and asymmetric conditions?;
 - How does NATO want to involve partners in keeping Air and Space Power fit for future purposes?;
 - Develop strategic options for assuring the availability, correct knowledge base, education, training opportunities and career perspectives for NATO's most strategic potential: human resources in the future Air and Space Power environment;
 - Develop strategic options and ideas for maintaining NATO's sub-strategic nuclear deterrence capacity as an ultimo remedy;
 - Develop thoughts and ideas on the following set of questions (R. Palmer)³:
 - What new policies, cooperative relationships and capability investments are necessary to leverage 'forward presence' benefits?
 - How should NATO combine a smaller volume of forces in deployed operations with larger standing forces engaged in forward presence?
 - Determine transatlantic Air and Space Power complementarity and intra-European complementarity in the realm of Air and Space Power.

- How far is NATO from a network based approach to optimization of air forecasts and capabilities?
- Do we have the right mix of LIVEX, CAX and SYNADEX to meet evolving training and mission preparation objectives?

With this broad set of food for thought there is ample opportunity to start with the important work of developing a comprehensive vision and strategy for Air and Space Power towards 2040!

Endnotes

1. In this respect it is important to note that the European Air Chiefs recently discussed the need for such a narrative as well, during their Sep. 2013 meeting.
2. Lt Gen (ret.) Freek Meulman, *Air power over Afghanistan: The Quest for Strategic Effect*.
3. Diego A. Ruiz Palmer, Special Advisor for Economics and Security to the NATO Secretary General, Presentation, 2012 JAPCC Annual Conference, Kleve, Germany (10 Oct. 2012).

List of Acronyms

AGL	Above Ground Level
ATPs	Advanced Targeting Pods
AAF	Afghan Air Force
ANSF	Afghan National Security Forces
AWACS	Airborne Warning and Control Systems
ACCS	Air Command and Control System
AD	Air Defence
AOC	Air Operations Centre
ATO	Air Tasking Order
AG	Air-to-Ground
AT	Air Transport
ASP	American Security Project
AAA	Anti-Aircraft Artillery
AOR	Area of Responsibility
A2/AD	Assured Access/Aerial Defence

AHs	Attack Helicopters
ADF	Australian Defence Force
ASPI	Australian Strategic Policy Institute
BMD	Ballistic Missile Defence
BMC4I	Battle Management Command, Control, Communications, Computers and Intelligence
BRIC	Brazil, Russia, India and China
CASEVAC	Casualty Evacuation
CAS	Chief of the Air Staff
CAS	Close Air Support
CAP	Combat Air Patrol
CSAR	Combat Search and Rescue
CAOC	Combined Air Operations Centre
CFACC	Combined Force Air Component Commander
C2	Command and Control
COMAIRSOUTH	Commander, Allied Air Forces Southern Europe
CINCSOUTH	Commander in Chief, Allied Forces Southern Europe

List of Acronyms

COMAIRCOM	Commander, NATO Air Command
COP	Common Operational Picture
CFI	Connected Forces Initiative
CALCM	Conventional Air Launched Cruise Missile
COAs	Courses of Action
DCA	Defensive Counter Air
DCFACC	Deputy Combined Force Air Component Commander
EW	Electronic Warfare
EU	European Union
FSE	Future Security Environment
GRF	Gaddafi Regime Forces
GPS	Global Positioning System
GIRoA	Government of the Islamic Republic of Afghanistan
GDP	Gross Domestic Product
GBAD	Ground Based Air Defence
HARM	Hi-Speed Anti-Radiation Missile

IEDs	Improvised Explosive Devices
IAF	Indian Air Force
IADS	Integrated Air Defence System
ISR	Intelligence, Surveillance and Reconnaissance
ISTAR	Intelligence, Surveillance, Target Acquisition and Reconnaissance
ICC	Interim CAOC Capability
ICAO	International Civil Aviation Organization
ISAF	International Security Assistance Force
JAPCC	Joint Air Power Competence Centre
JDAMs	Joint Direct Attack Munitions
JFCB	Joint Forces Command Brunsum
JISR	Joint Intelligence, Surveillance and Reconnaissance
JPADS	Joint Precision Airdrop Systems
JPS	Joint Precision Strike
KLA	Kosovo Liberation Army

List of Acronyms

LGBs	Laser-Guided Bombs
LoA	Level of Ambition
LOC	Lines of Communication
MJO	Major Joint Operations
MANPADSs	Man-Portable Air Defence Systems
MEDEVAC	Medical Evacuation
MMRs	Minimum Military Requirements
MOD	Ministry of Defence
NAC	NATO Atlantic Council
NCS	NATO Command Structure
NDPP	NATO Defence Planning Process
NFS	NATO Forces Structure
NRF	NATO Response Force
NSPA	NATO Strategic Plans Afghanistan
NFZ	No-Fly Zone
NEO	Non-Combatant Evacuation Operation

NGOs	Non-Governmental Organizations
NATO	North Atlantic Treaty Organization
OCA	Offensive Counter Air
OAF	Operation ALLIED FORCE
OEF	Operation ENDURING FREEDOM
OUP	Operation UNIFIED PROTECTOR
PLAAF	People's Liberation Army Air Force
PTDS	Permanent Tracking and Display System
PID	Positively Identify
PGMs	Precision Guided Munitions
PSAs	Priority Shortfall Areas
PRTs	Provincial Reconstruction Teams
QRFs	Quick Reaction Forces
RAOCC	Regional Air Operations Coordination Cell
RC	Regional Command
ROE	Rules Of Engagement

List of Acronyms

RF	Russian Federation
SFA	Security Force Assistance
SJO	Smaller Joint Operations
SD	Smart Defence
SOFs	Special Operations Forces
SIPRI	Stockholm International Peace Research Institute
SEAD	Suppression of Enemy Air Defences
SACEUR	Supreme Allied Commander Europe
SAM	Surface-to-Air Missile
TLAM	Tomahawk Land Attack Missile
TIC	Troops in Contact
UAE	United Arab Emirates
UNHCR	United Nations High Commissioner for Refugees
UNSCR	United Nations Security Council Resolution
UN	United Nations
USAF	United States Air Force

UASs	Unmanned Aerial Systems
UAVs	Unmanned Aerial Vehicles
UNSC	UN Security Council
WMDs	Weapons of Mass Destruction

[illegible]



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