July **2021**

From Ground to Exosphere

15-Years of
The Joint Air Power Competence Centre

'NATO's Dedicated Air and Space Warfare Centre'

Joint Air Power
Competence Centre

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This Joint Air Power Competence Centre (JAPCC) Paper, titled 'From Ground to Exosphere – 15-Years of The Joint Air Power Competence Centre', is a product of the JAPCC. The purpose of this 15-Year Paper is to inform the members of the JAPCC, NATO organizations, Sponsoring Nations, contemporary organizations, academia and to whom it may concern about the 'raison d'être' of the JAPCC. It does not represent the opinions or policies of NATO and reflects independent analysis, opinion and the position of its authors.

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FROM:
The Executive Director of the Joint Air Power Competence Centre (JAPCC)

SUBJECT:
From Ground to Exosphere –
15-Years of The Joint Air Power Competence Centre

DISTRIBUTION:
All NATO Commands, Nations, Ministries of Defence, and Relevant Organizations

Dear Colleagues,

I am often asked what an Air Power Competence Centre is and what it does? I also have to sometimes explain, in these increasingly resource-constrained times, the value of the JAPCC's work to the Nations and to the Alliance.

This latest paper, titled 'From Ground to Exosphere – 15-Years of The Joint Air Power Competence Centre', not only answers these questions, but also provides an extensive overview of our achievements. While the paper is designed to be a narrative that can be read with ease, it is far more than just a simple snapshot of the JAPCC's activities over its history to date.

The paper was inspired by the research effort required to inform the latest Periodic Assessment (PA) of the JAPCC, an activity that has now been undertaken twice in the JAPCC's existence in order for it to remain a NATO accredited Centre of Excellence (COE). The PA covered a seven-year span since the previous one, and it became evident that while the JAPCC had many records of the substantial body of work produced, those records were not consolidated into a single source that was readily available even to JAPCC personnel, let alone external members of the Joint Air and Space power Community of Interest. We have endeavoured to rectify that here.

This paper explains the NATO Military Committee (MC) policy and Allied Command Transformation processes for COEs, and describes what an organization must be capable of doing in order to be accredited by NATO as a Centre of Excellence. A COE has to be able to contribute to one or more of four core or 'pillar' activities (e.g., Lessons Learned, Doctrine and Standardization) on behalf of the Alliance. You will see the JAPCC does not just do one type of COE activity, but all of them, across the spectrum of Joint Air and Space Power.

I offer that the enclosed paper serves two important functions. Firstly, it demonstrates, using the JAPCC as the best example, why COEs are now an intrinsic support mechanism for NATO and that without them, the NATO Command Structure, along with the NATO Defence Planning Process and many committees and working groups, would struggle to function. Second, it articulates the very substantial return on what has been a very modest investment by Sponsoring Nations of both human and financial resources into the JAPCC. It makes the

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case that the JAPCC, and the COE enterprise writ large, are fundamental to the success of NATO and even in a resource-constrained environment must continue to be supported to help the Alliance meet the challenges of an increasingly competitive and contested world.

I offer that Air and Space Power is NATO's Asymmetric Advantage; it is what our adversaries fear most and as a result, is a major contribution to deterrence. Having access to the best technology is one thing but, NATO's real edge resides in the capability of its people. The ability to prevail in future conflict will be determined by the intellectual component – the ability to out-think any adversary will be decisive. The 'home' of the Intellectual Component for NATO Air and Space Power is the JAPCC – NATO's dedicated Air and Space Warfare Centre.

Please enjoy this latest offering and feel free to contact me should you wish to discuss any of its contents. An ideal opportunity to meet and discuss would be at this year's JAPCC Annual Conference where we can discuss your continued support, or dare I hope for, increased support of the JAPCC.

Klaus Habersetzer
Lieutenant General, GE Air Force
Executive Director, JAPCC

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TABLE OF CONTENTS

FROM GROUND TO EXOSPHERE –
15-YEARS OF THE JOINT AIR POWER COMPETENCE CENTRE

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'After 15 years of outstanding service, the JAPCC continues to provide an unparalleled contribution to the Alliance by accelerating change, driving innovation, and forging the future of Air and Space Power matters.'

The Director of the Joint Air Power Competence Centre
General Jeffrey L. Harrigian

15th ANNIVERSARY

FROM GROUND TO EXOSPHERE – 15-YEARS OF THE JOINT AIR POWER COMPETENCE CENTRE

1. Introduction

Why This Publication? The Joint Air Power Competence Centre (JAPCC) has recently undergone a Periodic Assessment (PA)[1], conducted by Allied Command Transformation (ACT). This PA was the JAPCC's second, the first having been conducted in 2013. Preparing for the PA took a considerable amount of work and crucially, needed the staff to consider what the organization has *really* achieved? To answer this question required a 'deep dive' into all that the JAPCC had done, for whom and to what effect? In delivering this work, successfully passing the PA and subsequently being re-accredited as a NATO Centre of Excellence (COE), the JAPCC was forced to undertake a thorough review of itself. Having learned and captured so much about the JAPCC, the logical progression was to share it with Sponsoring Nations and other Customers. The final part of this publication, having looked at what we have achieved, is an attempt to describe where the JAPCC thinks it should be going next. As a reader of this publication your input to this debate is absolutely necessary, welcomed, and indeed encouraged!

Why Now? The JAPCC has existed for 15-years. While 15-years may not seem such a long time, if we think of it in terms of the events that have occurred and how these have affected the Domain of Air and Space, then one quickly starts to realize just how much our environment *has* changed:

2005: YouTube launched, Hurricane Katrina hits New Orleans, London terrorist attacks, NATO Air Transport assets support African Union Mission in Sudan (AMIS) and provides earthquake relief to Pakistan.

2006: The verb 'to google' enters the Oxford English Dictionary; Saddam Hussein is executed.

1. All NATO accredited Centres of Excellence (COE) are assessed periodically by HQ SACT (COE Programme Development Branch – CPD) to ensure they meet the criteria for a NATO accredited COE, as described in the IMSM 0416.

2007: Apple releases the iPhone; NATO supports the African Union Mission in Somalia (AMISOM) and the Global Financial Crisis hits.

2008: The Large Hadron Collider at Cern, Switzerland is switched on, Kosovo declares independence from Serbia and NATO agrees to maintain its presence in Kosovo in accordance with UN Security Council Resolution 1244.

2009: NATO Counter-Piracy in the Gulf of Aden – Operation ALLIED PROTECTOR.

2010: The 'Arab Spring' starts.

2011: Osama bin Laden killed, the Syrian Civil War begins and NATO Operation UNIFIED PROTECTOR to protect the Libyan people.

2012: The rover Curiosity takes a selfie on Mars and 900 million people watch the London 2012 Olympics opening ceremony.

2013: Nelson Mandela dies and the Boston Marathon bombing.

2014: Malala Yousafazi wins the Nobel Peace Prize, Russian annexation of Crimea, NATO Air Policing Mission commences and the International Security Assistance Force (ISAF) mission in Afghanistan ends.

2015: Coordinated terrorist attacks across Paris and the start of Operation RESOLUTE SUPPORT.

2016: Great Britain votes to leave the European Union – BREXIT.

2017: Facebook has 2-billion users.

2018: Creation of the NATO Training Mission Iraq.

2019: The so-called 'Year of Protests', US-China trade war and the start of what will become the Worldwide Coronavirus Pandemic.

2005–2019

Whilst many of those delivering the PA were JAPCC Subject Matter Experts (SMEs), their insight, at best, rarely went back beyond their immediate predecessor. Consider this: How many individuals in each of our nations has passed through the appointment of Chief of Defence Staff (CHoDS) or Air Chief since that group of Air Chiefs that signed the JAPCC's Memorandum of Understanding (MoU) on 1 January 2005,[2] or indeed, how many different jobs have each of us done? The question thus became, that if we know so little about what has gone before in our own organization, then what chance does our wider audience have of understanding the JAPCC's achievements? Therefore, having captured the JAPCC's achievements in two separate PAs, this publication is an attempt to provide an overview of the JAPCC's entire body of work to date in a single, easily readable publication.

So What? The World is a very different place now from when the JAPCC was created in 2005. The JAPCC has evolved both through internal restructuring and based on the Direction and Guidance (D&G) provided by the Steering Committee (SC). It is offered that the JAPCC is now more relevant than ever and in a complex and increasingly uncertain World, is more essential than ever. This publication provides an insight into just what the JAPCC can do for NATO and the Nations but also, just how resource-efficient the organization really is.

2. If one assumes a 2-year term in office, then most of our nations have had seven or more Air Chiefs over the period of the JAPCC's existence.

2. NATO Centres of Excellence – An Introduction

(Extracted from www.act.nato.int)

Overview. NATO COE's are nationally or multi-nationally funded institutions accredited by NATO. They train and educate leaders and specialists from NATO member and partner countries, assist in doctrine development, identify lessons learned, improve interoperability and capabilities, and test and validate concepts through experimentation. They offer recognized expertise and experience that is of benefit to the Alliance and support the transformation of NATO, while avoiding the duplication of assets, resources and capabilities already present within the NATO Command Structure (NCS).

Evolution of Centres of Excellence. COEs trace their roots back to the reorganization of NATO's military command structure following the Prague Summit in 2002. After the summit, Allied Command Atlantic became Allied Command Transformation (ACT). ACT became responsible for transforming the Alliance into a leaner, more efficient organization. Specifically, ACT ensures that the Alliance is able to face future challenges by enhancing training, conducting experiments to test new concepts and promoting interoperability within the Alliance. In line with this goal, ACT has used its links with various institutions to direct the transformation of the military structure, forces, capabilities and doctrine of the Alliance. The Joint Air Power Competence Centre in Germany and the Defence Against Terrorism Centre of Excellence in Turkey became the first institutions to receive NATO COE accreditation in 2005 and 2006, respectively.

Role of Centres of Excellence. Although not part of the NCS, they are part of a wider framework supporting NATO Command Arrangements. Designed to complement the Alliance's current resources, COE cover a wide variety of areas, with each one focusing on a specific field of expertise to enhance NATO capabilities.

Coordination. The overall responsibility for COE coordination and utilization within NATO lies with ACT, in coordination with the SACEUR. ACT is responsible for the establishment, accreditation, preparation of candidates for approval, and PA of the centres. The establishment of a COE is a straightforward procedure. Normally, one or more members decide to establish a COE. The idea then moves into the concept development phase. During this phase the Framework Nation (FN) or Nations further develop the concept and provide to ACT information such as the area of specialization, the location of the potential COE and how it will support NATO transformation.

Approval. Once ACT approves the concept, the COE and any NATO country that wishes to participate in the COE's activities then negotiate two Memoranda of Understanding (MoU): a Functional MoU, that governs the relationship between the COE and the Alliance and an Operational MoU, which governs the relationship between participating countries and the COE. Once participating countries agree to and sign the MoU, the COE seeks accreditation from ACT.

Funding Concept. The Alliance does not fund COE. Instead, they receive national or multinational support, with the FN, Sponsoring Nations (SNs) and Contributing Nations financing the operating costs of the institutions. As of 31 December 2019, the closing date of this 15-year report, 25 COE have received NATO accreditation.

Purpose of Centres of Excellence. The primary purpose of COE is to assist with transformation within the Alliance, while avoiding the duplication of assets, resources and capabilities already present within the NCS. They generally specialize in one functional area and act as subject matter experts in their field of expertise. They distribute their in-depth knowledge through training, conferences, seminars, concepts, doctrine, lessons learned and papers. In addition to giving NATO and partner country leaders and units the opportunity to augment their education and training, COE also help the Alliance to expand interoperability, increase capabilities, aid in the development of doctrine and standards, conduct analyses, evaluate lessons-learned and experiment in order to test and verify concepts. In summary, NATO COEs should provide support to NATO in the following broad areas (pillars):

a. Education, Training, Exercise and Evaluation;
b. Analysis and Lessons Learned;
c. Concept Development and Experimentation;
d. Doctrine Development and Standardization.

3. The Joint Air Power Competence Centre

What is the Joint Air Power Competence Centre? The JAPCC is NATO's dedicated Air and Space Warfare Centre. It was established on 13 December 2004. A Functional MoU was signed with ACT by representatives from 16 Nations; subsequent to accreditation and activation, Romania joined as a SN. The Centre was accredited as a NATO COE and has held the status of an International Military Organization (IMO) since 1 June 2005. This section now describes what the JAPCC is and how it functions.

JAPCC Evolution. The JAPCC has evolved and reorganized throughout its existence in order to remain effective, resource-efficient and ultimately relevant. The JAPCC emerged out of the Reaction Forces Air Staff (RFAS) as NATO's first COE. RFAS was a Cold War construct operating in support of the two Air Component Headquarters. Following the fall of the Berlin Wall, the Alliance looked to claim the so-called 'Peace Dividend' and the NCS was rationalized. Staff work to explore the effects of a closure of RFAS identified that if RFAS was to disappear, there would need to be an equal, compensating uplift of staff officers within the Air Headquarters. Since its creation in 2005, the JAPCC has had several distinct 'epochs' as follows:

a. **2005–2010.** As the first NATO COE, the JAPCC developed many of the practices that are the bedrock of all the now 25 currently accredited COEs.[3] The JAPCC had two principle foci: The continued evolution of air forces in an ever-changing world and Air and Space Powers' role in Counter Insurgency (COIN). A significant amount of the JAPCC's output was described as *'blue-skies thinking'.*

b. **2010–2014.** A period of enforced austerity with many Nations cutting their military budgets significantly which saw the JAPCC's relevance and continued existence questioned. In 2013, the SC directed the JAPCC to reorganize[4] in order to reduce the resource requirement as well as re-balance its efforts so that whilst maintaining a focus on the future, substantial effort could simultaneously be directed to support NATO activity in the present. The latter part of this period saw the end of ISAF, the Russian annexation of Crimea and the emergence of the Islamic State of Iraq and the Levant (ISIL). These events led to the concept of the Alliance and Partners having to evolve again in order to confront what has been described as the 360° challenge.[5] Note that the 2012 PA suggested that the JAPCC could be more effective in the areas of Education and Training as well as Lessons Learned. This recommendation was absorbed and as this publication demonstrates, the JAPCC now makes a considerable contribution across all areas of COE endeavour.

c. **2014–2019.** A reorganized and revitalized JAPCC with more robust governance of its output. Whilst continuing to compete for scarce resources, the JAPCC demonstrated that, as NATO's Air and Space Warfare Centre, it was both an irreplaceable component in the system of systems that delivers NATO Air and Space Power and that it was delivering effect in a truly resource-efficient manner; output far exceeds investment. Put another way, the JAPCC is extraordinary value for money!

JAPCC Vision

'Be NATO's catalyst for the improvement and transformation of Joint Air and Space Power; delivering effective solutions through independent thought and analysis.'

3. ACT COE Catalogue 2020.
4. The JAPCC reduced support staff overheads, rationalized its structure down from six to four branches while concurrently maintaining its long-term vision but re-prioritizing some resources away from transformational activity toward support to current operations and training.
5. The need to defend against the threat posed by Russia, the threats emanating from North Africa and the Middle East; primarily the risks of mass migration and acts of terror.

JAPCC Mission

'The JAPCC, as a team of multinational experts, is to provide key decision-makers effective solutions on Air and Space Power challenges, in order to safeguard NATO and the Nations' interests.'[6]

Location and Facilities. The Framework Nation (FN), Germany, has provided facilities on the von-Seydlitz-Kaserne for the JAPCC. These consist of two buildings, one of which houses the offices and working spaces for the SMEs, including security for classified material and NATO Secret Wide Area Network (WAN) system. The second includes the publications section, Financial Controller (FINCON), and a modern conference facility built specifically for the JAPCC. The conference facility is used to host not only the Steering and Senior Resources Committee but, also many of the working groups that JAPCC chairs, participates in or, simply hosts as a centrally-located, conference/meeting venue.[7]

JAPCC Location – The Air C2 Cluster. The JAPCC is located in close proximity to several other NATO and FN organizations, including but not limited to: NATO Combined Air Operations Centre – Uedem; German Air Force Air Operations Command (Zentrum Luftoperationen – ZLO) HQ; German Space Situational Awareness Centre (GSSAC), soon to be the German Space Operations Centre (GSpOC); and the German Joint Force Air Component (JFAC) HQ. This presents many opportunities for JAPCC to draw in additional subject matter experts to contribute to research efforts, working groups, and the Air

6. Current Mission and Vision were established by the Director and agreed by the Sponsoring Nations (SNs) at the Steering Committee of 2013. The JAPCC's Mission and Vision are re-assessed on a regular basis by the Steering Committee to ensure continued relevance.
7. Readers are encouraged to consider the JAPCC as a potential future meeting or conference venue.

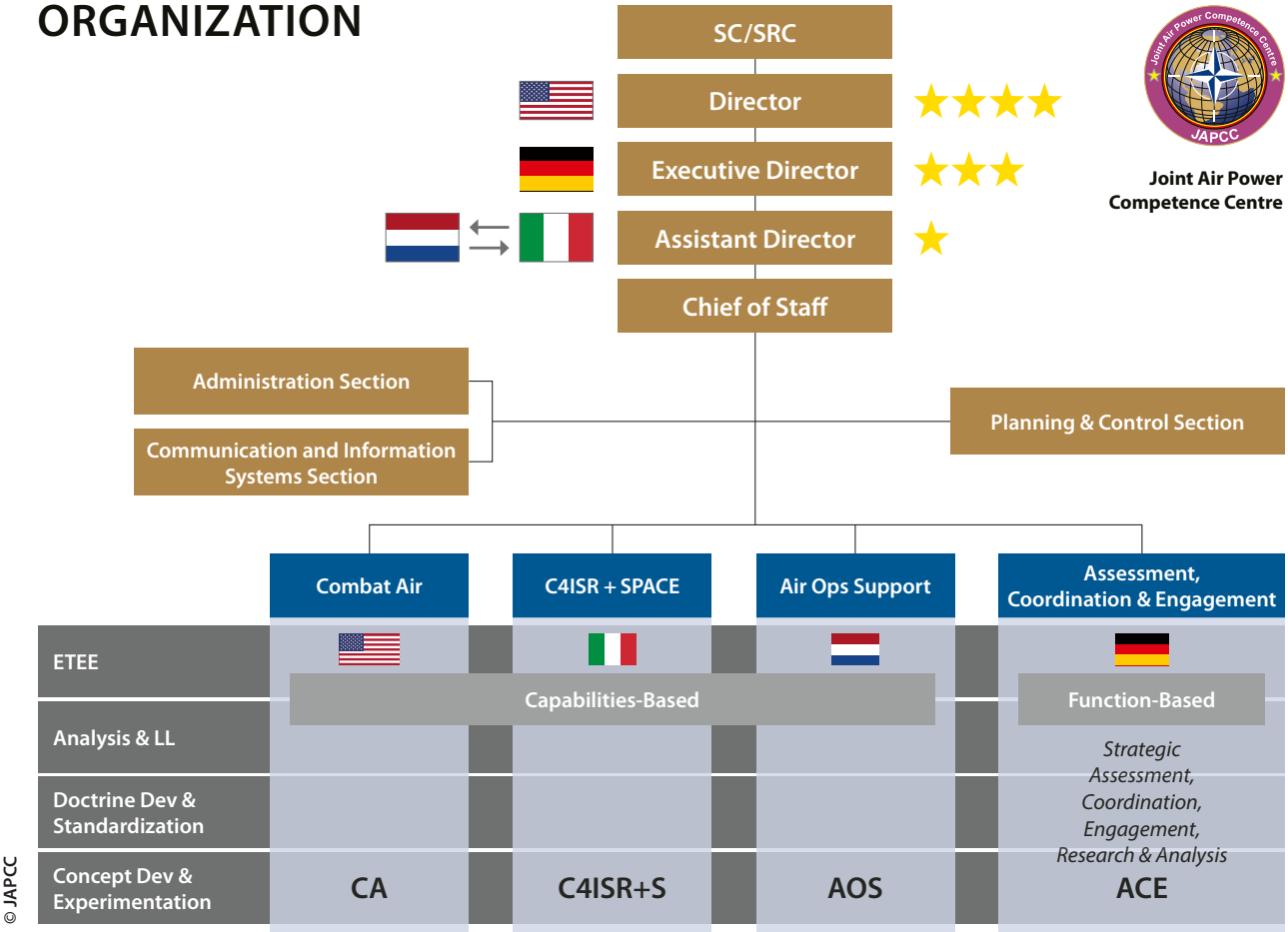


Figure 1: Organization.

OPFOR team in NATO exercises, and to collaborate on other matters including supporting the FN exercise KALKAR SKY and the NATO AIRCOM exercise RAMSTEIN AMBITION, as well as the German Air Force Air C2 Course.

Part of a larger Community of Interest. As the first and largest COE, the JAPCC is at the heart of the COE community. Several Letters of Agreement regulate the cooperation with the Analysis and Simulation Centre for Air Operations (CASPOA), the European Air Group (EAG) and the Competence Centre for Surface-Based Air and Missile Defense (CC-SBAMD – formerly the Extended Air Defence Task Force (EADTF)) among others. Other Letters of Agreement are currently under development.

JAPCC Organization. The JAPCC is currently composed of 16 sponsoring NATO Nations with Germany as the FN.[8] The JAPCC is organized into four main branches,[9] three of which provide capabilities based expertise while the fourth branch has officers assigned to coordinate support across the four COE pillars in areas including but not limited to: Exercise support, Education and Training, Lessons Learned, Doctrine and Concept Development, NATO Defence Planning Process, and Capability Development *(see Figure 1)*.

8. Belgium, Canada, Czech Republic, Denmark, Germany, Greece, Hungary, Italy, The Netherlands, Norway, Poland, Romania, Spain, Turkey, United Kingdom, United States of America.
9. Though not depicted here because of the historical nature of this document, on 1 Jul. 2020 the JAPCC restructured to add a separate fifth branch for Space, in order to enhance the Centre's ability to better address the growing amount of Space-related work for NATO following the declaration of Space as a domain of operations in Dec. 2019.

Figure 2: JAPCC Subject Matter Areas.

Figure 2 shows the Subject Matter Areas (SMAs) in the four Branches.

JAPCC Jointness. It is important to note that JAPCC is a *truly* **JOINT** organization and not simply an Air Force-focused one. The JAPCC staff includes Air Force, Army and Navy SMEs from the Air, Land, Maritime, Space and Cyberspace domains, and collaborates with other COEs such as Combined Joint Operations from the Sea (CJOS) and Confined and Shallow Water Warfare (CSW) to provide air and space expertise to projects affecting their physical domains. Of particular note, the JAPCC Assistant Director co-chairs the Maritime-Air Coordination Conference (MACC) with the Commander, MARCOM Air, on an annual basis to address better integration of Air between the two components. Many NATO-level policy documents to which JAPCC contributes are Joint and not just Air-related, such as the NATO Policies for Space, Integrated Air & Missile Defence (IAMD), Electronic Warfare and Force Protection.

Command and Control of the JAPCC. Governance and oversight of the JAPCC is performed by two bodies, the Steering Committee (SC) and the Senior Resource Committee (SRC), in accordance with the JAPCC Operational MOU. The two bodies meet annually at the JAPCC in Kalkar, Germany, on consecutive days.

Steering Committee. The SC is the primary regulating authority for the JAPCC, and provides strategic guidance and advice to the Director of the JAPCC for the effective execution of his mission. The SC is chaired by the JAPCC Director or Executive Director, who are not voting members. The SC is composed of the Chiefs of Air Staff (CoAS) of the Sponsoring Nations (SNs), but they may delegate attendance at the annual SC meeting in Kalkar. The SC approves the JAPCC Focus Areas and the general direction of the associated Programme of Work (PoW).

Senior Resource Committee. The SRC oversees legal, financial, personnel, infrastructure and other administrative matters on behalf of the SNs. The SRC is composed of designated budget/manpower officers from each of the SNs. During the annual SRC meeting the SRC receives a report on the current year's budget execution, previous year's final budget execution, the proposed budget for the following year and the Medium-Term Financial Plan (MTFP) for the subsequent five years. The SRC, on behalf of the SNs, is the approval authority for the following year's budget and the MTFP, as well as for any proposed permanent adjustments to JAPCC Job Descriptions or organizational structure. SRC members normally attend the SC the preceding day.

Senior Leadership. The post of the Director JAPCC is held by a US Air Force 4-Star General, who is also Commander Allied Air Command (AIRCOM), and the post of Executive Director is held by a German Air Force 3-Star General from the Framework Nation (FN), who is also the Commander of the German Air Operations Centre.[10] The JAPCC Directorate is composed of the Director, Executive Director and the Assistant Director. The Director JAPCC reports to the SC. Because the Director and the Executive Director have multiple roles outside the JAPCC, the day-to-day operation of the Centre is guided by the Assistant Director.

Senior National Representatives. Through its Senior National Representatives (SNRs), JAPCC is in continuous touch with the national Air and Space Power-related entities within SNs. Beyond this network, JAPCC's advice is now regularly sought worldwide. This has resulted in contributions to Air and Space Power Conferences and meetings not only in NATO nations but, also in places such as Sweden, Singapore, Japan, and Australia, among others.

Delivering Air and Space Power Excellence. The JAPCC is recognized as source of professional competence and Subject Matter Expertise across the complete spectrum of Air and Space Power. As an independent MOU organization that supports, but is not part of the NATO Command Structure (NCS), the JAPCC has the academic and intellectual freedom to provide impartial and objective advice to Alliance and National decision-makers in support of the transformation of Air and Space power. The JAPCC:

a. Contributes Joint Air and Space expertise to Alliance decision and policy-making processes through active leadership and/or participation in NATO committees, working groups and forums;

b. Researches, develops and champions innovative ideas, concepts and solutions for the transformation and improved interoperability of Joint Air and Space power;

c. Supports NATO Joint operational-level training, exercises and education with high-quality and timely Joint Air and Space power expertise.

JAPCC Knowledge. The JAPCC is NATO's recognized champion for the advocacy and transformation of Joint Air & Space Power. Its role in NATO is unique. There is no other multinational organization affiliated with NATO that offers and retains as much comprehensive knowledge and competence in transforming

10. Unlike most other COEs, the Framework Nation Germany does not hold the Director post. As agreed in the JAPCC Operational MOU and as stated in the *Formal Request for the Activation of a NATO Military Body and subsequent Deactivation of and existing NATO Military Body in Accordance with Parts III, V, and VI to the Annex to C-M(69)22 for the Joint Air Power Competence Centre (JAPCC)/Reaction Force Air Staff (RFAS)*, Enclosure 1, Para 4.b.(2), dated 6 Dec. 2004, 'A 4-star US Air Force General Officer will assume the post of Director JAPCC. The post of Executive Director JAPCC will be manned by a 3-star GE Air Force General Officer.'

all aspects of Air and Space Power. Consequently, JAPCC is the first place to turn to when addressing questions of Air and Space Power transformation.

JAPCC Personnel – The Experts. The JAPCC is staffed with officers at the OF-3 and OF-4 level who are highly experienced in their areas of expertise and support the four pillars of COE work. JAPCC has between 1 and 4 SME posts for each of 26 separate subject matter areas across the Combat Air, Air Operations Support, and C4ISR & Space branches.[11] Each SME or group of SMEs has their own networks across other NATO organizations and entities outside of NATO (e.g. the European Air Group), providing JAPCC a 'network of networks'. This allows JAPCC to pull together multiple areas of expertise to address complex issues. Some examples where networking 7–12 different subject matter areas together include: Integrated Air & Missile Defence (IAMD), Counter-Unmanned Aircraft Systems (C-UAS), Multi-Domain Operations (MDO), Anti-Access Area Denial (A2AD), and building a comprehensive Opposing Forces (OPFOR) Air Team to construct the exercise scenarios and execute 'enemy' or 'Red Air' operations in major NATO exercises such as TRIDENT series and Ramstein Ambition.

a. **Staff Professional Development Opportunities.** JAPCC sends every new Staff Officer SME to the NATO School Oberammergau (NSO) NATO Staff Officer Orientation course, an internally funded Advanced Research Skills course at Lincoln University in the UK, other SME-relevant courses at NSO, and national development programs on a case-by-case basis. Regular Thursday Staff Training Events to educate entire staff on current issues of interest, Counter-Intelligence and FP threats, etc. Some officers may also be afforded opportunities to participate in national professional development opportunities, manning and workload permitting.

b. **Multinational and Joint Perspective.** As of December 2019, 34 of 58 SME staff officer posts are designated in the Peacetime Establishment (PE) manning table as Joint/Multiple-Service or Army or Navy and so can be filled by non-Air Force personnel at the discretion of the bidding nation. Many of these posts are filled by Air Force personnel when that is the service where the expertise resides in the sending nation. At least ten unbid and four unfilled posts are either non-AF or available for Joint fills. JAPCC has obtained SRC approval to change two Job Descriptions to allow civilian fills and has identified five more positions where civilian fills are acceptable, but the changes have not yet been made and SNs have shown no intent to provide civilian fills in-lieu of military.

JAPCC Relevance. In order to remain up-to-date and relevant to NATO, the JAPCC regularly reviews NATO Summit declarations, Political Guidance, and Supreme Allied Commander Europe (SACEUR), Supreme Allied Commander Transformation (SACT) and NATO Air Command (AIRCOM) priorities to determine where to best focus JAPCC resources. JAPCC Focus Areas are reviewed, updated when necessary and approved by the SC and serve to guide the long-term direction of effort for the JAPCC.

JAPCC as a Focal Point. As an accompaniment to relevance, the JAPCC may be considered as a '*Spider in a Web*' sitting at the heart of a huge amount of activity but reaching out and exerting influence on that activity in order to shape thinking and guide the direction of effort. JAPCC has many connections that include but are far from limited to:

a. **With NATO Headquarters.** The JAPCC works directly with NATO HQ International Staff (IS) as an active participant in the Aviation Committee, Air and Missile Defence Committee, NATO Electronic Warfare Advisory Committee and the NATO C-UAS Working Group. It also provides Subject Matter Expertise to Capability Area Facilitators in the Defence Investment Division, NATO HQ.

11. The full list of 26 Capability-based subject matter areas and 6 ACE branch work areas are shown in **Annex A.**

b. **With Strategic Commands.** JAPCC participates with ACT in the development of the Strategic Foresight Analysis (SFA), the Framework for Future Alliance Operations (FFAO), and as requested and able, supports ACT by providing SME expertise to Capability Area Groups in relation to the NATO Defence Planning Process (NDPP). The JAPCC regularly responds to Requests for Support from Allied Command Operations (ACO) both in direct support of operations and in development of directives.

c. **As a Facilitator.** JAPCC Chairs the NATO Air Operations, Air Transport, Air-to-Air Refuelling and the Doctrine Organization and Interoperability (DOI) Panel of the Force Protection Working Group (FPWG), and participates in the Panel on Air and Missile Defence, Helicopter Inter-Service Working Group, Joint Capability Group Vertical Lift, Next Generation Rotorcraft ad-hoc Working Group, NATO Electronic Warfare Working Group, and was Vice-Chair of Aerospace Capability Group 2 (ACG-2) and the Next Generation Rotorcraft Capability Team of Experts. Furthermore, JAPCC is the Chair of the Air Operations Working Group (AOWG) and the Co-Chair of the Bi-Strategic Command Maritime Air Coordination Conference (MACC).

d. **In an Advisory Capacity.** The JAPCC AAR SMEs are members of the Board of Advisors to the NATO Air Force Armaments Group and the Steering Committee for the Air Refuelling Systems Advisory Group (ARSAG). Space SMEs are involved in guiding the development of Space-based support to NATO now that Space has been recognized as an operational domain. They are working closely with the newly-assigned Capability Area Facilitator for Space in the Aviation and Aerospace Capabilities section of the International Staff – Defence Investment (IS-DI) to provide SME support.

JAPCC on the Vanguard of Transformation. The JAPCC is an example in practice of the NATO concept of Smart Defence and perfectly demonstrates the level of cooperation that is really possible between nations. Smart Defence is a concept that encourages Allies to cooperate in developing, acquiring and maintaining military capabilities to meet current security problems in accordance with the new NATO strategic concept; Smart Defence means pooling and sharing capabilities, setting priorities and coordinating efforts in order to achieve best effect.

Current Focus Areas. The JAPCC's currently approved Focus Areas are:

1. Multi-Domain Operations/C2 (Air C2, Tactical C2, Air-Maritime Integration, etc.);
2. Space & Cyber Integration;
3. Rotary Wing/Vertical Lift Transformation;
4. Joint ISR & Big Data Management;
5. Integrated Air and Missile Defence;
6. Electromagnetic Spectrum Operations (SEAD/EW/Mission Data);
7. Logistics Support to Air Operations (Logistics, Air Mobility/Transport/AAR);
8. Force Protection;
9. Unmanned Air Systems/ Countering Unmanned Aircraft Systems;
10. Emerging Technologies (5^{th} Gen Integration, AI, Hypersonic Weapons, etc.);
11. Resilient Basing.

Programme of Work. Cascading from the Focus Areas is the JAPCC's Programme of Work (PoW). The PoW sits at the core of all of JAPCC's activity. The PoW exists as a database of those individual activities that JAPCC SMEs are engaged with on a daily basis. At the time of writing, the JAPCC PoW contains more than 150 individually numbered Objectives. An Objective can be virtually any type of activity that is deemed necessary and achievable from within the JAPCC's available resources that supports the Alliance, a Nation(s) and/or Partners. In the main, an Objective will likely be a project, publication or provision of SME support and can be either time-bound or enduring (e.g. to deliver a one-off, clearly defined output or product or, provide ongoing support to routine activity such as a training course). Objectives are regularly reviewed by the Chain-of-Command to ensure

continued progress and where necessary Objectives are re-prioritized to allow emerging work to be incorporated into the PoW. Robust and dynamic management of the PoW is a key element in the day-to-day running of the JAPCC. Day-to-day approval of PoW items is normally delegated to the Assistant Director (AD), who meets periodically with the Executive Director to conduct a comprehensive review.

Budget and Finance. The JAPCC operates using a fixed budget allocated by the SRC annually. The COE presents its funding requirements/forecast to the SRC for approval for the following year in detail, and the 5-year Financial Plan in outline. Sufficient funds for future projects including NATO Requests for Support (RfS) are considered in the establishment of the Medium-Term Financial Plan and the budget estimates. The transparent and proactive relationship with the SRC on all financial issues ensures that the required budgetary credits can be approved by the SRC. In the execution phase, the users of funds are provided with permanently updated, timely information in order to achieve a maximum use of the annual budgetary credits by means of budget transfers or, in order to allow the shifting of potential savings to other projects including RfS at an early stage.

4. JAPCC Annual Events and Enduring Outputs

JAPCC Conference. One of the mechanisms through which the JAPCC aims to influence concept development/adaptation is the JAPCC Annual Joint Air and Space Power Conference. This conference aims to inform a large number of military senior leaders and decision-makers on Air and Space related matters. Being organized since 2005, the conference has successfully addressed very relevant topics for NATO, Nations and Partners. The conference has increased annually in both attendance and influence, with the 2019 Conference attended by more than 340 people, including more than 60 Flag Officers/General Officers (FOGOs) and senior NATO and European Union (EU) civilian officials. The following list is included to provide some examples of the topics discussed:

Year	Theme
2005	How do we ensure that NATO Air Power remains relevant?
2006	The Exploitation of Unmanned Aerospace Capabilities (AC) in the Alliance
2007	The Role of Joint Air Power in Expeditionary Security and Stability Operations
2008	Decision Superiority in the 21st Century
2009	NATO at 60 – The Evolving Air & Space Power Challenges for the 21st Century
2010	NATO Air and Space Power in Contemporary Operations
2011	Understanding Air Power – A Joint Appraisal
2012	Warfare in the 21st Century – Decline or Rise of Air Power?
2013	The Proposal for NATO's Future Air Vision after Afghanistan
2014	Air and Space Power in NATO – Future Vector Project
2015	Air Power and Strategic Communications – NATO Challenges for the Future
2016	Preparing NATO for Joint Air Operations in a Degraded Environment
2017	The Role of Joint Air Power in NATO Deterrence
2018	The Fog of Day Zero – Joint Air & Space in the Vanguard
2019	Shaping NATO for Multi-Domain Operations of the Future

After each conference, the JAPCC produces and publishes the proceedings in order to capture and preserve the findings. These publications are widely used and referenced among NATO entities, NATO Nations and Partners in both day-to-day as well as conceptual work.

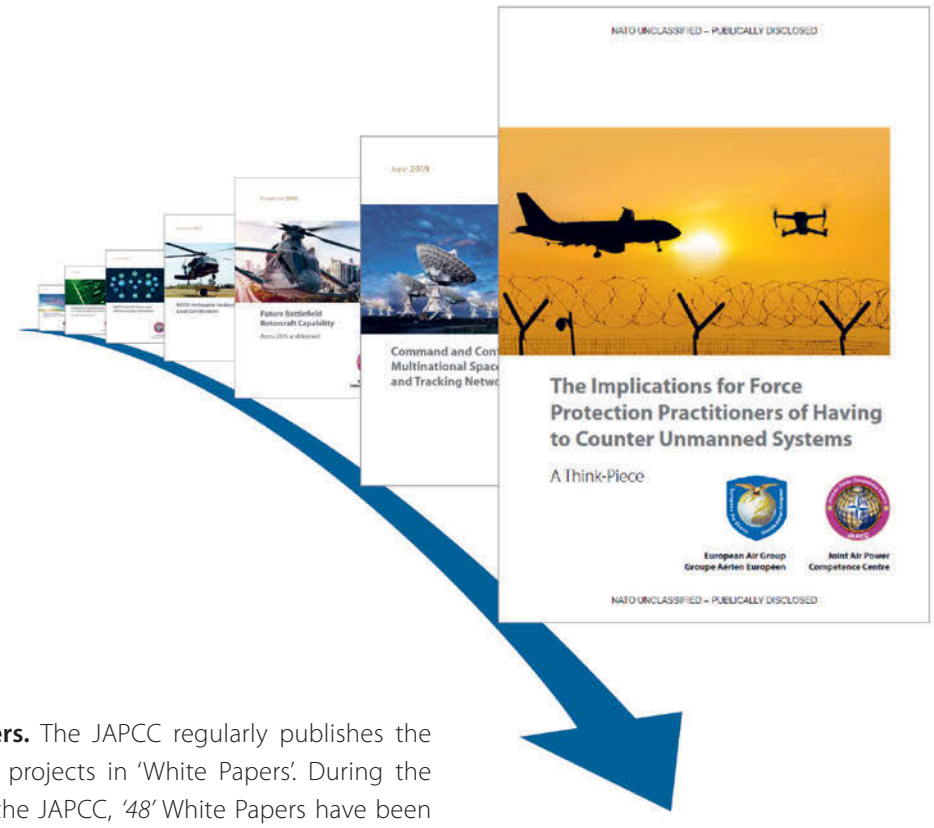
JAPCC Journal. The JAPCC periodically[12] publishes a unique journal, '*Transforming Joint Air and Space Power – The Journal of the JAPCC*'. On average, each year, at least 15–16 articles are published that are designed to promote awareness of the Air and Space power issues of the day through interviews with JAPCC SN Air Chiefs and other senior leaders, as well as through articles from both JAPCC Staff Officers and external authors. The principle focus of the majority of articles is the presentation or discussion of concepts for future development and evolution of Alliance capabilities. Some recent articles include:

a. Future Command and Control of Electronic Warfare.
b. Space Resilience – Why and How?
c. Challenges of Future SEAD Operations.
d. The Future Role of Artificial Intelligence.
e. Multi-Domain Command and Control.
f. Unmanned Systems in Anti-Submarine Warfare.
g. Hypersonic Vehicles – Game Changers for Future Warfare.
h. Countering Anti-Access/Area Denial (A2AD).

Think Tank Forum. Since 2014 the JAPCC has organized an annual Think Tank Forum (TTF) that brings together representatives from Air Warfare Centres and Defence Colleges of the JAPCC SNs and other invited nations. Normally 10 to 12 nations participate in sharing programmes of work and identifying areas of common concern on which to collaborate to more effectively and efficiently in finding usable solutions.

Joint Air and Space Power Network. The Joint Air and Space Power Network Meeting (JASPN) also initiated in 2014 and hosted at the JAPCC, is similar in purpose to the TTF, but includes organizations rather than Nations. The latest JASPN meeting, in November 2019 was attended by NATO International Staff/Defence Investment (IS/DI), AIRCOM, European Defence Agency (EDA), EAG, European Air Transport Command (EATC), European Space Agency (ESA), NATO Science and Technology Office (STO), the Air Operations COE, the CC Surface-Based Air and Missile Defence (SBAMD), Movement Coordination Centre – Europe (MCCE), and a representative of the soon-to-be established IAMD COE.

12. The JAPCC aims for two Journals per 12-month period with Jun. and Dec. as publication target dates.



White Papers. The JAPCC regularly publishes the outcome of projects in 'White Papers'. During the 15-years of the JAPCC, *'48'* White Papers have been produced on a huge range of subjects from *Force Protection* to *Air Warfare Communication in a Networked Environment to Multinational Space Situational Awareness*. A complete list of all White Papers published by the JAPCC to date can be found at *Annex C* however, some examples with basic descriptions are provided below:

a. ***Standardization of Qualifications for NATO Helicopter Crews in Support of Land Operations,*** 2015. This paper was used as the basis for ATP-3.2.49 Use of NATO Helicopters in Support of Land Operations.

b. ***NATO/Multinational Joint Intelligence, Surveillance and Reconnaissance Unit – A Feasibility Study,*** 2015. This paper assessed the challenges and benefits of a potential Joint ISR Unit to augment NAEW&C and NATO AGS.

c. ***Alliance Airborne Anti-Submarine Warfare – A Forecast for Maritime Air ASW in the Future Operational Environment,*** 2016. It was produced in response to direct Request for Support from COM MARCOM. It has informed NATO and UK planning as well as follow-on classified work.

d. ***Future Unmanned System Technologies – Legal and Ethical Implications of Increasing Automation,*** 2016. This study examined concerns about human-machine interaction and legal and ethical implications regarding machine decision-making.

e. ***NATO/EU Air Transport Training, Exercises and Interoperability,*** 2016. This presents a summary of existing NATO and EU-sponsored training programs and Airlift capabilities with suggestions to improve cooperation and efficiency.

f. ***Mitigating Disinformation Campaigns Against Air Power,*** 2017. Provided a detailed analysis of internal strategic communications regarding Air Power in five nations in order to help NATO prepare to counter adversary misinformation campaigns. The project included the development of a course module that is now included

in a '*STRATCOM and Air Power*' Seminar overseen by the NATO HQ Strategic Communications Office.

g. Air Warfare Communication in a Networked Environment, 2017. This paper examined how Nations and NATO can keep up with the exponential rate of expansion of computer and communication technology and be able to fight in air and space at the speed of relevance. The findings of this publication were briefed to NAEW&C organization at the commander's request.

h. NATO Joint Air Power and Offensive Cyber Operations, 2017. This paper addresses how a Defensive Alliance could leverage Nations' sovereign offensive cyber capabilities to deter and when necessary counter adversary actions. This paper was very well perceived by Nations and fostered widespread discussion about this topic.

i. NATO Helicopter Underslung Load Certification, 2017. Due to the very limited cross-national interoperability for helicopter sling-load operations, this paper offered several suggestions for improving certification and capability for multinational helicopter support to operational commanders in the future and has resulted in the development of the Helicopter Underslung Load (USL) and Helicopter Underslung Load Equipment (HUSLE) certification and interoperability database.

j. Think-Piece on Force Protection Command and Control, 2018. Developed in cooperation with the European Air Group (EAG), this study affirmed that a key component of airbase protection is a dedicated, air-minded Force Protection (FP) force that are specifically trained and organized for the task in multinational environments and has directly influenced FP concepts. The whitepaper is used by individual NATO Nations, international organizations and other entities in order to inform development of capability.

k. Future Battlefield Rotorcraft Capability – Anno 2035 and Beyond, 2018. This paper examined the possible operational and physical environments in

which rotary wing/vertical lift craft will operate. It outlined capability concerns regarding the next generation of rotorcraft with which many nations will recapitalize their vertical lift aircraft inventories.

l. ***The Implications for Force Protection Practitioners of Having to Counter Unmanned Systems – A Think-Piece,*** 2019. Developed in cooperation with the European Air Group (EAG), this paper addressed potential solutions to counter the increasing threat from Low, Slow and Small (LSS) unmanned systems and whether this requires extensive new technology or if it can be done effectively using existing Force Protection TTPs and tools. This product has been briefed to the NATO C-UAS Working Group in NATO HQ. In addition, individual nations are already adopting broader counter-threat methodologies as recommended in this paper.

m. ***Command and Control of a Multinational Space Surveillance and Tracking Network,*** 2019. Five European nations track space objects and debris. The paper concluded that NATO must leverage these capabilities along with those of the US to provide support to NATO operations and compose a Recognized Space Picture. This paper is being used as a reference document by the ESA.

JAPCC Flyers. A complete list of all Flyers published by the JAPCC to date can be found at **Annex D.**

5. Achievements, Activities and Partnerships

JAPCC Engagements. JAPCC participates in or chairs multiple NATO working groups and supports multiple NATO Committees (e.g. Aviation, Air and Missile Defence, Electronic Warfare), as well as other COEs (e.g. Command and Control COE, Air Operations COE, Confined and Shallow Waters COE, Centre for Combined and Joint Operations from the Sea, COE for Cooperative Cyber Defence etc.). As described above, the SMEs in the JAPCC come from 16 SNs and collaborate with experts from many more, both within and external to the Alliance. Likewise, the Community of Interest for the JAPCC is a true network of networks. In addition to NATO accredited COEs, JAPCC collaborates robustly with National Air Warfare Centres and Defence Colleges from all 16 SNs, as well as, organizations including, but not limited to:

a. NATO HQ (primarily Defence Policy and Planning (DPP) and Defence Investment (DI));
b. Allied Air Command (AIRCOM);
c. NATO Joint Warfare Centre (JWC)*;
d. European Defence Agency (EDA)*;
e. European Space Agency (ESA);
f. NATO Support and Procurement Agency (NSPA);
g. Competence Centre for Surface-Based Air and Missile Defence (CC SBAMD)*;
h. European Air Transport Command (EATC);
i. NATO School Oberammergau (NSO);
j. NATO Standardization Office;
k. European Personnel Recovery Centre (EPRC);
l. German Air Operations Command – Zentrum Luftoperationen (ZLO)*;
m. German Space Situational Awareness Centre (GSSAC);
n. US Joint Personnel Recovery Agency (JPRA);
o. European Air Group (EAG).

*(*JAPCC has formal, written agreements with these organizations.)*

Engagement with Industry and Academia. In order to provide comprehensive outputs, the JAPCC has substantial engagement with both Industry and Academia. More detail can be found under the heading of 'Research and Development' on page 23.

Achievements. Since its accreditation as a NATO COE, JAPCC counts a host of activities as achievements in terms of developing, enabling and advocating Air and Space Power. The reader will note that these achievements, while primarily serving the Alliance, have delivered capability enhancements beyond 'just' NATO. Equally, it is not only Air stakeholders who have benefitted from JAPCC activity but actors and organizations from across the spectrum of

Combined, Joint, Multi-Domain and Comprehensive[13] operations/activity. The list below highlights some of the JAPCC's key achievements:

a. **2009 Air-Land-Maritime Integration.** Development of a study on the effectiveness and relevance of Joint Air and Space Power as critical elements in Air, Land and Maritime integrated operations.

b. **2009 Kabul International Airport Force Protection Review.** A piece of work conducted in Afghanistan to review the FP arrangements for Kabul International Airport (KAIA), reorganize the Ground Defence Area (GDA), rewrite defence plans and make recommendations to increase FP effectiveness in a resource-efficient manner. This work was carried out as a project on behalf of Joint Force Command Brunssum.

c. **2011 Air and Space Contribution to the C-IED Fight.** Several discreet pieces of work again involving deployments to Afghanistan in support of NATO's Counter Improvised Explosive Devices (C-IED) Task Force. This led to the production of two White Papers looking at the Air and Space Power Contribution to C-IED Fight as well as the delivery of Education and Training to support NATO entities. Further training support was provided to ACT employed civilians and NATO-employed civilian contractors.

d. **2011 Personnel Recovery.** Published a white-paper on Personnel Recovery which contained recommendations that included the creation of a European Personnel Recovery Centre (EPRC). This concept was embraced and taken forward by the EAG, supported by JAPCC.

e. **2011–2013 Operation UNIFIED PROTECTOR.** The JAPCC conducted a number of activities in support of Operation UNIFIED PROTECTOR (OUP)[14] to include Air Command and Logistics Support activity Lesson Identified.

f. **2012 Air and Space Power in Counter-Piracy Operations.** Development of a study providing an insight on Air and Space Power contribution to Counter-Piracy off the Horn of Africa by determining the best composition of Air and Space assets in for this type of very specific mission.

g. **2012 Regional Fighter Partnership.** Development of a Regional Fighter Partnership, implementation considerations study in support of the Smart Defence concept.

h. **2013 Exercise Support.** Established agreement with the NATO Joint Warfare Centre (JWC) in 2013 to provide Air expertise for TRIDENT Exercise development and OPFOR Air execution. The Red-Air component has since expanded to include A2AD, IAMD, Cyber and Space elements.

i. **2014 Future Vector Project.** This was a major project that looked in-depth at the gaps in NATO Air and Space Power in the 2012/13/14 time frame and at both short (2020) and longer-term recommendations for both military and political solutions to ensure the sustainment and future adequacy of NATO Air and Space Power. This product was used to inform the development of the NATO Joint Air Power Strategy (JAPS).

j. **2014 Air-to-Air Refuelling.** The JAPCC developed and maintains the global Air-to-Air Refuelling (AAR) Compatibility Matrix.

k. **2014 Specialized Heavy Air Refuelling Course.** The Specialized Heavy Air Refuelling Course or 'SHARC' was developed and run by the JAPCC.

13. NATO's Strategic Concept, adopted at the Lisbon Summit in Nov. 2010, underlines that lessons learned from NATO operations show that effective crisis management calls for a comprehensive approach involving political, civilian and military instruments.
14. In Feb. 2011, NATO answered the United Nations' (UN) call to the international community to protect the Libyan people. In Mar. 2011, a coalition of NATO Allies and partners began enforcing an arms embargo, maintaining a no-fly zone and protecting civilians and civilian populated areas from attack or the threat of attack in Libya under Operation UNIFIED PROTECTOR (OUP).

l. **2016 Department Head for Space Support in Operations.** The JAPCC assumed this role in accordance with NATO Education, Training, Exercises and Evaluation (ETEE) Policy MC 0458/3[15].

m. **2016 ATP-3.3.6, NATO FP Doctrine for Air Operations.** Based on a request from the Nations, through the NATO Air Operations Working Group (AOWG), JAPCC wrote, facilitated through to ratification and continues to act as Custodian of this document.[16]

n. **2016 Exceptional Service to Air Refuelling.** Recognized by US Undersecretary of the Air Force for International Affairs at Aerial Refuelling Systems Advisory Group (ARSAG) meetings for Exceptional Service to Air Refuelling for 2016–17 and 2017–18.[17]

o. **2017 Urgent Priorities After Warsaw.** This project was a HQ SACT sponsored in-depth study of the status of implementation of recommendations from Future Vector, along with priority shortfall areas identified at the Wales and Warsaw summits, and resulted in a published volume containing approximately 163 distinct recommendations. This study was used to perform a gap analysis on the NATO JAPS before it was finalized.

p. **2017 Air-to-Air Refuelling Clearances and Training.** JAPCC developed both AAR Clearance training and an accompanying table-top exercise, designed to significantly improve capacity through expanding the number of NATO officers qualified to serve as tanker planners in NATO and National Air Operations Centres.

q. **2017 Helicopter Users Database.** The JAPCC has developed and continues to manage the Helicopter Users Database. This task was undertaken in response to a RfS from NATO's Maritime Component Headquarters' Air Section (MARCOM AIR).

r. **2018 Joint Air Power Strategy.** JAPCC contributed to the writing of the first-ever Joint Air Power Strategy (JAPS) for NATO. This was a multi-year effort that led to follow-on tasks from NATO in which JAPCC has also performed key roles.

s. **2018 Interoperability Studies.** JAPCC participated in both ACT and Allied Command Operations (ACO) writing groups in order to deliver the JAPS Interoperability Studies.

t. **2018 Force Protection Policy.** The International Security Assistance Force (ISAF) era demonstrated that there was a huge disparity of understanding across the Alliance as to what constituted 'Force Protection', to resolve this challenge, the JAPCC developed NATO's first FP capstone document – MC-0656, *Military Committee Policy for the Force Protection of Alliance Forces*.

u. **2019 New Metric for Air Level of Effort.** The JAPCC led the New Metric for Air Level of Effort study in support of ACT to answer a North Atlantic Council (NAC) task following the publication of the JAPS. The study was endorsed by the Council and used to inform the Political Guidance for 2019.

v. **2019 Personnel Recovery Partnership.** US Joint Personnel Recovery Agency (JPRA) engaged JAPCC to established a partnership for the MCDC 2019–2020 project entitled 'JPR 2040 – A Global perspective'.

15. The Department Head is responsible for translating NATO E&T requirements into solutions for the individual and collective training spectrum to prepare the NATO Command and Force Structure for current and future missions in accordance with the Alliance's Level of Ambition (LOA) – Bi-SC Dir 075-002, 'Education and Training Directive (E&TD)', 6 Sep. 2016.
16. The JAPCC is in the process of reviewing this publication.
17. The *Exceptional Service to Air Refuelling* award is recognition from a major body in the US/NATO/Partners air-to-air refuelling community, two years in a row, for the extensive work the JAPCC has done in developing the SHARC course, the AAR Clearance Training and Tabletop Exercise, and in creating, growing and maintaining the AAR Compatibility Matrix which all contribute to the development of greater human capacity in non-US NATO nations of AAR planners to serve on staffs and in Operations Centres planning and executing AAR missions. This was all growth out of OUP Lessons Learned.

Committees and Working Groups. JAPCC routinely participates in NATO committees, meetings, working groups and panels covering an extensive field of expertise related to Air and Space Power and beyond; these include:

a. JAPCC is an active participant in the Air Defence Committee and the Panel on Air Defence.

b. JAPCC officers have chaired:
   (i). Air Operations Working Group (AOWG);
   (ii). Doctrine, Organization and Interoperability Panel of the NATO Force Protection Working Group (FPWG);
   (iii). NATO Air-to-Air Refuelling (AAR) Panel;
   (iv). Aerial Refuelling Systems Advisory Group (ARSAG) Interoperability Group;
   (v). Joint Intelligence, Surveillance, Reconnaissance (JISR) Panel;
   (vi). NATO Air-to-Air Refuelling Working Group;
   (vii). NATO Air Transport Working Group.

c. The JAPCC co-chairs or has co-chaired:
   (i). The Maritime Air Coordination Conference;
   (ii). NATO Air Capabilities Group 2.

Concept Development. While the JAPCC plays a major role in the development of Policy and Doctrine (on the following page), the JAPCC, in its role as NATO's Air and Space Warfare Centre, also acts as a '*think-tank*' creating, developing and contributing to the development of concepts. The JAPCC contributes to concept development both within its specific area of expertise and more broadly. Some examples of the JAPCC's concept development work:

a. At the request of the International Military Staff, JAPCC created a draft Military Concept for NATO Integrated Air and Missile Defence.

b. As a result of an internal initiative JAPCC wrote the Strategic Concept of Employment for Unmanned Aerial Systems in NATO. It describes a capabilities-based approach to UAS employment, which enhances the joint and coalition operator's ability to execute assigned missions and tasks. The concept was developed in close coordination with the United States Joint UAS COE, the NATO UAV Panel community representing all NATO nations and NATO institutions involved in UAS operations.

c. In support of Allied Air Command, JAPCC developed a concept for Joint Forces Air Component (JFAC) Key Leader Training.

d. The JAPCC contributed to both the NATO Warfighting Capstone Concept and the NATO Counter-Terrorism Concept.

e. JAPCC contributes important insights into the development of concepts, by providing credible and realistic Air, Space and Cyber training through the provision of Opposing Force (OPFOR) in cooperation with the JWC during the 'TRIDENT' exercise series.

f. Contribution to the development of the NATO Integrated Air & Missile Defence Concept of Operations.

g. Supported the development of the Bi-Strategic Command Air Command and Control Vision and Concept.

Support to Concept Development. In addition to the activity above, the JAPCC has engaged in a range of other activities that either directly or indirectly support NATO concept development activity:

a. AAR Clearance Training/Table-Top Exercise (TTX) (in cooperation with European Air Transport Command (EATC), training and exercise in utilizing Compatibility Matrix and gaining clearances for ATO production).

b. Global AAR Strategy Team development (in cooperation with EDA, NATO HQ/IS and national agencies).

c. 5th Generation Platform Integration (in cooperation with EAG, USAFE, AIRCOM).

d. Co-lead with US-Joint Personnel Recovery Agency on 'JPR 2040' project, under the US Joint Staff J7's Multinational Capability Development Campaign.

Development of Policy on Behalf of NATO. The JAPCC has contributed to the development of the following NATO policies and strategies:

a. C-M(2002)50 (Part of NATO Security Policy), *Protection Measures for NATO Civil and Military Bodies Deployed NATO Forces and Installations (Assets) Against Terrorist Threats* (JAPCC-led revision on behalf of the NATO Office of Security).

b. MC-0656, *Policy for the Force Protection of Alliance Forces* (JAPCC is the author and custodian).

c. NATO Overarching Space Policy, through the Bi-Strategic Command Space Working Group.

d. NATO IAMD Policy through the Panel on Air and Missile Defence, in support of the Air and Missile Defence Committee (AMDC).

e. NATO Joint Air Power Strategy, through HQ SACT.

f. NATO UAS Policy, through Joint Capability Group – Unmanned Aerial Systems (JCG-UAS).

g. NATO Electronic Warfare Policy through the NATO Electronic Warfare Working Group (NEWWG) and NATO Electronic Warfare Advisory Committee (NEWAC).

h. NATO Electromagnetic Spectrum Strategy through the NEWWG.

Work on NATO Doctrine. Since its inception, the JAPCC has made a significant contribution to the development and maintenance of doctrine. This work spans not just the Air and Space domain but, reaches into other domains through the provision of an Air and Space Power input. At the time of writing, the JAPCC is contributing to the development and maintenance of more than 30 NATO doctrine documents including the custodianship of 13. Custodianship includes the oversight of the periodic review and revision process to ensure these documents are kept current, relevant and hence, fit-for-purpose.

Current Doctrine Custodianships:

a. AJP-3.3, *Allied Joint Doctrine for Air and Space Operations;*
b. AJP-3.14, *Allied Joint Doctrine for Force Protection;*
c. ATP-3.2.49, *Use of NATO Helicopters in Support of Land Operations;*
d. ATP 3.3.4 (I), *Air Transport Doctrine;*
e. ATP 3.3.4 (II), *Air-to-Air Refuelling Doctrine;*
f. ATP-3.3.4.1, *Tactics, Techniques and Procedures for NATO Air Movement Operations;*
g. ATP-3.3.4.2, *Air-to-Air Refuelling;*
h. ATP-3.3.4.3, *Tactics, Techniques and Procedures for NATO Air Transport Operations;*
i. ATP-3.3.4.4, *Tactics, Techniques and Procedures for NATO Airborne Operations;*
j. AT SRD 3.3.4.4.1, *Recommended Procedure for Cross Parachuting;*
k. ATP-3.3.6, *NATO FP Doctrine for Air Operations;*
l. AD 80-25, *Allied Command Operations FP Directive*[18].

Current Contributions to Doctrine:

a. AJP-3.3.3, *Air-Maritime Coordination (Part of AMCWG);*
b. AJP-3.4.4, *Allied Joint Doctrine for Counter Insurgency;*
c. AJP 3.6, *NATO Joint EW Doctrine;*
d. AJP-3.7, *Allied Joint Doctrine for Recovery of Personnel in a Hostile Environment;*
e. AJP-3.15, *Allied Joint Doctrine for Countering-Improvised Explosive Devices;*
f. ATP-3.3.3.1, *Maritime Air Coordination Procedures;*
g. ATP 3.3.4.2.1 SRD 1, *Guide to Obtaining AAR Clearances and Compatibility;*

18. While not a doctrine publication, this is a major NATO publication that drives future doctrine development.

h. ATP 3.3.4.2.2 SRD 2, *Recommended AAR Aircrew Certification and Currency;*
i. ATP 3.3.4.2.3 SRD 3, *Tanker Capabilities;*
j. ATP 3.3.4.2.4 SRD 4, *Tanker/Receiver Clearance Compatibility Matrix;*
k. ATP 3.3.4.5, *AAR Boom-Receptacle Requirements;*
l. ATP 3.3.4.6, *AAR Pro-Drogue Characteristics;*
m. ATP 3.3.4.7, *AAR Signal Lights in Hose and Drogue Systems;*
n. ATP-3.12.1, *Route Clearance;*
o. ALP-4.3, *Air Forces Logistic Doctrine and Procedures.*

Work on Procedures and Standards. The JAPCC makes a significant contribution to the development and maintenance of standards and procedures[19], through participation in numerous NATO and international forums including but not limited to:

a. Military Committee Joint Standardization Board (MCJSB), Force Protection Working Group, Doctrine, Organization and Interoperability Panel (Chair).

b. Chairing the ARSAG, Interoperability Panel.

c. Military Committee Air Standardization Board (MCASB):
   (i). Air Operations Working Group (Chair);
   (ii). Air Transport Working Group (Chair);
   (iii). Air-to-Air Refuelling Working Group (Chair)[20];
   (iv). Personnel Recover/Search and Rescue Working Group;
   (v). Aircraft Servicing and Standard Equipment Working Group (ASSEWG).

d. Military Committee Land Standardization Board (MCLSB), Helicopter Interservice Working Group (HISWG):
   (i). Helicopter Underslung Load Equipment (HUSLE) Panel;
   (ii). Helicopter Operations Panel.

e. Military Committee Maritime Standardization Board (MCMSB):
   (i). Helicopter Operations from Ships Other Than Aircraft Carriers (HOSTAC) Working Group;
   (ii). Multinational Through-Deck and Aircraft Carrier Crossdeck Operations (MTACCOPS) Working Group;
   (iii). Maritime Operations Working Group;
   (iv). Amphibious Operations Working Group.

f. NATO Army Armaments Group (NAAG):
   (i). Joint Capabilities Group – Vertical Lift (JCGVL);
   (ii). Joint Capabilities Group – Ground Based Air Defence (JCG-GBAD).

g. NATO Air Force Armaments Group (NAFAG):
   (i). Aerospace Capability Group (ACG)-2[21];
   (ii). ACG-3[22].

h. NATO Naval Armaments Group (NNAG):
   (i). Joint Capability Group – Unmanned Aircraft Systems (JCG-UAS);
   (ii). Above Water Warfare Capability Group (AWWCG).

i. NATO Science and Technology Organization (STO):
   (i). Systems Concept and Integration (SCI)-301 Outlook on Future Related Topics to Space Support in NATO Operations;
   (ii). SCI-308 Resiliency Concepts to Enhance Preservation of NATO Space support;
   (iii). SCI-309 Opportunities for Large Scale Commercial Small Satellites Constellations to NATO Operations;

19. Noting that this is in addition to the JAPCC's Custodianship and Contributor responsibilities outlined elsewhere in this White Paper.
20. JAPCC maintains Standards-Related Documents (SRDs) on the JAPCC AAR webpage that are provided by Nations and Partners and used to populate the Air-to-Air Refuelling Compatibility Matrix.
21. ACG2 is a subgroup of the NATO Air Force Armaments Group (NAFAG), which was created under the auspices of the Conference of National Armaments Directors (CNAD). The ACG2 is underpinned by three subgroups: Air Armaments Sub Group (AASG), the Agent Defeat Working Group (ADWG) and the NATO Universal Armaments Interface (NUAI) Specialist Team.
22. ACG3 is a subgroup of the NAFAG, which was created under the auspices of the CNAD. It is responsible for all aspects of effective survivability and, more particularly, Electronic Warfare (EW) in the aerospace domain and the relevant aspects of the joint domain.

(iv). SCI-311 Collaborative Space Domain Awareness Data Collection and Fusion Experiment;
(v). Applied Vehicle Technology (AVT)-329.

j. NATO Communication and Information Agency (NCIA), BMD Operational Users Group.

k. Co-Chair Bi-Strategic Command Maritime Air Coordination Conference (MACC).

l. German A2AD WG.

m. (USAFE) European F-35 Users' Group WG (UGWG).

n. NATO Aircraft Cross Servicing (ACS) Conference & ASSEWG.

o. Support to NATO SHARC Course[23] & AAR Clearance Requirements Training.

p. Multinational Capability Development Campaign (MCDC) JPR 2040 study with US Joint Personnel Recovery Agency (JPRA).

q. Co-lead in developing ARSAG standardization documents DoD JSB WG5 and chairing the ARSAG Interoperability Panel.

The JAPCC in Support of Education and Training. The JAPCC supports NATO's, the European Union's (EU) and the SN's Education and Training efforts. The JAPCC is the Department Head (DH) for the discipline of Space Support in NATO Operations. In this role the JAPCC coordinates, under HQ SACT DCOS JFD guidance, the identification and development of effective, efficient and affordable E&T solutions for the requirements provided by the Requirement Authority (RA), in accordance with NATO ETEE Policy 0458/3. The RA for Space is SHAPE DCOS SDP. In the role of DH, the JAPCC organizes and conducts an annual Discipline Conference to review related E&T activities. JAPCC was chosen for the DH role due to its recognized expertise in Space matters, its broad network of experts across NATO and multinational and national working groups and committees, and its dedicated interest in supporting transformation efforts of SACT. JAPCC does not provide courses. Instead JAPCC contributes to the development of courses in support of the NATO School at Oberammergau (NSO), and provides facilitators and instructors upon request. Some of the main activities JAPCC contributes to are:

a. Since the last Periodic Assessment, the JAPCC has made significant contribution to C-IED Education and Training, supporting both NATO entities and ACT employed civilian training development and training delivery contractors through JAPCC SMEs developing and presenting courses.

b. JAPCC has played an active role in the Schriever Wargame (Nellis AFB, USA) from preparation to After Action Report.

c. JAPCC offers Command and Control (C2)/Leadership Competence improvement training and has developed an Education and Training model in the area of Command, Control and Leadership Competence improvement. Training can be provided in national and international environments such as the Canadian Forces Air Warfare Centre and the German Air Force Officer School. Training uses low-technology, inexpensive wargames to focus emphasis on understanding and improving decision-making in chaotic environments. The established information database is constantly increasing. It provides access not only to NATO Military environments but also to academies, universities and industry.

d. JAPCC directly supports the Joint Warfare Centre in the NRF/STEADFAST series exercises as member of their Training Team.

23. Hosted by the Deployable Air Command and Control Centre.

e. JAPCC provides support to CAOC Uedem in the preparation phase of exercises. It directly supports the Core Planning Team and has developed a Key Leader Engagement (KLE) training scenario for use during exercises.

f. JAPCC participates regularly in the Bi-SC Education, Training & Exercises Coordination Conference to identify NATO training or exercise events that can be supported by JAPCC. This includes coordination with ACT Joint Force Trainer with respect to their quality assurance initiative for education and training in NATO.

g. JAPCC participates in the NATO Training Synchronization Conferences.

h. Comprehensive Operations Planning Course facilitator at NSO (S5-54).

i. JAPCC provides the primary SME for and leads the Basic Force Protection Course at the NSO (P5-40).

j. JAPCC developed an Advanced Force Protection (Practitioners) Course at the request of both the Nations and the NCS/NFS. A Pilot course ran at NSO in mid-2019. The course is becoming a recognized course and 2 x iterations are scheduled for 2020 (XX-155).

k. JAPCC provides a speaker to the NATO Combined Joint Operations Centre Course (P3-53) at the NSO.

l. Provides instructors to NATO-selected SHARC course (DACCC) & AAR clearance requirement training.

m. Support CCSBAMD Defence Design Planning Course in coordination with AIRCOM on N3-20/134 course at the NSO.

n. JAPCC provides FP briefings to 'Objektschutzregiment' – (DEU FORCE PROTECTION element).

o. JAPCC periodically reviews and provides briefers to the Introduction to Space support in NATO Operations Course at the NSO (N3-01).

p. JAPCC contributes to the development of the Space Support Coordinator Course.

Support Specific to Exercises. In addition to the education and training events described above, the JAPCC also provides a significant number of tailored briefings to support the NATO exercise programme as follows:

a. JAPCC provides briefings on Space Support in Operations to various entities on request (e.g. EUROCORPS, STRIKEFORNATO, 1st DEU-NLD Corps, European Defence Agency (EDA)).

b. JAPCC SBAMD/IAMD SMEs have filled core team positions for exercise Nimble Titan since 2016 in the Wargame Control Group (Deputy WCG Lead) and Analysis and Reporting Team to help shaping a meaningful experiment and to ensure a valid background for the experiment analysis. NIMBLE TITAN is a Missile Defence (MD) campaign of experimentation series in an Integrated Air and Missile Defence (IAMD) context set in a notional scenario ten years in the future. 24 nations from NATO, the Asia-Pacific and the Gulf region, and four organizations (NATO, JAPCC, CASPOA and CC SBAMD) are currently participating in these biennial campaigns. It is the premier forum for developing experimental IAMD policy and military options among allies and partners and building awareness of regional and global deterrent and defensive effects across the missile defence enterprise at the Ministry of Foreign Affairs and Ministry of Defence level.

c. JAPCC actively participates in the biennial Air & Missile Defence exercise Joint Project Optic Windmill (JPOW). JAPCC provides the co-chair for the Operations Control Group in the exercise organization and supports experiments in the CD&E phase of the exercise. The last two editions of JPOW, JAPCC also provided the Exercise

Director. JPOW distinguishes itself from other exercises by including a Concept Development and Experimentation (CD&E) phase in the exercise set-up. This pre-execution segment offers participants the unique opportunity to demonstrate, practice, evaluate and validate different IAMD programmes and concepts. Doctrine, Techniques, Tactics and Procedures (DTTP) can be developed, tested, validated, improved upon and tested again in a test bed environment. Currently, JPOW is a bi-national DEU-NLD led exercise which enjoys strong support from US EUCOM and the US Missile Defence Agency. JPOW has already proven to be a valuable tool in supporting NATO air operations by improving planning and C2 procedures throughout the domain of IAMD.

d. JAPCC participated regularly in Air Training and Exercise Working Group (ATEG) at HQ AIRCOM, in Multinational Solutions Synchronization Conference (MNSS), in Chief of Transformation (COT) Workshop 1 in 2018 and 2019, in NATO Training Synchronization Conference 2018 (TSC 18).

e. Based on a 2013 Letter of Agreement with the Joint Warfare Centre (JWC), JAPCC supports the JWC with a team of Air, Space, IAMD and Cyberspace specialists who participate in the development, preparation and execution of large-scale Joint NATO exercises. The JAPCC leads and provides the core of the Opposing Forces Air, -Air Defence, -Tactical Ballistic Missiles, -Space and -Cyberspace operations during execution to provide a realistic and challenging adversary to NATO training audiences. JAPCC has supported the JWC with the development of the SKOLKAN, SOROTAN, OCCASUS and FIKSO scenarios since 2014. JAPCC also supports AIRCOM with the activities mentioned above for their RAMSTEIN AMBITION exercises[24].

f. JAPCC provides similar OPFOR support to Allied Air Command for exercise RAMSTEIN AMBITION, participating in scenario development and scripting, Main Events List/Main Incidents List (MEL/MIL) development, and exercise execution.[25]

Research and Development. JAPCC maintains relationships with both industry and academia. A significant proportion of the JAPCC's work is designed to enhance capability and staff regularly use the NATO Capability Development, Lines of Development[26] as a handrail when undertaking projects. While this a sound (military) methodology, without understanding how industry and/or academia views a particular challenge, it is difficult to present a comprehensive and balanced view, therefore, the JAPCC has developed partnerships with a variety of leading Air and Space businesses as well as with academic institutions with security studies or, related subject faculties. These relationships may be described as 'symbiotic' and are all conducted with an understanding that all engagement is 'Without Prejudice'. Unfortunately, Commercial and Academic sensitivities preclude any detailed discussion of research and development activities/partners here, however, some highlights are:

a. Industry

(i). Industry Round Table discussions and regular attendance of industry representatives during the JAPCC Annual Conference.

(ii). The establishment in 2013 of a JAPCC enhanced research capability.

(iii). Establishment of an upgraded comprehensive Intelligence Network in addition to a cooperative approach with civil intelligence providers that guarantees robust, high-quality research results.

(iv). JAPCC is active in supporting both the NATO HQ, Emerging Security Challenges Division and the NATO Consultation, Command and Control Agency (NC3A).

24. Without the support JAPCC has provided since 2013, the TRIDENT and RAMSTEIN AMBITION exercises would still lack a viable Air piece in the exercise. The 'added value to NATO' cannot be overstated here.
25. Ibid.
26. Doctrine, Organization, Training, Materiel, Leadership, Personnel, Facilities and Interoperability (DOTMLPFI).

(v). C-IED Capability Development activity. JAPCC SMEs have deployed to Operational Theatres on behalf of customers, to include industry, to undertake research activity.

(vi). Development of possible Decision Support Tools.

b. Academia. The JAPCC is continuously developing its links to academia, looking to gain specialist input in areas as diverse as law, engineering and Human Factors analysis. A piece of work currently underway sees academia using NATO publications as study texts and work to develop true international standards vice simple NATO Standards.

JAPCC Work on Research and Development. JAPCC develops and published significant research projects that include but, are not limited to:

a. Three volume publication entitled: *'Air and Space Power in NATO – Future Vector'* (published 2014) including Vol. I *'Present Paradox – Future Challenge',* Vol. II *'Future Vector Part I'* and Vol. III *'Future Vector Part II'.* This project examined the identified capability gaps and shortfalls in NATO Air & Space Power and recommended viable solutions to strengthen the Alliance and enhance deterrence.

b. *'Joint Air Power Following the 2016 Warsaw Summit – Urgent Priorities'* (published 2017). This project identified 163 recommendations for improvements in Air & Space Power capabilities and competencies spanning low-/high-cost and short-/long-term, matrixed.

Contributions to Research and Development. JAPCC also contributes to the following activities:

a. Alliance Future Surveillance and Control Project (AFSC). JAPCC provided SME support to SACT and NSPA AFSC Project Office in this NATO project. Aim of the AFSC project is to conceptualize the follow-on capability of the NATO AWACS fleet which will retire around 2035. In the 2018–2019 timeframe, Refined Requirements and Knowledge Gap Analysis was conducted. Furthermore, Operational Assessment criteria for the down-selection of industry-provided High Level Technical Concepts were developed. The current status for the industry is to provide High Level Technical Concepts by the end of 2019. The Project Group will down-select the two most promising concepts for further development in the follow-on Risk Reduction and Feasibility Study. JAPCC SME supported all relevant PO/ACT/ACO Workshops and attended three SPC meetings.

b. Multinational Capability Development Campaign (MCDC) 2019–2020 Project JPR 2040. Based on a Request for Support from the designated project leader US Joint Personnel Recovery Agency (JPRA), JAPCC provided an SME to support the project. The aim of the project is to provide recommendations based on assessments and the prioritization of the enduring gaps and seams, while considering likely future operational environments and trends related to JPR and focusing on the preparation and execution phases of the JPR system.

c. JAPCC is involved in the Next Generation Rotorcraft Capability (NGRC) studies. JAPCC is co-leading the JCGVL NGRC WG with UK. The intent of this WG is to provide Allies with a SOI for a future NATO medium rotorcraft (>2035). The pre-concept study will extend till summer 2020 and the concept study until summer 2021. Furthermore, JAPCC is supporting the STO-Applied Vehicle Technology Panel 329: NGRC Impact on Military Operations. The AVT329 will help NGRC WG develop the SOI by defining the trade space for the NGR.

d. A JAPCC/EAG Counter-Unmanned Systems white paper identified an emerging work strand to support the development of a FP Decision Support tool. JAPCC is working with the UK, who are currently funding ongoing development, and the AIRCOM FP Cell. The JAPCC is supporting AIRCOM with the aim of making this tool available to NATO, once fully developed (estimated delivery date is the end of 2021).

e. JAPCC is now engaged with MILENG COE to assist in development of a MILENG Support to FP Planning Tool to harmonize efforts and ensure no duplication with the FP Decision Support tool.

Work on Lessons Identified and Lessons Learned. Lessons Identified and Lessons Learned (LI/LL) together with recognized 'best practices' are routinely incorporated in the majority of JAPCC's activities. The internally established methodology for producing system assessments, 'Flight Plans' and 'Roadmaps' analyses current processes and capabilities, evaluates where gaps exist in meeting current and future requirements and ultimately offers solutions on how to overcome those gaps. As examples, the JAPCC worked with JFC Brunssum to identify lessons from operations and feed them into NRF Capability Development in the areas of FP and C-IED and at the request of the then Air Command Izmir, deployed two SMEs to assist in the collection of Lessons Identified from OUP. More recently, the JAPCC is engaged with HQ SACT and the Joint Allied Lessons Learned Centre (JALLC) in order to support the NATO Lessons Learned development processes through the following efforts:

a. JAPCC participates in every NATO COE LL Workshop and every NATO LL Conference.

b. JAPCC took part in the 2019 COE LL Workshop, where COEs shared experiences and best practice related to Lessons Learned Structure, Tools and Training in COEs and worked on coordinating their LL efforts and understanding.

c. The LL SO is regularly observing the NLLP and the home page of JALLC for information relevant to the JAPCC (Analysis, LI, LL).

d. The Exercise Support SME contributes a post-exercise report to the JWC after each TRIDENT exercise execution to inform overall LL development.

e. JAPCC developed the Specialized Heavy Air Refuelling Course (SHARC) in 2014 to train NATO officers to perform as tanker planners in NATO Air Operations Centres, directly as a result of LL from Operation Unified Protector (OUP) in Libya. This course was first provided at the NATO CAOC-Uedem and subsequently transitioned to the DACCC.

f. The AAR Compatibility Matrix developed by JAPCC was also an outgrowth of the LL from OUP, intended to provide a useable and centralized source of tanker and receiver compatibility information for operational planners.

g. JAPCC provides a feedback questionnaire to attendees of the annual Joint Air and Space Power Conference to solicit suggestions for improvement, action items and future topics. The 2019 Conference yielded a 40 % response rate, with 122 returned surveys, some of which fed development of the 2020 conference theme.

JAPCC Contribution to Interoperability. The contribution of JAPCC to developing and/or increasing 'interoperability' is inherent in all of the JAPCC's work. Through its numerous chairmanships and memberships in various NATO Boards, Working Groups, Panels and Drafting Groups, the JAPCC exerts considerable influence on NATO's endeavours to enhance interoperability. Examples for JAPCC's proactive engagement in the arena of interoperability are the projects *'Air-Land Integration'* and *'Regional Fighter Partnership – Options for Cooperation and Cost Sharing'.* The latter study being included as a NATO Smart Defence project. Whether supporting exercises, teaching academic courses, writing doctrine and policy, or researching and writing on future capabilities and concepts, almost everything JAPCC does is aimed at improving interoperability; some further examples are:

a. JAPCC developed a briefing titled *'Advanced Layered Defence Systems – Component Integration Challenges'* that provides an overview of joint coordination and interoperability challenges between components when looking at an Anti-Access Area Denial (A2AD) problem. This was

developed based on a Maritime Air Coordination Conference (MACC) event and presented to the JWC in 2016. The JAPCC now travels to Training Audience HQs to present this each year as an enduring element of battle-staff preparation.

b. The SHARC, AAR Compatibility Matrix, AAR Clearance Training and the AAR Tabletop Exercise were all developed by the JAPCC, in partnership with Combined Air Operations Centre (CAOC) Uedem, European Air Transport Command (EATC), NATO HQ, European Defence Agency (EDA) and others, with the aim of improving interoperability between both NATO Nations and Partners in the area of AAR.

c. Current work on AAR as an Airworthiness issue with NATO HQ International Staff/Defence Investment (IS/DI) in semi-annual Aviation Committee meetings is aimed at standardizing flight test procedures and certification processes to enable more rapid sharing of data and accelerating the achievement of interoperability between Nations.

d. Coordination with the EDA Helicopter Exercise Program (HEP) through participation in the annual EDA Helicopter Tactical Symposium and by providing liaison officers/observers during the EDA Blade Series Exercises. Ultimately, this coordination will lead to the alignment of both EDA and NATO helicopter related doctrine and hence improve the interoperability between EU and NATO Nations.

e. The Maritime-Air Coordination Committee, co-chaired by the JAPCC Assistant Director and the Commander, MARCOM-Air is aimed at improving interoperability between the Air and Maritime components.

f. As Chairman of the ARSAG Interoperability Panel, JAPCC is directly responsible for bringing to the forefront of the international AAR enterprise concepts that foster increases in Interoperability as well as highlighting challenges. Another area is the development, in conjunction with NATO IS-DI and EDA of the Military Air Worthiness Authority Workshop designed to produce a commonly agreed upon set of standards for AAR clearances while elevating the discussion to an airworthiness issue.

g. JAPCC completed a project entitled *'Enhancing NATO's Operational Helicopter Capabilities – The Need for International Standardisation'.* In this study, a significant number of areas where NATO Nations' helicopter operations interoperability needed improvement were identified and suggestions for improvements offered. NATO interoperability issues are also included in the wider framework of cooperation with the European Union (EU). JAPCC participates in EU Air Power related Working Groups with the intent of increasing general interoperability through a single NATO/EU aligned approach similar to the approach of the European Defence Agency (EDA) or European Air Transport Command (EATC) etc.

h. JAPCC developed and maintains the Helicopter Users Database for use by Allies, Partner nations and other (JAPCC) accredited nations/organizations.

i. JAPCC is in the process of developing a Helicopter Underslung Load and Equipment (HUSLE) database for use by Allies, Partner nations and other (JAPCC) accredited nations/organizations.

j. JAPCC is currently conducting a study *(An Assessment of the Possible Future Construct of Czech tactical Air Force)* in response to an RfS from the Czech Republic to assess their Air Force and provide advice to inform future procurement decisions to promote interoperability with NATO, as CZE recapitalizes its tactical air fleet.

Support to Operations. The JAPCC is a Combined and Joint organization that understands the complexities of operations in contested and multi-domain environments. Furthermore, it applies NATO's concept of the Comprehensive Approach to all of its undertakings as demonstrated by its span of engagement not just with the military but with politicians, government

and non-governmental organizations as well as academia and industry. With this in mind, the JAPCC has been ideally placed to provide direct and indirect support to operations over the course of the past 15-years. Some examples of the support the JAPCC has provided to operations are:

a. The JAPCC is the Custodian of AJP-3.3, *Allied Joint Doctrine for Air and Space Operations* and is author of Chapter 5, *Space Support in NATO Operations*. Chapter 5 was drafted in close coordination with the Bi-Strategic Command Space Working Group (BiSCSWG).

b. JAPCC built and maintains the Air-to-Air Refuelling Compatibility Matrix, developed and teaches the Air-to-Air Refuelling Clearance Training and Tabletop Exercise, and helped developed and helps teach the Specialized Heavy Air Refuelling Course. All of this supports the education and training of NATO officers to plan and conduct multinational AAR in support of Combined NATO air operations.

c. Direct to support to both the NATO C-IED Task Force and ISAF through work both in-theatre and across NATO HQs to enhance the Air and Space Power Contribution to the C-IED Fight. This included the provision of an Air and Space Power module on the C-IED Staff Officers' Course at the NATO C-IED COE, Madrid.

d. The *'Enhancing NATO's Helicopter Capabilities'* project that was designed to improve the interoperability between all rotary asset users in the battlespace during operations.

e. Multiple deployments to operational theatres in support of NATO FP activity including to Kandahar Airfield as Deputy Airfield Commander responsible for FP. Also, FP SME has run a number of FP Advisory Team (FPAT) visits for JFC Brunssum and subsequently produced the NATO FPAT Handbook and FPAT Annex of the ACO FP Directive.

f. JAPCC provides FP support to include mentoring during the EAG's Exercise VOLCANEX, which is a preparatory exercise for deployed operations.

g. The development of Logistics Lessons Learned for Operation UNIFIED PROTECTOR.

h. Support to both NATO Joint Forces Commands.

i. Support to 1. German/Netherlands Corps.

j. Cooperation with the NATO Intelligence Fusion Centre with activity contributing to both direct support of ongoing operations and the preparation of forces during pre-deployment training.

k. As Department Head for Space Operations, the coordination of development of the *'Introduction to Space Support in NATO Operations Course'* which is a NATO accredited course run at the NATO School Oberammergau. Also, the *'Space Support Coordinator Course'* is in the final phase of development, also facilitated by and coordinated through the JAPCC.

l. JAPCC provides Exercise Support to JWC and AIRCOM for the TRIDENT series[27] and RAMSTEIN AMBITION exercise by supporting and/or providing:
   (i). Scenario development;
   (ii). Master Event List/Master Incident List (MEL/MIL) development and scripting;
   (iii). Order of Battle (ORBAT) validation;
   (iv). Provision of the Opposing Force (OPFOR) TEAM for Air/Space/Cyber.

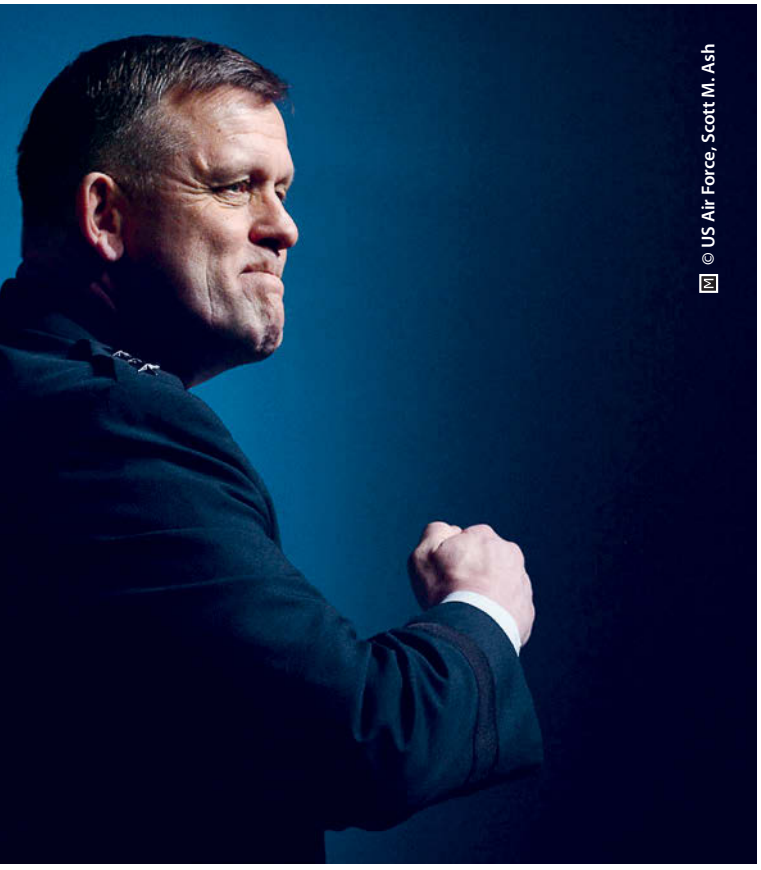
m. JAPCC is in the process of developing a Helicopter Underslung Load and Equipment (HUSLE) database for use by Allies and Partners. The supporting Helicopter Underslung Load compatibility matrix will enable improved combined operations in support of deployed Land forces.

27. The TRIDENT series of exercises are used to certify the NATO Joint Force Commands and supporting HQs for operational command.

SME Manning	Peacetime Establishment	Multinational Posts	Framework Nation SME Posts
Number of posts	58	49	9
# of bid posts	47	38	9
Filled posts	34	27	7
Joint or non-AF posts	33	25	8
Actual non-AF fills	6	4	2

6. Challenges

Manning Challenge. The JAPCC has significant manning; the PE consists of 89 total posts, of which 68 are bid and 57 are filled. 58 of the 89 total posts are considered SME Staff Officers. This does not include leadership posts, Branch Heads, or the Planning and Control Section. Of the 58 SME posts, only 45 are bid and 34 are filled (58.6 %) as of 31 December 2019.



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Non-Officer Subject Matter Experts. The 2016 SC approved a proposal for SNs to fill 1–2 posts, on a test basis, with Senior Enlisted or Warrant Officers in Subject Matter Areas where significant expertise exists in those grades in the sending nation. This proposal was reaffirmed at the 2017 SC. In both cases it was made clear that the posts are still cost-share staff officer posts, and that the cost-share exemption for enlisted positions applies only to support staff. To date JAPCC has had one volunteer from a SN, but due to internal national manpower position allocation disconnects the volunteer could not be sent. This proposal was briefed to the NATO

'No Nation that considers itself a true Air and Space Power player would entertain divesting itself of its National Air (and/or Space) Warfare Centre capability, therefore, the Alliance cannot expect to function without its integral Air and Space Warfare Centre – the JAPCC.'

General Frank Gorenc,
Director JAPCC, 2013–2016

Air Chiefs' Senior Enlisted Advisors by JAPCC during the 25 September 19 NATO Air Chiefs' Symposium at HQ AIRCOM.

Use of Reserves. The JAPCC has also proposed to SNs to examine the possibility to fill SME posts with Reserve Component personnel. However, only three or four SNs have a Reserve program that might allow for this and to date, only one nation is providing a Reserve officer fill to a SME post. The FN provides some Reservists to the support staffs, usually on a temporary basis to fill a gap. A second SN has a request out with their Reserve component for a fill but so far, has not solved the problem of providing a Reserve officer for a full tour.

7. The JAPCC Looking Forward

Some thoughts on the JAPCC's future:

More effective liaison with ACT. Need to develop a better working relationship with ACT so that they are able to provide a better service in support of the JAPCC.

The Alliance, Sponsoring Nations, Non-Sponsoring Nations and Partners should be encouraged to further utilize the capabilities and expertise of the JAPCC.

The JAPCC MOUs do not allow the flexibility that most of the later COEs enjoy – the JAPCC MOUs are in urgent need of revision.

Is keeping the JAPCC as a COE the most effective option? JAPCC absolutely needs to maintain its 'independence' but is an alternative governance structure required? Links to the challenge that COEs are considered as a single entity yet all 25 currently accredited COEs are all very different from one another.

8. Summary

This publication has attempted to capture a historical overview of the JAPCC's first 15 years, with detail provided where necessary to demonstrate the JAPCC's unquestionable utility to Global Air and Space Power as well as wider military and military-related endeavours. The JAPCC delivers way above any resource-cost considerations; the JAPCC is both extremely effective and, at the same time, incredibly resource-efficient. The question should not be 'why should nations invest or continue to invest' but rather, 'why would any nation not want to invest?'

Our primary customers are NATO Headquarters (Allied Command Operations, Allied Command Transformation, NATO Joint Commands and Air Command) and sponsoring nations. However, the JAPCC does accept Requests for Support (RfS) from other sources via our RfS form, which can be accessed through the JAPCC website. With numerous successful products and ever-increasing connections with industry and academia, the JAPCC continues to build upon its reputation as NATO's preeminent advocate for the development and enhancement of Joint Air and Space Power.

Stay informed about the future of Air and Space power through the JAPCC website (www.japcc.org), where all (unclassified) products listed in this overview are accessible.

ANNEX A

Subject Matter Areas and Focus Areas 2019

CAPABILITIES BRANCHES

COMBAT AIR BRANCH

Electronic Warfare | Manned Air (Fixed-Wing) | Precision-Guided Munitions | Close Air Support/JTAC | Special Operations | Maritime Air & Carrier Aviation (FW) | Maritime Air & Carrier Aviation (RW) | Maritime Patrol Aircraft (ASW) | 5th Generation Aviation

C4ISR & SPACE BRANCH

ISR | Air Leadership | Air Battle Manager/Air C2 | Space | Cyber/Deployable CIS | Airspace Control and Air Traffic Management | Air Operations Planning

AIR OPERATIONS SUPPORT BRANCH

Air Transport | Air-to-Air Refuelling | Support RW, Joint Personnel Recovery, Littoral and Special Air Ops RW | Force Protection | CBRN | Logistics

FUNCTIONAL BRANCH

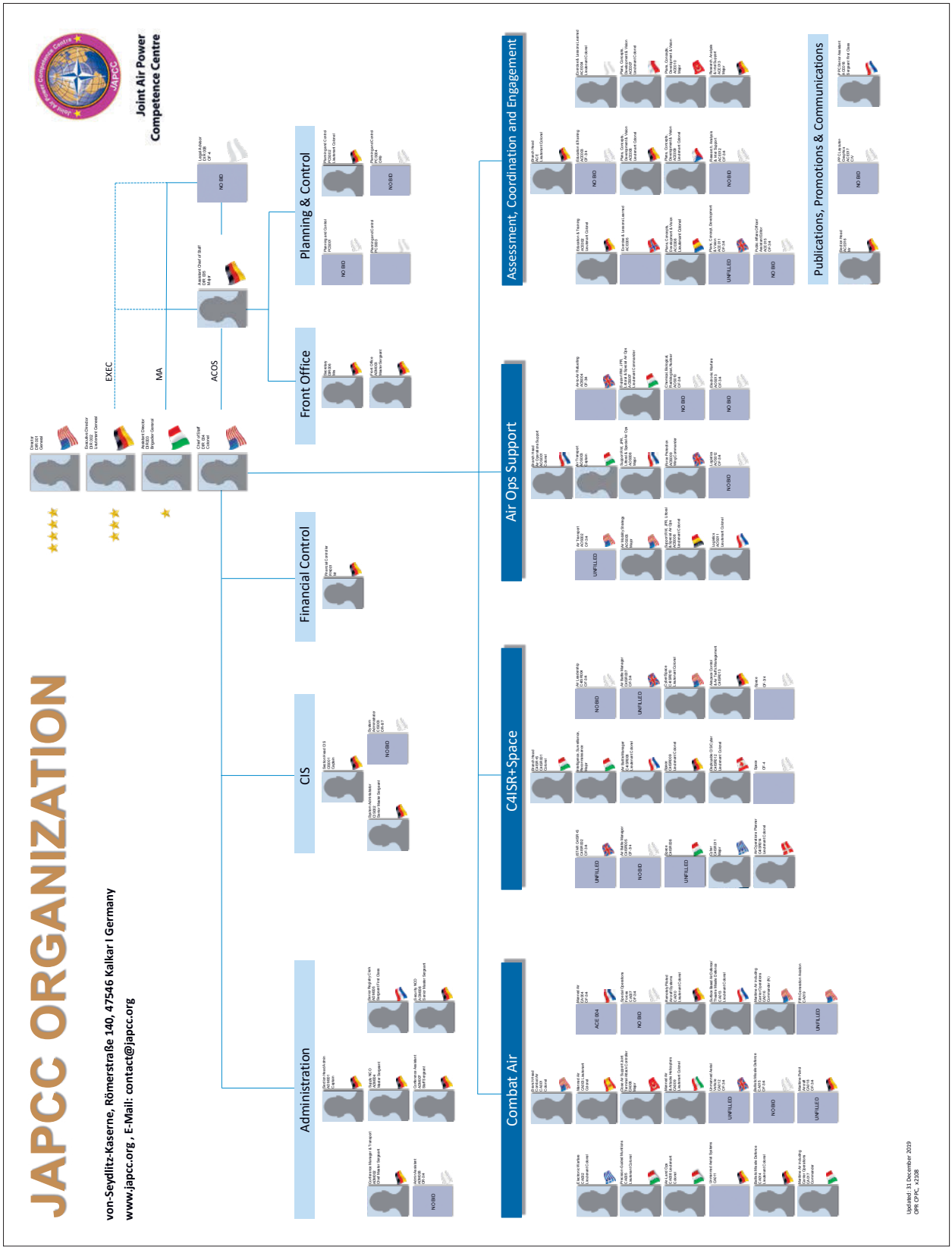
ASSESSMENT, COORDINATION & ENGAGEMENT BRANCH

Education & Training | Exercises & Lessons Learned | Plans, Concepts, Development and Vision (NDPP, Event Coordination, Sponsorship Liaison, etc.) | Policy and Doctrine | Research, Analysis & Intel Support | Public Affairs/Assistant Editor

Focus Areas 2019. Focus Areas identify areas of need for NATO Joint Air and Space Power that fall within the scope and mandate of the JAPCC. These Focus Areas are reviewed every year and occasionally change as NATO evolves. Shown here are those that were in effect as of 2019.

ANNEX B

JAPCC Organization as of December 2019



ANNEX C

White Papers

June 2019	Command and Control of a Multinational Space Surveillance and Tracking Network
May 2019	The Implications for Force Protection Practitioners of Having to Counter Unmanned Systems
February 2019	Think-Piece on Force Protection Command and Control (FPC2)
November 2018	Future Battlefield Rotorcraft Capability
November 2017	NATO Helicopter Underslung Load Certification
November 2017	NATO Joint Air Power and Offensive Cyber Operations
September 2017	Joint Air Power Following the 2016 Warsaw Summit – Urgent Priorities
June 2017	Air Warfare Communication in a Networked Environment
May 2017	Mitigating Disinformation Campaigns Against Air Power
November 2016	Air Transport Training, Exercises and Interoperability
November 2016	Future Unmanned System Technologies – Legal and Ethical Implications of Increasing Automation
June 2016	Alliance Airborne Anti-Submarine Warfare
October 2015	NATO Multinational Joint Intelligence, Surveillance and Reconnaissance Unit
July 2015	Standardization of Qualifications for NATO Helicopter Crews in Support of Land Operations
October 2014	Air and Space Power in NATO – Future Vector Part II
September 2014	Remotely Piloted Aircraft Systems in Contested Environments – A Vulnerability Analysis
July 2014	Air and Space Power in NATO – Future Vector Part I
May 2014	Enhancing NATO Joint Personnel Recovery Capability
April 2014	Improving NATO Support to Future Air Advisor Operations
March 2014	Future Vector Project – Present Paradox – Future Challenge
March 2014	Air-to-Air Refuelling Consolidation
January 2014	JAPCC Capstone Document 2014–2017
October 2012	Air and Space Power in Counter-Piracy Operations
August 2012	Enhancing NATO's Operational Helicopter Capability
June 2012	Filling the Vacuum – A Framework for a NATO Space Policy
March 2012	Regional Fighter Partnership – Options for Cooperation and Cost Sharing
August 2011	NATO Air Transport Capability – An Assessment
July 2011	NATO Air and Space Power in Counter-IED Operations 2nd Edition
February 2011	Air-to-Air Refuelling Flight Plan
January 2011	Personnel Recovery – That Others May Live to Return with Honour
September 2010	Three Air Power Considerations within a Comprehensive Approach
September 2010	NATO Air and Space Power in Counter-IED Operations
January 2010	Strategic Concept of Employment for Unmanned Aircraft Systems in NATO
January 2009	NATO Space Operations Assessment
April 2008	NATO's Future Joint Air & Space Power (NFJASP)
March 2008	The JAPCC Flight Plan for Unmanned Aircraft Systems in NATO

ANNEX D

Flyers

March 2019	Air-to-Air Refuelling Fact Sheet
May 2015	JAPCC Air & Space Power Conference 2015 – Air Power and Strategic Communications – NATO Challenges for the Future
December 2013	Flyer 10 – NATO Space 'Operations Iceberg'
November 2012	Flyer 9 – Machines Do Not Think!
October 2012	Notice to Airmen – NATO Air-to-Air Refuelling
August 2012	Flyer 8 – 'Leadership Cannot Really Be Taught. It Can Only Be Learned.'
July 2012	Flyer 7 – Fires are a Joint Business
May 2012	Flyer 6 – Well Worth Doing: NATO's Space Integrated Project Team
May 2012	Flyer 5 – Schriever Wargame 2012 International
November 2011	Flyer 4 – Multinational Logistics – A Missed Opportunity?
May 2011	Flyer 3 – Enhancing NATO's Space Capabilities … an 'Educational Blueprint'
September 2010	Flyer 2 – NATO Air and Space Power in Counter-IED Operations
March 2010	Flyer 1 – Status Report: UAS Integration into the European National Air Space System

ANNEX E

Acronyms and Abbreviations

A2AD	Anti-Access Area Denial
AAR	Air-to-Air Refuelling
AASSEP	Allied Aircraft Servicing and Standard Equipment Publication
ACE	Assessment, Coordination & Engagement
ACG	Aerospace Capabilities Group
ACS	Aircraft Cross Servicing
ACT	Allied Command Transformation
AD	Alliance Directive
ADL	Advanced Distributed Learning
AFSC	Alliance Future Surveillance and Control
AGS	Airborne Ground Surveillance
AI	Artificial Intelligence
AJP	Alliance Joint Publication
AMDC	Air & Missile Defence Committee
AOS	Air Operations Support
AOWG	Air Operations Working Group
ARSAG	Aerial Refuelling Systems Advisory Group
ASSEWG	Aircraft Servicing and Standard Equipment Working Group
ASW	Anti-Submarine Warfare
AT	Air Transport
ATEG	Air Training and Exercise Working Group
ATO	Air Tasking Order
ATP	Alliance Tactical Publication
AVT	Applied Vehicle Technology
AWACS	Airborne Warning and Control
AWWCG	Above-Water Warfare Capability Group
BiSCSWG	Bi-Strategic Command Space Working Group
BMD	Ballistic Missile Defence
C2	Command & Control
C4ISRS	Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance and Space
CA	Combat Air
CAOC	Combined Air Operations Centre
CAPDEV	Capability Development
CASPOA	NATO Air Operations COE
CBRN	Chemical, Biological, Radiological and Nuclear
CC SBAMD	Competence Centre for Surface-Based Air and Missile Defence
CHoDS	Chief of Defence Staff

CIS	Communication & Information Systems
CJOS	Combined and Joint Operations from the Sea (COE)
CoAS	Chiefs of Air Staffs
COM	Commander
COT	Chiefs of Transformation
CSW	Confined and Shallow Waters (COE)
C-UAS	Counter-Unmanned Aircraft Systems
DACCC	Deployable Air Command and Control Centre
DH	Department Head
DI	Defence Investment (NATO HQ)
DPP	Defence Policy and Planning (NATO HQ)
DTTP	Doctrine, Techniques, Tactics and Procedures
EAG	European Air Group
EATC	European Air Transport Command
EDA	European Defence Agency
EPRC	European Personnel Recovery Centre
ESA	European Space Agency
ETEE	Education, Training, Exercises and Evaluation
EUCOM	(United States) European Command
EW	Electronic Warfare
Ex	Exercise
FFAO	Framework for Future Alliance Operations
FINCON	Financial Controller
FN	Framework Nation
FOGO	Flag Officer/General Officer
FP	Force Protection
FW	Fixed Wing
GSpOC	German Space Operations Centre
GSSAC	German Space Situational Awareness Centre
HISWG	Helicopter Inter-Service Working Group
HOSTAC	Helicopter Operations from Ships other Than Aircraft Carriers
HUSLE	Helicopter Underslung Load Equipment
IAMD	Integrated Air & Missile Defence
IS-DI	International Staff – Defense investment
ISR	Intelligence, Surveillance and Reconnaissance
JADL	Joint Advanced Distributed Learning
JAPCC	Joint Air Power Competence Centre
JAPS	Joint Air Power Strategy

JASPN	Joint Air and Space Power Network
JCGGBAD	Joint Capability Group Ground-Based Air Defence
JCGUAS	Joint Capability Group on Unmanned Aerial Systems
JCGVL	Joint Capability Group Vertical Lift
JFAC	Joint Force Air Component
JFC	Joint Force Command
JPOW	Joint Project Optic Windmill
JPR	Joint Personnel Recovery
JPRA	Joint Personnel Recovery Agency
JSB	Joint Standardization Board
JWC	Joint Warfare Centre
Km	Kilometer
LAN	Local Area Network
LI	Lessons Identified
LL	Lessons Learned
LSS	Low, Slow and Small
MACC	Maritime-Air Coordination Conference
MCCE	Movement Coordination Centre – Europe
MCDC	Multinational Capability Development Campaign
MD	Missile Defence
MDO	Multi-Domain Operations
MEL/MIL	Main Events List/ Main Incidents List
MISR	Maritime Intelligence Surveillance Reconnaissance
MNSS	Multinational Solutions Synchronization
MoU	Memorandum of Understanding
MTACCOPS	Multinational Through-Deck and Aircraft Carrier Crossdeck Operations
MTEP	Military Training and Exercise Program
MTFP	Medium-Term Financial Plan
NAAG	NATO Army Armaments Group
NAEW&C	NATO Airborne Early Warning and Control
NAFAG	NATO Air Force Armaments Group
NCIA	NATO Communications and Information Agency
NCS	NATO Command Structure
NDPP	NATO Defence Planning Process
NEWAC	NATO Electronic Warfare Advisory Committee
NEWWG	NATO Electronic Warfare Working Group
NFS	NATO Force Structure
NGRC	Next Generation Rotorcraft Capability
NNAG	NATO Naval Armaments Group

NSO	NATO School Oberammergau
NSPA	NATO Support and Procurement Agency
OPFOR	Opposing Force
OUP	Operation Unified Protector
PCS	Planning & Control Section
PE	Peacetime Establishment
POW	Programme of Work
RfS	Request for Support
RW	Rotary Wing
SACEUR	Supreme Allied Commander Europe
SACT	Supreme Allied Commander Transformation
SBAMD	Surface-Based Air and Missile Defence
SC	Steering Committee
SCI	Systems Concepts and Integration
SEAD	Suppression of Enemy Air Defence
SFA	Strategic Foresight Analysis
SHAPE	Supreme Headquarters Allied Powers Europe
SHARC	Specialized Heavy Air Refueling Course
SMA	Subject Matter Area
SME	Subject Matter Expert
SN	Sponsoring Nation
SOF	Special Operations Forces
SOI	Statement of Intent
SRC	Senior Resource Committee
SRD	Standards-Related Document
STO	Science and Technology Office (NATO)
STRATCOM	Strategic Communications
TTF	Think Tank Forum
TTP	Tactics, Techniques & Procedures
TTX	Tabletop Exercise
UAS	Unmanned Aircraft Systems
UGWG	Users Group Working Group
URfS	Urgent Request for Support
USAFE	United States Air Forces Europe
USL	Underslung Load
WAN	Wide Area Network
WCG	Wargame Control Group
WG	Working Group
WS	Workshop
ZLO	Zentrumluft Operations (German Air Operations Command)

ANNEX F

Journals

Journal Edition 1, 2005

- Air and Space Power – Past, Present and Future
- Transformation Challenges for NATO's Air Command and Control
- Air Power in Turbulent Times: A Brief Assessment of the Future Value of Air Power
- Deployable Airfield Activation Wing
- Air Power and the New World Disorder
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- Air Guard Over the 2004 Olympic Games: CAOC Larissa's Support to Greece for the Athens Summer Olympics
- The Future of Air & Space Power: Fact or Fiction?

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- Deploying the NRF: Meeting the Airlift Challenge
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- Targeting for Effects
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- Preparing the Warfighter: The Work of the Joint Warfare Centre
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- Let's Get SMART!
- Do We Still Need 'The Man' in the Cockpit?

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- The Evolving Capability of UAV Systems
- Integrating UAVs with Other Airspace Users
- Exploiting a New High Ground
- Beyond Technology: Successful Unmanned Aircraft System Employment
- An Interview with Chief of the Air Staff, Royal Air Force
- 30 Years of Israeli UAV Experience: Interoperability and Commonality
- Manned Unmanned Missions: Chance or Challenge?
- Manned vs Unmanned: Aerial Systems – False Expectations, Real Opportunities & Future Challenges
- Lessons Learned from Predator Operations
- Unmanned Air Vehicles: Some National Perspectives

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- Airbase Opening in Force Generation
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- A Risk Management Process to Maximize Combat Capability
- Sustainability Through Exploiting Resource Interdependencies
- NATO Support to the Pakistan Earthquake
- The Challenges of Medical Support
- C4ISTAR – More Than One Dimension

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- ISAF: International Security Assistance Force Mission in Afghanistan: Air C4ISTAR Lessons Learned
- Joint Intelligence Surveillance Reconnaissance (JISR)
- How Air Power can Overcome the Phenomenon of the Empty Battlefield

- NATO Airborne Early Warning and Control Human Aspects of Platform Capability Change
- The Human Side of Transformation
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- Interview with Commander RNLAF Lieutenant General de Jong
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- Air Power in Urban Operations – Fallujah
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- Air Power in Countering Irregular Warfare
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- How do we get there? Maximising NATO and EU Airlift
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- Creating a Favourable Air Environment: Key to Successful Crisis Response Operations
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Journal Edition 29, 2019

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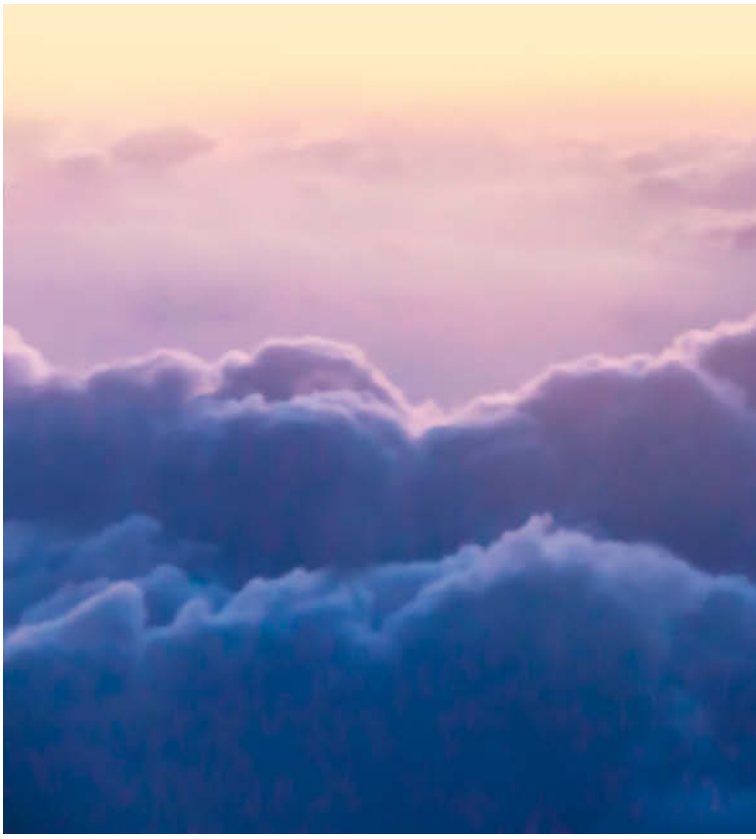
Notes



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