CENTRE FOR MILITARY STUDIES
UNIVERSITY OF COPENHAGEN

The Transformation of European Airpower

Implications for the Royal Danish Air Force

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Foreword

Denmark will buy new fighter aircraft in 2015. This is stated in the 2014-17 Defense Agreement. The Danish Parliament will accordingly need to allocate funds in the range of 20 to 30 billion Danish kroner to replace the Royal Danish Air Force's fleet of aging F-16 fighter jets. This will be the largest defence procurement program in a generation and it will have long-term effects on Danish military capabilities as well as the procurement plans and opportunities of the Danish Armed Forces. Substantial effort is currently being put into deliberating and preparing a comprehensive platform for making the final decision. A dedicated "New Combat Aircraft Program Office" within the Ministry of Defence is conducting analyses of the strategic, military, economic, and industrial issues inherent in the choice between the three competitor aircraft. These will inform members of Parliament as they choose the number and type of replacement aircraft. This decision, in turn, will determine the general capabilities and shape of the Royal Danish Air Force (RDAF) for the next 40 years.

Denmark is not alone in making such significant decisions at this time. The United States, Canada, the United Kingdom, France, the Netherlands, Norway, and Sweden have faced similar requirements and have recently made, or will soon make, similar decisions. These countries have modernized, reorganized, downsized, restructured, adapted, and transformed their airpower capabilities in ways that can inform Danish decisions and stimulate debate about the future of Danish airpower.

The intent of this symposium is to provide analyses of these experiences by scholars and officers from these countries to Danish civilian and military policy makers and to the wider public. Our objective is not to consider or judge which aircraft is best or make recommendations as to appropriate investments. It is, rather, to provide a platform for discussing the long-term opportunities and constraints that such an investment entails. If Denmark's experience with the F-16s is instructive, new aircraft will enable new capabilities and new opportunities for their use. These could require changes in the organization of the RDAF, the number and type of its personnel, their training, education, and career development, ethos, the support and maintenance structure, and basing. Furthermore, a valuable lesson from the F-16 program is that international collaboration in missions, modernization, maintenance, and training is essential in today's use of airpower. Understanding what Denmark's allies and partners have done and will do to overcome similar challenges and realize similar opportunities should prove useful as politicians, civil servants, and officers are required to make further decisions as new aircraft are being integrated into Danish and allied air force structures in the period ahead.

Contents

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For more information about this symposium or airpower, please contact
Dr. Gary Schaub of the Centre for Military Studies at gs@ifs.ku.dk.

Program

08.15 - 08.45	Registration & Coffee	
08.50 - 09.00	**Greetings**	*Dr. Kristian Søby Kristensen (CMS)*
09.00 - 09.30	**Opening Address**	*Lt Gen Tom Jones (USAF)*
09.35 - 11.05	Panel 1 **United Kingdom & France**	*Dr. Philip Sabin (King's College London)* *Dr. Peter Gray (University of Birmingham)* *Dr. Christian Anrig (SAF)* *Col Bruno Mignot (FAF)*
11.10 - 11.25	Coffee	
11.30 - 12.45	Panel 2 **The Netherlands & Norway**	*Col Bertil Van Geel (RNlAF)* *Lt Col Dag Henriksen (RNoAF)* *Colonel Gjert Lage Dyndal (RNoAF)*
12.50 - 13.50	Lunch	
14.00 - 15.15	Panel 3 **Sweden & Denmark**	*Maj Anders Wendel (SwAF)* *Lt Col Tommy Petersson (SwAF)* *Dr. Gary Schaub (CMS)*
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15.40 - 17.00	Panel 4 **Airpower Past & Present**	*Air Commodore Frans Osinga (RNlAF)* *Col John Andreas Olsen (RNoAF)* *Lt Gen (ret) Frederick Meulman (RNlAF)*
17.05 - 17.25	**Concluding Remarks**	*Dr. Gary Schaub (CMS)*
17.30 - 18.30	Reception	

Lieutenant General "Tom" Jones

Vice Commander, U.S. Air Forces in Europe - U.S. Air Forces Africa

Lt Gen Noel T. "Tom" Jones is the Vice Commander, U.S. Air Forces in Europe - U.S. Air Forces Africa, Ramstein Air Base, Germany. He was commissioned in 1980 following graduation from the U.S. Air Force Academy and holds Masters degrees from Embry-Riddle Aeronautical University, U.S. Army Command and General Staff College, and the U.S. Naval War College. He completed undergraduate pilot training in 1981, has served as an F-16 instructor pilot and operations officer.

General Jones commanded a fighter squadron, an operations group, an expeditionary wing during Operation Iraqi Freedom, and a fighter wing. The general has also served as the Director, Strategic Plans and Assessment, U.S. Forces-Iraq, U.S. Central Command and held staff assignments at North American Aerospace Defense Command, Air Combat Command, and the National Security Agency. Prior to his current assignment he was the Director, Operational Capability Requirements, Deputy Chief of Staff for Operations, Plans and Requirements, Headquarters U.S. Air Force, Washington, D.C.

General Jones is a command pilot with more than 3,500 flying hours, including combat sorties over Iraq in operations Southern Watch, Desert Fox, and Iraqi Freedom.

Fighting, Flying, and Winning Together:
Coalition Air Campaigns

Looking back at coalition air campaigns in Iraq, Bosnia and Herzegovina, Kosovo, Afghanistan, and Libya, we learn how coalition airpower is ultimately effective but not without challenges. The success of coalition air campaigns is not only defined by what we accomplish from the air, but also by the ground forces' ability to maneuver unmolested, due to air superiority.

As our forces and our enemy continue to evolve, we must ensure each of our nations is ready to fulfill our distinctive roles in coalition campaigns. Although disparate levels of readiness challenge our nations individually, collectively these challenges grow exponentially, thus becoming too difficult to overcome unless they are identified and addressed. Unfortunately, we know that readiness – people, assets, and training – comes at a high price, but it is one the coalition must be willing to pay.

When making decisions about modernizing our weapon systems, we should remember that trained and well-equipped Airmen are vital for mission success. From the air, we confidently engage the enemy with superior technology and training. Through the operations center, we provide actionable intelligence, clear command and control, and persistent communications, enabling precise engagement of ground targets. Above all, it is our innovative Airmen who make the full spectrum of operations possible. As a result of precision and excellence, our ground troops march forward with courage, knowing that air support is ready and available at a moment's notice.

The success of future coalitions will require tough decisions today. We must learn from our past failures and triumphs in order to achieve even greater cohesion amongst our forces. In the end, if we do not make the right choices, it is our nations' sons and daughters who pay the ultimate price.

United we are Victorious…Divided we will Fail!

Dr. Philip Sabin
King's College London

Philip Sabin *is Professor of Strategic Studies in the War Studies Department, King´s College London, from which he earned his PhD before holding research fellowships at Harvard University and the International Institute for Strategic Studies. He played a leading role in establishing King's academic partnerships with the Joint Services Command and Staff College and the Royal College of Defence Studies. He has been writing and lecturing on air matters ever since his 1987 book on The Future of UK Air Power. He was a founder member of the UK Chief of the Air Staff´s Air Power Workshop, and has contributed to most of the group´s publications. He has published air power articles recently in the RUSI Journal, JAPCC Journal, and RAF Air Power Review, and has lectured on the subject in several countries. His other academic interests reach all the way from Greek and Roman warfare to conflict simulation, as reflected in his latest books Lost Battles (2007) and Simulating War (2012). He is currently heavily involved in promoting and advancing the professional use of wargaming techniques in the UK and elsewhere.*

The Transformation of the Royal Air Force

In 1981, UK air power was focused increasingly on the Cold War roles of air/land defence in Germany, air defence of the UK, and maritime defence in the Eastern Atlantic, with the emphasis throughout being on high intensity warfare and on operations from established home bases. The 1982 Falklands war was an early wake up call to the rather different challenges of expeditionary operations, and since 1990, UK air power has been called on to contribute significantly to almost all of the many western expeditionary campaigns of the post-Cold War world. The inertia of modern combat aircraft programmes has been a big constraint, and the UK has had to work hard to adapt existing Cold War platforms such as the Tornado to the new environment, as well as to justify persisting with the Typhoon fighter programme and adapting it too to the changed context. Weapon and sensor systems such as the Brimstone munition and Litening reconnaissance pod have been crucial to the adaptation, and have helped in the transformation of UK air power into a highly capable and responsive ´Combat ISTAR´ force with increasingly impressive intelligence-gathering and discriminate engagement potential as required in conflicts like Afghanistan and Libya. Support platforms such as Nimrod R1, Sentinel, C-17 and Chinook have made an invaluable contribution, and the UK has also shadowed US employment of UAVs like Predator, to the point of creating a ground control station in Britain itself. By far the biggest constraint on UK air capabilities in this period has been unremitting resource shortages. Front line strength has shrunk inexorably, and Britain´s maritime air power has been especially hard hit with the controversial retirement of Harrier and Nimrod MPA systems. The new big aircraft carriers should redress the balance in due course, though here again programme inertia and cost escalation have been big problems in a strained budgetary environment. The qualitative future for UK air power looks good, with a consolidation around the capable Typhoon and Lightning B together with equally modern support aircraft. However, critical mass is a real worry, with the chronically limited numbers of personnel and deployable platforms threatening the UK´s ability to provide much more than a token air contribution in future conflicts.

Dr. Peter Gray
University of Birmingham

Peter Gray *is a Senior Research Fellow in Air Power Studies at the Centre for War Studies, University of Birmingham. He retired from the Royal Air Force in June 2008, having reached the rank of Air Commodore; he took up the position of Senior Research Fellow in Air Power Studies at the University of Birmingham in 2008. Gray spent his early career as a navigator on the F4 Phantom aircraft and, more recently, commanded 101 Squadron flying VC10 K tanker aircraft. He has spent two staff tours in the personnel field followed by a lengthy sojourn in the Cabinet Office, several appointments in the Ministry of Defence and has served as Director of Defence Studies for the Royal Air Force. Gray is a graduate of the Higher Command and Staff Course and was assistant director on the 2001 programme. Gray holds degrees from the Universities of Dundee, London, Cambridge and Birmingham (PhD). He is a Fellow of the Royal Aeronautical Society, the Royal Historical Society, and of the Institute of Leadership and Management. His latest book, Leadership, Direction and Legitimacy of the RAF Bomber Offensive, was published in June 2012. His other books include Air Power History: Turning Points from Kittyhawk to Kosovo, (Frank Cass, 2002), edited with Sebastian Cox; Air Power Leadership – Theory and Practice, (HMSO, 2002), edited with Sebastian Cox; Air Power 21 – Challenges for the New Century, (HMSO, 2000); British Air Power, (HMSO, 2003); Military History into the 21st Century, Strategic Combat Studies Institute, Occasional No 43, (2001), and chapters in volumes from Frank Cass Publishers and the Canadian Defence Academy.*

The Future RAF

May 2015 will see a General Election in the UK. It will be followed by a Strategic Defence and Security Review irrespective of the shade of government. Notwithstanding the usual assurances that the Review will be strategy-led, it will undoubtedly be resource constrained. The force structures emanating from the Review will be subject to economic, political, technological and operational pressures depending on how the threat to UK national interests is seen in the immediate term, and in the longer period of the life of the next government. That government, and its various departments, will have to balance their priorities in ensuring both defence and security needs are met. The standard mantra that UK force structures are inherently sufficiently flexible to meet a wide spectrum of threats, contingencies and scenarios is coming under increasing pressure. The implications of the birth of the Islamic State in both domestic and international arenas needs to be considered seriously as does a resurgent Russia. The UK also needs to consider the implications of its wider reach and how it sees itself on the world stage. It will need to balance manpower costs with technology; equipment with aspirations; and square the debates within defence and between defence and security.

Dr. Christian Anrig
Swiss Air Force

Christian F. Anrig *is Deputy Director of Doctrine Research and Education, Swiss Air Force. From 2007 to 2009, he was a lecturer in air power studies in the Defence Studies Department of King's College London. The author of The Quest for Relevant Air Power (Air University Press, 2011), he has also published various articles and book chapters covering topics from European military transformation to modern air power and its ramifications for European nations. His scholarship has been translated into Chinese, French, and Spanish.*

Dr. Anrig is a reviewer for Air & Space Power Journal and he serves on the academic advisory panel of the Royal Air Force's Centre for Air Power Studies. Whilst working in the United Kingdom, he was on the editorial board of the Royal Air Force Air Power Review. Several European air forces have invited him as a speaker to conferences and seminars.

The Transformation of the French Air Force

During the Cold War, the French Air Force was dominated by its nuclear mission in Europe and supporting light infantry operations against irregular forces in Francophone Africa. Thus it was ill-prepared for the conventional air campaigns of the 1990s. Shortfalls experienced in Operation Desert Storm and France's ambition to act as lead nation triggered a far-reaching transformation process that started to produce tangible results by the end of the decade. In 1999 the French contribution to Operation Allied Force over Kosovo and Serbia was the second largest in terms of sorties flown, aircraft dispatched, and precision-guided munitions released. Aware of the relative magnitude of their contribution, French decision makers were able – from an American vantage point – to unduly influence the course of the campaign. Despite the alliance frictions of 1999, the French Air Force was the first European air force to engage targets in Afghanistan in the wake of September 11. Two decades after Operation Desert Storm, in March 2011, French combat aircraft launched the opening strikes against the Gadhafi regime. The strikes depended on a number of core capabilities including air refueling, airborne command and control, and intelligence, surveillance and reconnaissance. Retaining a balanced force structure comprising these vital force multipliers has become a key paradigm for French Air Force transformation. At the same time, French decision makers have put a premium on retaining strategic industrial capacities and on indigenously developed and manufactured air power assets. Concerns over autarchy and politico-industrial aspects have tended to outweigh concerns over operational needs. Ambitious national and European development programs in times of constrained defence budgets have led to significant delays in acquiring new capabilities. The French air transport fleet for instance has suffered from chronic overstretch and shortcomings that could be mitigated through international cooperation. Despite these shortcomings, France has developed the most balanced European aerospace forces allowing – albeit limited – autonomous expeditionary campaigns.

Colonel Bruno Mignot

French Air Force

Bruno Mignot *is a Colonel in the French Air Force, Deputy Director of the Aerospace Strategic Studies Centre, and Chief of the Prospective & Strategy Division. He has previously been Chief of the Concept division at the Aerospace Strategic Studies Centre, Commander of the National Air Operations Centre, Deputy Chief of the Operational Air Staff, Director of the African War College, and Military Professor at the French Joint War College. He has authored over forty articles in publications such as Armées d'Aujourd'hui, Air Power Review, Défense Natonale, Le Piège, Penser les Ailes Françaises, and the electronic newsletter on innovation Epidosis. He is the editor of Regard d'un Militaire Sur la Société Française- La République Nous Appelle (2007), Il Était Une Fois des Militaires- Chronique d'Une Mutation en Cours (2009), and Les Drones, Passé, Présent et Avenir-Approche Globale, Ouvrage Collectif (2013).*

The Future of the French Air Force

Over the past decade, the French Air Force has been subjected to numerous internal and external reforms whose objectives were sometimes contradictory. The 2013 White Paper outlines the French policy in the Defense and Security areas and has been implemented by a 5 year military Planning Law that defines the budget allocated to meet the ambitions of the French Defense enterprise. The FAF chief of staff has defined a plan entitled Together We Face the Future to address the challenges ahead. It presents his vision and a strategy to address the future security environment, providing and contributing to give meaning to the actions of all, from the airman to the general. More than ever, this enterprise is focused on the French Air Force's ability to accomplish its missions both domestically and overseas.

The French Air Force is first and foremost an instrument of power to the service of the Nation. It contributes to each of the five strategic functions highlighted in the 2013 White Paper: Protection, Nuclear Deterrence, Prevention, Intervention, and Knowledge & Anticipation. To ensure excellence across the entire spectrum of air operations, the FAF has identified five core capabilities upon which to focus it efforts: Command & Control, Intelligence, Surveillance, & Reconnaissance, Immediate Intervention, Power Projection, and Education & Training. We think that if we miss one of them, we lose the coherence of the entire effort and thus the ability to perform high-level missions. These five core capabilities are the foundation of our fighting force and will allow us to intervene with the appropriate responsiveness. Together We Face the Future is a vision, a roadmap for a renewed air force that will be operational, modernized, partnered, and fueled by airmen. It will allow us to understand where we are going and how to reach our goal.

Colonel Bertil Van Geel

Royal Netherlands Air Force

Bertil van Geel *is a F-16 pilot in the Netherlands Air Force with over 3000 flying hours in total with various operational and staff postings. In the 1990s he participated in an exchange tour with the German Luftwaffe and flew the PA-200 Tornado. From 2004-2007 he was Squadron Commander of 312SQ at Volkel Airbase. His flying career includes operations in Former Yugoslavia (1998) as RNLAF/BAF F-16 Operations Officer and in Afghanistan (2005 and 2006) as the RNLAF F-16 Detachment Commander. His academic career includes the Netherlands Advanced Command and Staff College (2003-2004), the USAF 'School of Advanced Air and Space Studies' (SAASS) at the Air University in Alabama (2007-2008) and NATO Defense College in Rome (2012). From 2010 until 2013 he was associate professor for Airpower at the Netherlands Defense Academy in Breda. His publications include "The Netherlands Air Force in the Post Cold War Era," Netherlands Military Spectator 1 (2013). His current posting is at NATO Headquarters in Brussels Belgium, at the Permanent Military Representation of the Netherlands, dealing with NATO Operations and Intelligence.*

Royal Netherlands Air Force:
Future Force Structure Plans

The last 25 years brought a dramatic change in the strategic environment in Europe. The RNLAF quickly adapted to this changed environment in the 1990s. Reorientation, operational experiences, reform, new doctrine, and new equipment resulted in a "parvus numero, magnus merito" RNLAF. With a shrinking post-Cold War defense budget and a change in the character of military operations, the Netherlands chose to have a flexible, deployable, and high quality military, able to operate full spectrum, albeit at the cost of sustainability. For the RNLAF this meant lower numbers, but maintaining quality and diversity to be able to cover all air aspects: Air Defense (F-16, Patriot, NASAMS), Attack (F-16, AH-64D), ISR (F-16, AH-64D) and Mobility (KDC-10, C-130, NH-90, CH-47 and AS-532). RNLAF flexibility is kept by training all its F-16 pilots in the "swingrole" (Air Defense-Attack-Recce), cross-training NASAMS-Patriot personnel, and using the KDC-10 in a tanker-transport combination. High quality is maintained by a rigorous personnel selection system and investment in training, exercises, and operations in combination with the procurement of high tech aircraft and weapons (investment quote 15%). The RNLAF also has focused on improving joint and combined operations. Looking into the future, the RNLAF wants to maintain its flexibility and its coverage of all air aspects. The decision taken by the Dutch government at the end of 2013 to buy 37 F-35s definitely supports this, as well as the decision to buy 4 RQ-9 Reaper UAVs, including the associated ground stations. The RNLAF will be further modernizing its helicopter fleet and is participating in the new European Tanker project. Furthermore, the RNLAF wants to intensify multinational cooperation. The present chief of the RNLAF, LtGen Schnitger and his Belgian Air Force colleague, MGen Van de Voorde have the ambition fully integrate both air forces in ten years from now.

Lieutenant Colonel Dag Henriksen

Royal Norwegian Air Force

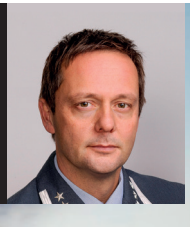
__Dag Henriksen__ is a Lieutenant Colonel in the Royal Norwegian Air Force and the Head of the Department for Airpower and Technology at the Royal Norwegian Air Force Academy. He holds a Ph.D. from the University of Glasgow. His publications include NATO's Gamble: Combining Diplomacy and Airpower in the Kosovo Crisis, 1998-1999, (Naval Institute Press, 2007); Wilhelm Mohr: On World War II, (Tapir Akademisk Forlag, 2009); Airpower in Afghanistan 2005-2010: The Air Commanders' Perspectives, (Air University Press, 2014); and articles in The Journal of Strategic Studies and Internasjonal Politikk.

The Transformation of the Norwegian Air Force

The Norwegian military contribution to the international involvement in Libya was on an unprecedented scale, with the Royal Norwegian Air Force dropping almost a hundred times more bombs in a few months in Libya than the accumulated total since WWII. Although there is little evidence supporting any long-term changes in Norwegian security and foreign policy based on these particular circumstances, what has arguably changed is the Norwegian perception of force. The national discourse has changed. This does not necessarily mean that the belief in military force to solve international conflicts has increased, but rather a certain level of acceptance that military force is an integral part of Norwegian foreign policy has been established. The military involvement also challenges the conventional domestic view on Norwegian use of force in international operations, which for long has appeared to be that, since our relative military contributions will always be of limited military value, it is the political effect of military participation that by itself is the predominant rationale for involvement – not the military results the military contribution may generate. Therefore, the argument goes, overarching conceptual thinking linking means to ends is of a more subordinate nature, and best left to major actors on the international scene. I argue that Norway's experiences from its military contributions in Libya represent a breach of this premise, since the relative contribution in this particular conflict in both quantitative and qualitative terms was substantial. Further triggered by the Norwegian purchase of 52 Joint Strike Fighters and substantial financial resources put into the Norwegian Defense Force, the question is whether Norway should consider this an exception to the rule, or whether the consequences of these experiences are that the logic of linking means to ends deserves a more prominent place in Norwegian military thinking.

Colonel Gjert Lage Dyndal

Royal Norwegian Air Force



Gjert Lage Dyndal *is a Colonel in the Royal Norwegian Air Force. He is currently Head of Department for Strategic Studies at the Norwegian Defence University College. Dyndal holds an M.Phil (R) in War Studies and a PhD in Modern History from the Scottish Centre for War Studies, University of Glasgow. He is the author of Trenchard and Slessor: on the Supremacy of Air Power over Sea Power (Tapir, 2007); Strategisk ledelse i krise og krig [Strategic Leadership in Crisis and War] (Fagbokforlaget, 2010); Exit Afghanistan (co-authored with Professor Torbjørn Knutsen) (Universitetsforlaget, 2012); and Land Based Air Power or Aircraft Carriers? (Ashgate, 2012), as well as several articles and book chapters in the fields of Maritime Air Power and Security Studies.*

The Future of the Royal Norwegian Air Force

The Norwegian Air Force is in the midst of a planned period of great change, including both a modernization of capabilities and changes to the Air Base structure. Norway has recently bought new C-135J aircraft and will soon receive new Joint Strike Fighter aircraft and new helicopters. However, Norway has not yet decided on replacement aircraft, or other capabilites, for maritime surveillance and intelligence functions, nor has it chosen replacement systems for the aging control and reporting centre (CRC) structure. As with many other nations, the Norwegian Air Force has yet to give serious consideration to the prospects and consequences of emerging unmanned technology and platforms. In general there are still many uncertainties about technological evolution, but the Air Force should lead in the developments.

In addition to the uncertainty about new technologies, it is clear that the future strategic environment in which these military forces will operate is uncertain. We are currently witnessing a great instability in the global security situation, with an emerging bipolar or multipolar world order. Security challenges have recently returned to European borders. How will this affect NATO and the character and demands of air power in the Alliance? What will the effect be on Norwegian national requirements for air power?

Given its enduring and solid national economy, Norway has largely been able to uphold a balanced force and many new capabilities are on their way. This puts Norway in an advantageous situation compared to many other countries. However, challenges remain. Planned force structure is clearly under-financed. Will Norwegian politicians increase funding for the Armed Forces, or will large parts of the structure become non-operational? Is the balance between structure and technology correct given the future threat environment? Will the Air Force be able to keep up with the pace of technological change? Or will it fail to adapt and transform? Such questions will occupy the airpower community for sometime to come.

Major Anders Wendel
Swedish Air Force

Anders Wendel *is a major in the Swedish Air Force. He holds a Masters degree from the Norwegian Defense University College.*

Transformation of the Swedish Air Force

Sweden's Air Force bears many of the hallmarks of a military service shaped by the country's grand strategy. Neutral throughout the Cold War and relatively small in terms of population and resources, Sweden nevertheless sought autonomy in its national defence – from manning its force to designing and producing its own armaments. Defending against a potential superpower invasion guided the size, capabilities, and operational orientation of its Air Force. Sweden fielded the fifth largest air force in the world in 1991, with 425 combat aircraft in 28 squadrons, a dispersed basing structure, a full spectrum of air defence capabilities including early network-centric capabilities, and a forward-oriented defence-in-depth to credibly deter armed attack.

Since the Cold War, Sweden's Air Force has modernized and downsized its force structure, but remained focused on defence of Swedish airspace and approaches throughout the 1990s. Acquisition of airborne early warning and air-to-air strike capabilities were given higher priority than enhanced reconnaissance, interoperability, or expeditionary operations.

The Swedish Air Force began orienting itself toward expeditionary operations at the turn of the millennium. It retired its J 35 Drakens and JA 37 Viggen air defence aircraft. Furthermore, the JAS 39A/B Gripen models procured in the 1990s that lacked interoperable equipment were retired, converted to trainers, or upgraded to newer Gripen C/D standards that can be refueled in flight. Combat air support (CAS) missions received substantial emphasis and precision strike capabilities such as Litening III laser-designator pods were procured. Its 8 C-130 Hercules mobility aircraft received a midlife update in cooperation with the U.S. Air Force and one was converted into an aerial refueling aircraft. Furthermore, its fleet of early warning aircraft was reduced and the remainder upgraded and modified to be compatible with NATO. Swedish participation in international exercises and operations has increased its ability to operate with others – as has adopting English for aircraft-to-aircraft communications and for cockpit information. These changes indicate an air force whose ongoing modernization may lead to its transformation.

Lieutenant Colonel Tommy Petersen

Swedish Air Force

Lieutenant Colonel Tommy Petersson *is the head of Plans at the Swedish Air Force Air Component Command. He is a former Fighter Squadron Commander, and still Command Pilot on the SAAB JAS 39C Gripen, with approximately 2400 military flying hours. He is a graduate of the Swedish National Defence College and also holds a Master in History from the University of Stockholm. Tommy Petersson is a member of The Swedish Royal Academy of War Sciences and the author of Med invasionen i sikte. Flygvapnets krigsplanläggning och luftoperativa doktrin 1958-1966 (With the Invasion in Focus: Swedish War Planning and Air Power Doctrine 1958-1966), (Svenskt Militärhistoriskt Bibliotek, 2009).*

The Future Air Force of Sweden

During the Cold War, Sweden's policy of nonalignment spurred the development of an indigenous defence industry designed to meet its needs. Its relatively strong air force emphasized air defenses, repelling a potential amphibious invasion in the south and a ground invasion in the far north, and gave less priority to offensive operations. At the end of the Cold War, the SwAF had twenty operational fighter squadrons equipped with Viggen and Draken fighters. Today, it has four with 100 JAS 39 Gripen fighters. It also has 8 C-130 cargo aircraft, two airborne surveillance and control (ASC) 890 AEW&C aircraft, seven light aircraft for transport and other duties, and is increasing its helicopter force from 30 to 50. A professional officer corps is being supplemented with a career NCO corps and enlisted personnel as Sweden transitions to an all-volunteer force. This revolution in personnel affairs presents a real challenge. In the future, it must be flexible: all operational units must be ready to shift between different levels of conflict, missions, and regions. The SwAF recognizes that superiority in numbers cannot be the norm for the Swedish Air Force, which implies that it must emphasize development in tactics and technology as it strives to fulfill its core missions: control of the air, air mobility, situational awareness with deep intelligence analysis to aid decision making, and long-range precision engagement on land and sea in all weather conditions. Future force structure will include Gripen fighters, today C/D and tomorrow E models, that can perform missions at home, in the near abroad, and in an expeditionary context.

Dr. Gary Schaub
Centre for Military Studies

Dr. Gary Schaub, Jr. *is a Senior Researcher at the Centre for Military Studies, Department of Political Science, at the University of Copenhagen. He has served on the faculty of the U.S. Air War College, the USAF School of Advanced Air and Space Studies, as a Research Fellow at the Air Force Research Institute, and a MacArthur Scholar in Arms Control, Disarmament, and International Security at the University of Illinois-Urbana.*

The Transformation of the Royal Danish Air Force

Today the Royal Danish Air Force (RDAF) is a highly visible instrument of Denmark's "activist" foreign policy. Successive governments have been willing to contribute Danish F-16 fighter jets and C-130 Hercules transport aircraft in the early stages of western military interventions with few, if any, restrictions. This was the case in Operation Allied Force over Kosovo in 1999, in Operation Enduring Freedom in Afghanistan in 2001–2003, in Operations Odyssey Dawn and Unified Protector over Libya in 2011, in Operation Serval in Mali in 2012-2013, and in Operation Inherent Resolve against the Islamic State in the Levant in Iraq in 2014. This record of early, fast, and open contributions has earned Denmark a reputation as a security provider rather than a security consumer.

But it was not always so. The Cold War RDAF reflected Danish strategic dilemmas and ambivalence toward military force. Its focus was the defence of Danish territory and maritime approaches—and only until Allied reinforcements arrived. The purchase of F-16 fighters with a consortium of European Partner Air Forces signaled an increased commitment to NATO. The F-16s increased Denmark's ability to defend its airspace, to integrate operations with the United States and other Allies, opened new training opportunities, and enabled collective modernization and enhancement programs that would have otherwise been financially out of reach.

The investment in the midlife update came just in time for the RDAF to undertake expeditionary operations with NATO in Kosovo. Older Danish F-16s were relegated to defensive missions over the Adriatic because they could not conduct precision strikes, but the updated aircraft dropped Denmark's first bombs in 50 years. Further investment in all-weather precision strike capabilities and other systems enabled full participation of RDAF F-16s with its European Partner Air Forces partners in Operation Enduring Freedom in 2003. This deployment built upon the concerted deployment of C-130 transport aircraft to Kyrgyzstan with Norway and the Netherlands in 2002, demonstrating how cooperation with allies with similar equipment can enable each to do more than they could accomplish alone.

While ground operations in Iraq and Afghanistan occupied the political debate, the RDAF reorganized itself to increase its ability to engage in expeditionary operations. It consolidated support into a single wing, established an expeditionary air staff to consider modern airpower ideas, doctrine, and operations, and changed personnel policies and expectations to establish deployment as the new normal. This change in organization and culture enabled the RDAF to take advantage of its capabilities even as the number of its operational F-16s was reduced to half of those available in 1999. This smaller RDAF is now Denmark's go-to contribution to Western military interventions abroad, participating in the first days of operations in Libya, Mali, and Iraq and earning accolades from its partners and allies. As the RDAF replaces its F-16 fleet, these new capabilities will increase its combat power and ability to operate with partners. They will likely enable further organizational transformation to support Danish foreign policy initiatives that are as distant to today's decision makers as the current ones would seem to the leaders who acquired F-16s 40 years ago.

Air Commodore Frans Osinga

Royal Netherlands Air Force

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Coping with the Paradox of European Air Power: Getting Smaller in a Bigger World

Due to rapid technological developments, air power has emerged as the crucial asymmetric edge of Western militaries. Precision weapons, stealth technology, persistent surveillance, and secure datalinks have resulted in swift victories over rogue states, with historically unprecedented low levels of destruction, while dramatically reducing the risk for our own ground troops in complex operations such as those encountered in Afghanistan. Also, Precision Age air power has proven its huge value as a tool for supporting diplomacy, as in Kosovo, and for Humanitarian Interventions, such as Operation Unified Protector. Air power has come a long way since its humble beginnings in 1913, one century ago. Indeed, precision air power has come to define the western way of war and a normative feature. The emerging international security environment suggests that the utility of air power will only increase. Crises have flared up in various regions relevant to European security interests and the demand for responsive and precise air power will certainly not diminish. Yet there is a paradox for Europe. The world is getting bigger, but despite an acute awareness among security experts that the security arena has drastically expanded over the past decade, Europe remains critically dependent on US air power for its security. If current trends are any indication, this dependency will certainly not decrease. Indeed, European air forces face significant challenges in balancing the requirements of modernization with the requirement to remain affordable in ever shrinking defence budgets. Left unaddressed, this poses not only a problem for key security organizations such as NATO, but also for European security itself in an era which sees increasing state level competition and civil wars at European borders.

Colonel John Andreas Olsen
Royal Norwegian Air Force

John Andreas Olsen *is deputy director general in the Norwegian Ministry of Defence, an active serving colonel in the Royal Norwegian Air Force, and a visiting professor of operational art and tactics at the Swedish National Defence College. Colonel Olsen was the deputy commander and chief of the NATO Advisory Team at NATO Headquarters, Sarajevo, from 2009 to 2012. His previous assignments include tours as dean of the Norwegian Defence University College and head of its division for strategic studies. He is a graduate of the German Command and Staff College and has served both as liaison officer to the German Operational Command in Potsdam and as military assistant to the Norwegian Embassy in Berlin. Olsen has a doctorate in history and international relations from De Montfort University, a master's degree in contemporary literature from the University of Warwick, and a master's degree in English from the University of Trondheim. Professor Olsen is the author of Strategic Air Power in Desert Storm (2003) and John Warden and the Renaissance of American Air Power (2007); co-author of Destination NATO: Defence Reform in Bosnia and Herzegovina, 2003-2013 (2013); editor of On New Wars (2006), A History of Air Warfare (2010), Global Air Power (2011), Air Commanders (2012) and European Air Power (2014); and co-editor of The Evolution of Operational Art: From Napoleon to the Present (2011) and The Practice of Strategy: From Alexander the Great to the Present (2012).*

A New Concept for the Application of Air Power

NATO members need to develop military-strategic concepts that better link the application of force in general – and air and space power specifically – to the endgame objective of fostering good governance as the defining legacy of any NATO-led intervention. This requires a conceptual approach that views the state of interest as a system, a strategy that seeks systemic empowerment of the supported ally and systemic paralysis of the opponent, using both lethal and non-lethal means in pursuit of strategic effect. Systemic paralysis seeks to prevent a state, government, or key forces from doing something while systemic empowerment seeks to create better conditions for friendly actors. While the former sets out to degrade, disintegrate, and damage, the latter seeks to facilitate, integrate, and build. This concept follows two lines of operations, conducted simultaneously and in parallel: one process-oriented to achieve psychological impact, and the other form-oriented to achieve physical effect. The former centres on the intangible – mental and moral – aspects of war, while the latter deals with the material sphere.

To be successful, airmen must capitalize on traditional and non-traditional intelligence, surveillance, and reconnaissance (ISR) and highly precise targeting, in addition to the other roles and missions. The new notion focuses on control rather than occupation, targeting from a safe distance rather than in-theatre fighting, and enhancing local political structures and processes in pursuit of good governance. To succeed, airmen must master their profession, connect air power directly to the end-state objective, adopt a new vocabulary and terminology for this purpose, and match new technology with innovative strategic thought. I propose a generic, system-level approach to warfare and subsequent state-building that challenges traditional military planning – which is usually ground-centric and battlefield-oriented. It is an air-minded concept that focuses on war-ending criteria rather than war-fighting skills per se.

Lieutenant General (ret) Frederick Meulman
Royal Netherlands Air Force

Frederik Meulman *is a retired Lieutenant General in the Royal Netherlands Air Force. From April 2010–May 2013, he was the Netherlands Permanent Military Representative to NATO and the EU in Brussels. In March 2008, Major General Meulman was appointed Deputy Chief of Defense and promoted to Lieutenant General. From January 2007–February 2008, he fulfilled the position of Deputy Commander Air at ISAF Headquarters in Kabul, Afghanistan. From June 2004–December 2006, he was the Deputy Commander of the Royal Netherlands Air Force. In 2003, Major General Meulman became Deputy Commander of the Combined Air Operations Centre in Kalkar (CAOC2). In 2001, promoted to Air Commodore, he assumed the position of Deputy Director of the Military Intelligence and Security Service. In 2000, he returned to the MOD/Defense Staff as Head of the Military-Strategic Affairs Division. He retired 1 June 2013. He is a 1979 graduate of the Royal Military Academy and studied Strategy and Air Power at the Air University's College for Aerospace Doctrine, Research, and Education at Maxwell Air Force Base in the United States.*

Air and Space Power in NATO: Transformational Trends & Challenges

Joint Air and Space Power has been of strategic importance to the Alliance since NATO's inception. Time and time again, NATO and its Member States have turned to Air Power as their first military response option. NATO acknowledges that security challenges will not diminish in an increasingly complex international environment. Despite this, NATO continues to witness drastic reduction in defence budgets and a diminishing of air power capabilities at the hands of its Member States. This trend (and paradox) began at the end of the Cold War and continues at an increasing rate. Serious deficiencies in Joint Air and Space Power capabilities and competencies, in particular in the NATO/European Member States, are exacerbated by recent political-military strategic developments such as the situation in the Ukraine, the rebalanced relationship with Russia, and the US pivot to Asia. These developments and trends should trigger measures to remedy the existing deficiencies. If this is not going to happen there is a sincere risk that NATO/Europe will not have the required joint air power capabilities and competencies and assured access to space-sourced information and data to cope with the security challenges, in particular crisis management operations near the borders of the NATO/European Member States. Therefore the Joint Air Power Competence Center (JAPCC) commissioned a Project Team to start the 'Air and Space Power in NATO – Future Vector Project' and to identify viable options and solutions to Air and Space Power challenges in order to meet NATO's and national interests in the short term (until 2020) and in the longer term (until 2040). It focuses on key transformational trends and challenges impacting on the future of Joint Air and Space Power in NATO/Europe. One of the main conclusions is that NATO/Europe must be capable of independently carrying out Crisis Management Operations near the borders of its Member States. The ability to execute these operations is very much dependent on the availability of a set of full spectrum Joint Air and Space Power capabilities and competencies provided by the NATO/European Member States. Extended forms of bilateral and multilateral cooperation form the basis for the realization of the required capabilities and competencies. Furthermore, the 'Future Vector Project' identifies a broad range of viable options and realistic solutions in order to ensure that Joint Air and Space Power will contribute to the security and success of NATO and its Member States.

Afterword

Dr. Gary Schaub

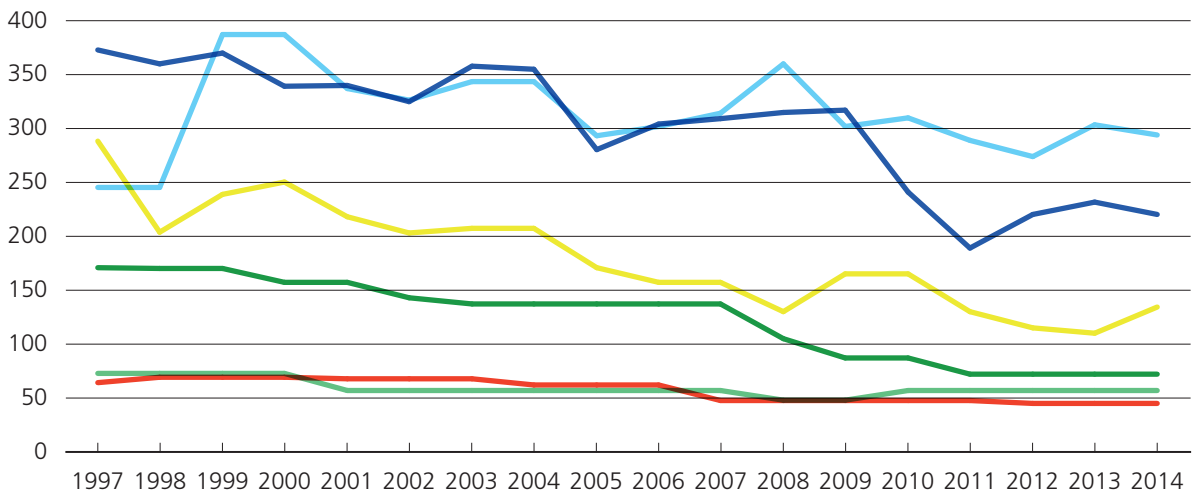
"No Boots on the Ground" perhaps summarizes the seductive nature of modern airpower for Western political leaders. The immediacy, range, persistence, precision, safety, and controllability of modern airpower have made it the first resort for political leaders who decide to use military force in the post-Cold War era. Airpower can be deployed much more rapidly than ground or naval forces after a decision has been made – perhaps within 24 hours. Airpower can quickly arrive in theatre and promply begin operations, particularly with the wider availability of airborne refueling. Furthermore, the incorporation of airborne battle management and well-trained staffs-in-being at combined air operations centres enables the employment of more complex operational concepts that are better tailored to the needs of the local commander and political leaders. The immediacy of airpower also enables it to be withdrawn quickly once objectives have been met or its deployment is no longer deemed politically expedient.

Beyond this, modern navigation, reconnaissance, surveillance, guidance, and targeting systems such as GPS and laser designation have increased the precision of airpower to unprecedented levels. Targets are destroyed with individual weapons rather than tens, hundreds, or thousands as in decades passed. Furthermore, collateral damage is a fraction of what it had been with unguided weapons and less than that caused by the employment of ground-based artillery. Friendly personnel are also much safer than if they were engaged in close combat with enemy forces on the ground. This helps political leaders sustain the commitment of military force in this casualty-sensitive "post-heroic age." Finally, modern communications systems permit a degree of knowledge about the battlefield activities that enables political control over airpower to a degree that is absent in ground and naval operations. Permission to strike particular targets can be granted or withheld within a single targeting cycle or sortie, allowing political leaders unprecedented control over the use of military force – for good or ill. All of these characteristics of airpower have increased the propensity of Western political leaders to engage in military interventions that heretofore would have been deemed too risky, costly, or politically perilous – most recently in Iraq and Syria against the irregular forces of IS. Airpower thus enables political leaders to "do something" about evils in the world and promote their values abroad in ways that other forms of military intervention cannot.

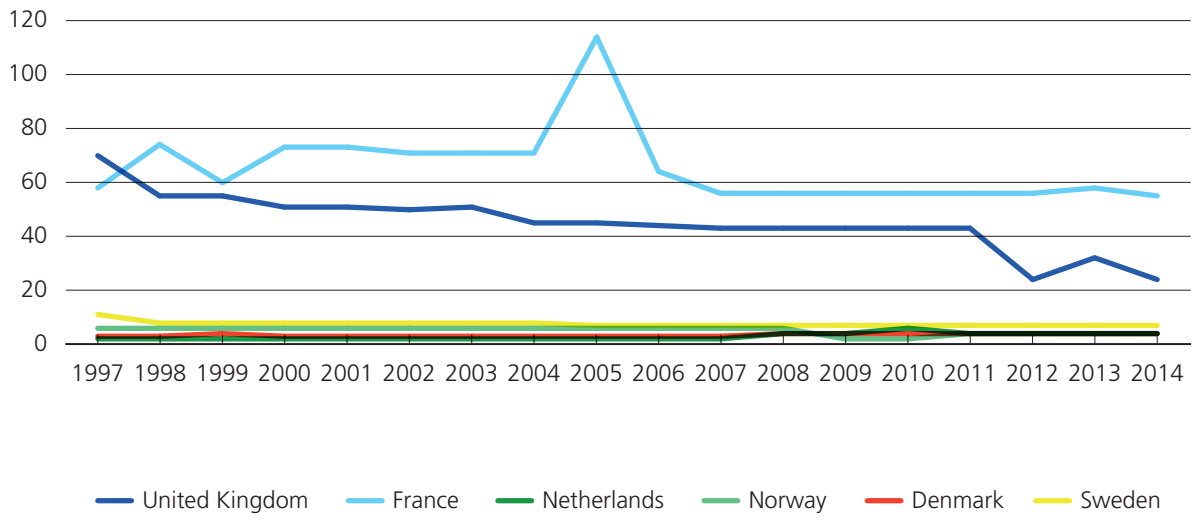
On the other hand, acquiring, maintaining, operating, and sustaining modern air forces with these advanced capabilities is expensive. Western air forces have been shrinking in size as governments press their armed forces to "do more with less," as seen in Figure 1. Many air forces have deactivated squadrons of aircraft, have eliminated entire mission sets and capabilities, and have focused on modernizing, upgrading, and extending the life of their remaining operational systems. The result has been smaller air forces that are in many ways more capable than they had been in the past and yet more reliant on the capabilities of others. Governments are hoping to extend this quantity/quality trade-off as legacy systems age and are replaced with fewer newer aircraft, such as the Eurofighter Tornado, the Lockheed Martin F-35 Lightning II, the Saab Gripen NG, the Boeing F/A-18 E/F Advanced Super Hornet, and the Dassault Rafael – to name the systems that have recently been considered in strike aircraft investment decisions.

Beyond strike aircraft, modern airpower requires critical enablers, such as intelligence, surveillance, and reconnaissance aircraft, aerial refueling aircraft, tactical and strategic transport, and air battle management aircraft such as the AWACS. These capabilities have never been a strong suit of most European air forces and they, too, have been shrinking in number even as these forces have engaged in operations further afield than a generation ago. For example, medium-sized mobility aircraft, such as the C-130 Hercules, have been the most plentiful of

Fighter & Multi-Role Aircraft Figure 1



Medium Mobility Aircraft Figure 2



these enablers and their inventories have either fallen or remained flat for the past 20 years – as shown in Figure 2.

But airpower is more than aircraft. It is a complex combination of personnel that utilize these capabilities according to doctrine and concepts of operations and whose efficacy depends significantly on the proficiency that they have acquired through training, education, and practical experience. The degree to which these are developed effectively through institutionalized force development programs ultimately determines the extent that an air force can succeed in consistently producing the desired results with its hardware.

Regrettably, quantifying these essential aspects of the airpower equation is difficult, if not impossible, and yet it is here where value can be added with relatively small investments – particularly when compared to the cost of major hardware acquisitions. Establishing programs to promote the development of airpower thought, increasing the quality of professional military education, expanding officer exchange programs, and extending training opportunities at home and abroad all cost money but pay off in effectiveness to a degree that far outstrips the investment. Yet each of these areas has suffered in the wake of the 2008 financial crisis and only some have recently begun to recover in the face of Russia's renewed assertiveness. The American Reassurance Initiative, the NATO Defence Planning Package announced at the Wales Summit, and the Connected Forces Initiative provide some means to retain, rebuild, and potentially expand on the skills and knowledge of NATO air force personnel – but more must be done at the national level as a matter of course.

Furthermore, the experiences of the past 35 years indicate that airpower will be used in the context of a coalition, but the tolerance for including less capable allies in actual warfighting for political purposes is waning. During NATO's Operations Deliberate Force and Allied Force in the Balkans, force packages included aircraft that could strike targets precisely – and those that could not – to ensure political cohesion and to allow defence ministers to justify the expense of deploying their aircraft as a show of political support. The legitimacy conferred by unanimity has been superseded by that of coalitions of the willing and assigning less capable allies "combat air patrol" missions to defend against the unlikely event that enemy aircraft will reach outside of the main theatre of operations once air supremacy has been established is a luxury in today's constrained financial environment. Allies that have been reluctant to join in coalitions of the willing have not enhanced their airpower capabilities and have seen their political influence commensurately reduced while that of those who are willing and able to effectively contribute have risen. Allies are not all equal and airpower capabilities that allow effectively plugging into coalition efforts on short notice is a key measure against which allies are measured. The experiences of the air forces discussed in our symposium today reflect that reality and it is a key lesson to be taken away.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