

2020

annual REPORT

Joint Air Power Competence Centre

www.japcc.org



**Joint Air Power
Competence Centre**

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Release

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Published and distributed by

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foreword

It is safe to say the Year 2020 was not what anyone expected it would be! We have all endured a very difficult global situation, with this ongoing pandemic affecting each of our Nations. Our thoughts and sympathies go out to everyone affected by this pandemic. In spite of these lingering challenges, we are proud that the JAPCC team remained resilient, flexible, and productive throughout the year. This edition of the Annual Report summarizes what the JAPCC accomplished in this busy year, and provides a glimpse into the work we will be performing across the A&S domains for 2021 and the years to come.

Throughout 2020, the JAPCC offered expertise in the development of the NATO Warfighting Capstone Concept, working closely with our partners across ACT and ACO. NATO intends to build on this Capstone Concept as the strategic vision for the next twenty years, and the JAPCC was honored to be part of its production. Moreover, the JAPCC published a white paper last year to complete a multi-year study on the evolution of Close Air Support. In addition, the team provided the Czech Republic Tactical Air Force a detailed analysis (in response to their request for support) offering several options to recapitalize their Air Force in-line with both National and NATO levels of ambition.

The JAPCC Opposition Forces (OPFOR) Air Team continued to provide extensive support to the NATO Joint Warfare Center in the development of a new exercise scenario used for Exercise Steadfast Jupiter-Jackal. Members of the JAPCC also led the OPFOR Air support to AIRCOM during the preparation of Exercise Ramstein Ambition. Due to the pandemic, these teams overcame new obstacles to work remotely to enable these critical exercises.

In June 2020, the JAPCC released its revised Capstone Document, to capture its evolving mission and vision after 15 years of existence. The result is a very short and comprehensive overview on the JAPCC's guiding principles, organization, and focus areas. The document also provides renewed strategic direction by the Sponsoring Nations. As with many organizations across the globe, the JAPCC enhanced our ability to

conduct online meetings last year. We held our Steering Committee and Senior Resources Committee meetings virtually, for the first time in JAPCC history. Although the meetings felt different from the 'family gathering' style of former years, they continued to be highly productive. Importantly, the Committees voted on several new JAPCC work strands, and we established a new Space Branch within the organization.

Looking into 2021, the JAPCC is developing a new approach to cover NATO Joint All Domain Operations (JADO). The primary purpose of the JADO project is to align work strands related to integrating assets from across services and countries that may contribute forces to NATO operations. As the JADO project matures, we will distribute all of the lessons learned in upcoming conferences and publications. Unfortunately, the ongoing pandemic forced us to cancel last year's JAPCC A&S Conference. Although we cancelled the annual conference in 2020, our team put together an outstanding read-ahead package with selected articles from a diverse set of authors. We highly encourage you to check out the JAPCC website to review these articles and find new ways to stay connected to the organization.

In closing, I would like to thank our Sponsoring Nations for continuing to support the JAPCC and take this opportunity to encourage other Nations to consider an active role as a Sponsor or Contributing Nation. Presence in the JAPCC provides access to a unique network of experts in the Air and Space domains and allows its members to contribute to work that influences decision making at the highest levels in our Alliance. With that in mind, please take a few minutes to review this document, and contact us with questions, feedback, or requests for support at any time.

Good Reading!



Jeffrey L. Harrigian
General, US AF
Director, JAPCC

who we are

Established in 2005, the JAPCC was the first NATO-accredited Centre of Excellence (CoE). We provide subject matter expertise across a broad range of Joint Air & Space (A&S) Power topics including the development of Concepts and Doctrine, Capability Development, Education and Training, and Lessons Learned in accordance with NATO MC (M) 236.

The JAPCC seeks to maximize its contribution to the improvement and transformation of Joint A&S Power through a well-formulated engagement strategy. This strategy not only guides the Centre's approach to organizations within NATO and our Sponsoring Nations, but also enables outreach to other national organizations and academia, allowing the CoE to tap into a comprehensive and diverse pool of Joint A&S Power subject matter experts.

The Joint Air Power Competence Centre (JAPCC) was formed on 1 January 2005 to provide a strategic level proponent for Joint Air and Space (A&S) Power that was missing in NATO.¹ Soon thereafter, JAPCC was accredited as NATO's first Centre of Excellence (COE) and, as such, is charged with the development of innovative concepts and solutions required for the transformation of A&S Power within the Alliance and the Nations.

Based on a Memorandum of Understanding (MoU), the JAPCC is sponsored by 16 NATO nations who provide a variety of experienced Subject Matter Experts (SMEs) that come from all services. Through its multi-discipline organization, the JAPCC chooses the most suitable SMEs for the task and combines their knowledge and experience to fully contribute to transforming NATO's A&S Power. Importantly, as the JAPCC is in

1. The Concept for the Joint Air Power Competence Centre, (31 Jul. 2003, MoD Bonn) established that JAPCC would serve as the CoE for Joint A&S Power as reflected in the statement: 'This synergistic application of air, space and information systems from and for all services to project military power is summarized with the term *Joint Air Power*.' This is also reflected by the inclusion of Space, Cyber, and Electronic Warfare positions in the JAPCC Peacetime Establishment in the JAPCC Operational MOU.



Director (US AF)
General Jeffrey L. Harrigian



Executive Director (GE AF)
Lieutenant General Klaus Heinrich Habersetzer



support of, but outside of the NATO Command Structure, it can offer independent objective military advice across the spectrum of Joint A&S Space Power matters to NATO and national policy-making bodies.

A&S Power SMEs drawn from the Land, Maritime, Air, Cyberspace and Space components of the 16 MoU nations conduct collaborative research into areas in which JAPCC assistance is requested by leveraging their independent thought and a global network of experts that reach across the military, academic and industrial spheres. The resulting analysis and solutions are disseminated via studies, reports, journal articles, seminars, panels and conferences.

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nizations within NATO and our Sponsoring Nations, but also enables outreach to other national organizations and academia, allowing the CoE to tap into a comprehensive and diverse pool of Joint A&S Power subject matter experts.

Director's Vision

To be NATO's catalyst for the improvement and transformation of Joint A&S Power, delivering effective solutions through independent thought and analysis.

Mission

The JAPCC, as a team of multinational experts, is to provide key decision-makers effective solutions on A&S Power challenges, in order to safeguard NATO and the Nations' interests.

Leadership

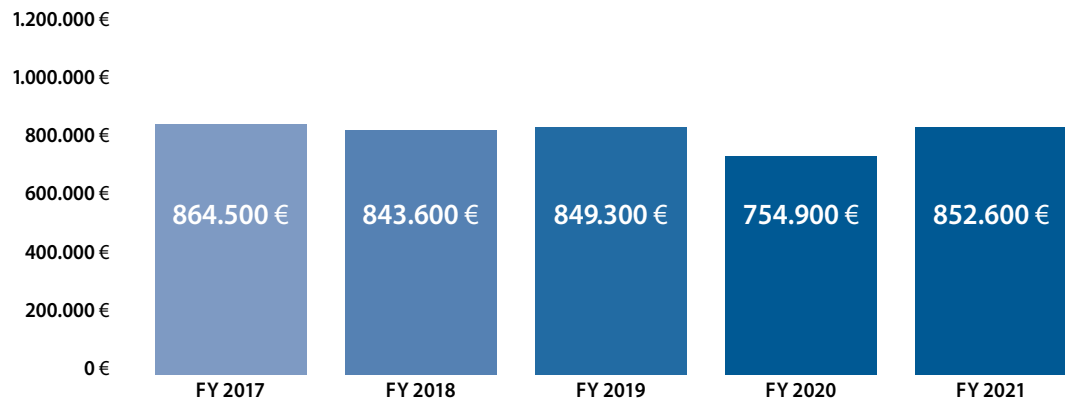
The JAPCC is headed by the Director, General Jeffrey L. Harrigian (US AF), who has led the centre since May 2019. General Harrigian also serves as the Commander,



Assistant Director (IT AF)
Brigadier General Giuseppe Sgamba



Chief of Staff (US AF)
Colonel Brad A. Bredenkamp



Approved JAPCC Budgets

Allied Air Command and the Commander, United States Air Forces in Europe and Air Forces in Africa (USAFE-AFAFRICA) at Ramstein Air Base.

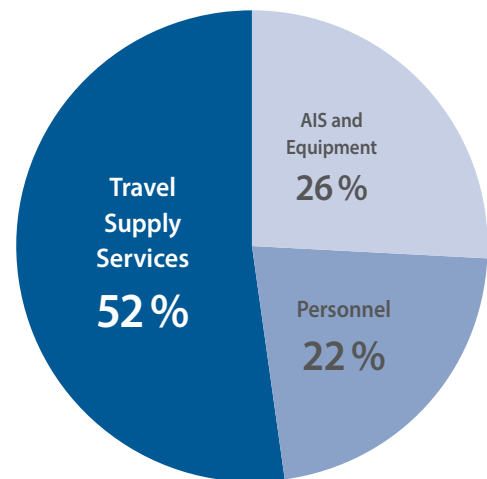
The JAPCC's Executive Director, Lieutenant General Klaus Habersetzer (GE AF), also commands the German Air Operations Command (AOC) and the German Joint Force Air Component Headquarters (GE JFAC HQ) as well as Combined Air Operations Centre Uedem (CAOC U).

On site, Brigadier General Giuseppe Sgamba (IT AF) serves as the Assistant Director (AD), and together with the Chief of Staff, Colonel Brad Bredenkamp (US AF), provides day-to-day leadership for the JAPCC team.

The five JAPCC branches are headed by: Colonel Thomas Schroll (GE AF) – Assessment, Coordination and Engagement (ACE), Colonel Matthew Willis (US AF) – Combat Air (CA), Colonel Maurizio De Angelis (IT AF) – C4ISR, Colonel Erik Rab (NE AF) – Air Operations Support (AOS), and Lieutenant Colonel Heiner Grest (GE AF) – Space.

Unified Space Branch

The 2020 Steering Committee and Senior Resource Committee approved the reorganization of JAPCC's internal structure to include a fifth branch – the Space Branch, whose SMEs so far have been a part of the



JAPCC Budget Spending in FY 2020

C4ISR+S Branch and played an active part in NATO Space-related activities since the Centre's founding in 2005. This new structure both reflects the growing importance and official recognition of the Space domain by NATO as well as creates a more effective and efficient way to respond to the rapidly increasing workload for Space-related aspects of the Alliance in its newest operational domain. The branch will finally consist of seven Space-related posts and further growth will be requirements-driven in line with future demands. Sponsoring nations of the JAPCC, but also all other NATO member and partner nations are encouraged to join this multinational team to participate in the future development and integration of the Space Domain in NATO's deterrence and defence posture.

Personnel

The JAPCC has lost capability and capacity due to decreasing manpower over the past years. The numbers stabilized in 2020, with JAPCC ending the year with an overall manning of 61 percent, but a Subject Matter Expert (SME) manning of only 55 percent.

The JAPCC continues to actively mitigate these shortfalls through cross-utilization, internal education and training as well as creative technological solutions. However, in order to better address the spectrum of A&S subject matter areas relevant to NATO, and to better support the Joint Warfare Centre and major NATO exercise programs, JAPCC needs Sponsoring Nations to consider increasing their participation, and needs other NATO nations who may be benefitting from the Centre's work to consider joining.

Budgeting and Finance

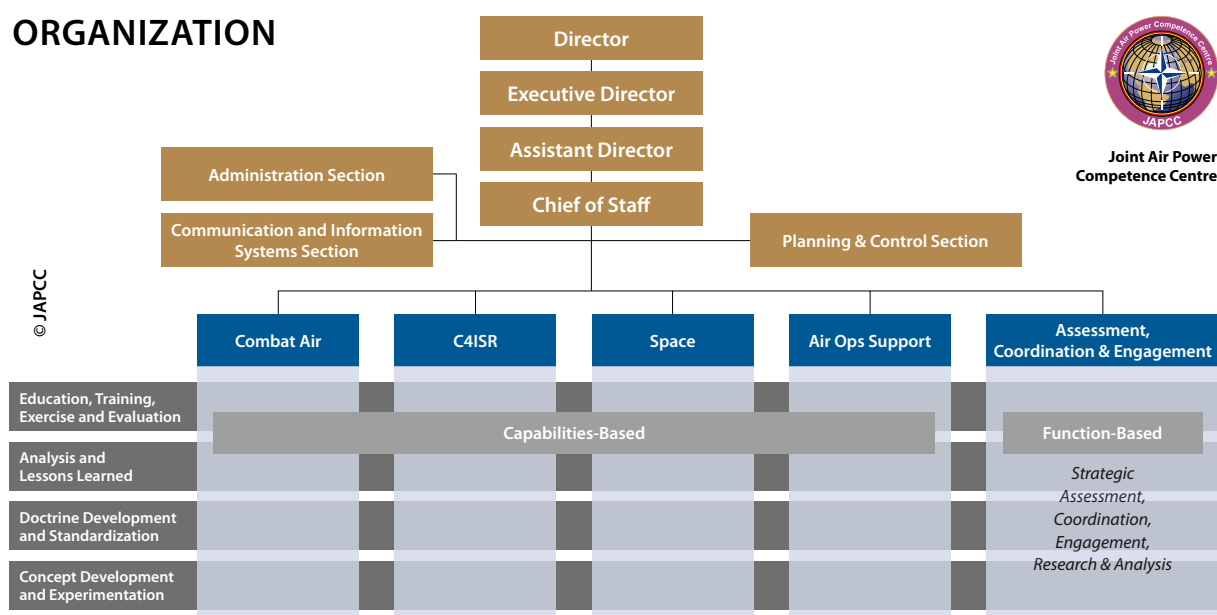
Based on the JAPCC Medium Term Financial Plan and taking into account the actual number of assigned staff officers, the JAPCC budget for 2020 remained just below 854,000 Euros. Our Senior Resource Committee

(SRC) continues to provide full support to our budget based on 'minimum military requirements'. As described in the JAPCC Operational Memorandum of Understanding, the sponsoring nations contribute to the budget according to the number of staff officers in their bid. For Fiscal Year 2020, the approved budget started with 853,500 Euros. Due to the impacts of the COVID 19 pandemic JAPCC could not operate as usual and consequently the approved budget authorizations were not required as originally requested. JAPCC requested the sponsoring nations to reduce the budget authorizations accordingly to an overall amount of 754,900 Euros. Additionally, the sponsoring nations were requested to approve JAPCC to invest 75,000 Euros into sophisticated VTC equipment to meet the increased demand for virtual meetings and conferences. Both requests have been approved by the SRC.

The current corresponding annual cost per staff officer is approximately 13,016 Euros.

The budget was expended primarily on travel, supplies and services (52%), personnel-related expenditures (22%) and replacement of furniture, as well as hard- and software upgrades for automated information systems (26%).

ORGANIZATION





Stakeholders

The JAPCC's primary customers include NATO Headquarters, Allied Command Operations, Allied Command Transformation, NATO Joint Force Commands, Component Commands and sponsoring nations. However, the JAPCC also accepts Requests for Support (RfS) from other sources as workload and staff availability permit. With a track record of successful products and ever-increasing connections to industry and academia, the JAPCC continues to build upon its reputation as NATO's preeminent advocate for the transformation of Joint A&S Power.

The JAPCC Provides Solutions to Address Air and Space Power Challenges

To fulfil our mission, the JAPCC conducts its own research and advocacy, as well as responding to the needs of NATO and its member nations. Our Programme of Work (PoW) comprises projects, activities, and tasks, which are dynamic in nature and are adjusted monthly based upon the acceptance of Requests for Support (RfS). Independently, the JAPCC

also hosts a number of major events, including an Annual Joint A&S Power Conference, the biannual meeting of the Air Operations Working Group (AOWG), the Maritime Air Coordination Conference (MACC), one session of the biannual meeting of Air-to-Air Refuelling WG, the JAPCC Steering Committee (SC) meeting and the Senior Resource Committee (SRC) meeting.

JAPCC Support to the 'Pillars' of Centre of Excellence Work for NATO

The breadth of A&S subject matter areas covered by the JAPCC make it impractical for the Centre to be organized along the recently established model of branches dedicated to each of the four pillars of COE work. Instead, four of the JAPCC branches provide subject matter experts on systems and capabilities whose work contributes to each of the pillar areas of Education and Training, Doctrine Development and Standards, Concept Development and Experimentation, and Analysis and Lessons Learned. The fifth JAPCC Branch, ACE, has at least two posts dedicated to each of the pillars to facilitate the alignment of JAPCC's PoW to NATO's needs.

key developments

The JAPCC is vigorously active in areas in which it has SMEs available. This section summarizes the efforts the organization has made in the past year in support of NATO's Joint A&S Power; however, due to size constraints in this report, these are top-level summaries of activity. For more detail on any specific area, please visit our website or contact us directly.

Concept Development

The JAPCC's support to Joint A&S Power development in 2020 includes the following:

- Contribution to the STO SCI-311 Research Task Group – Collaborative Space Domain Awareness Data Collection and Fusion Experiment;
- The Rotary Wing Focus Group (RWFG);
- Fifth Generation Integration Efforts in the European AOR;
- Air Force Protection Support to NATO Air Command, Ramstein;
- Alliance Future Surveillance and Control Project (AFSC);
- Co-Chair the NATO STO study (AVT-359) about Hypersonic Operational Threats and Capabilities;
- Close Joint Support Project;
- Insights on the Czech Tactical Air Force Structure for 2027 and Beyond Project;
- Support of NATO STO study SCI-301 Defeat of Low Slow and Small (LSS) Air Threats;
- Space support in operations;
- Support of NATO STO AVT-329 study;
- Support to GE AF/ACT study Artificial Intelligence in Air Command and Control (AirC2);
- NATO Force Protection Decision Support Tool Development;
- Cyberspace;
- Joint All Domain Operations (JADO) study – initiated by JAPCC to study the requirements, capabilities and training models NATO will need to conduct JADO in the next 10–20 years.

Contribution to the STO SCI-311 Research Task Group – Collaborative Space Domain Awareness Data Collection and Fusion Experiment

The JAPCC is involved in this two-year-long STO project as an active contributor. Today, space-related data and products from different NATO nations include variations in data protocols and sensor attributes. However, to ensure the timely and effective exploitation of these data and products, a joint integrated environment within NATO's planning and operations division is required. In particular, combined effort based on effective collaboration strategies can considerably improve NATO Space Situational Awareness by providing greater geometric diversity, enhanced observability of space objects, and timeliness of reporting. This project aims to experiment on the benefits of collaborative Space Domain Awareness (SDA) data collection and mutual exchange among NATO nations. It involves personnel and hardware/software resources from seven NATO countries: Germany, Italy, Poland, Romania, Spain, the UK, and the US. The final report on this experimental activity is expected to be delivered in early 2021.

The Rotary Wing Focus Group (RWFG). The JAPCC/RWFG is to increase awareness and coordination among the assigned Rotary Wing SMEs and their branch heads, in order to improve the quality of their work through a well-defined working method.

Today the RWFG counts four JAPCC SMEs from varying backgrounds from four different nations, split between the Air Operations Support and Combat Air branches within the JAPCC.

The RWFG also reaches out to other experts, within the JAPCC, the Allied Air Command, Combined Air Operations Centre Uedem and the German Air Operations (ZLO) Command Kalkar, in order to support the development of specific projects or the organization of specific events. Due to the inherent process of consensus making, this working method significantly

increases JAPCC credibility within the larger community of helicopter users.

Examples of projects and objectives to be managed by the RWFG are studies and white papers regarding future rotorcraft in support of the Next Generation Rotorcraft Capability (NGRC) concept for 2035–2040 and beyond, development and maintenance of NATO standardization, as well as improvement of interoperability of helicopter operations doctrines in cooperation with the NATO Helicopter Inter Service Working Group (HIS WG), and liaison with the Joint Capability Group Vertical Lift (JCGVL).

Contribute Joint A&S expertise to Alliance decision-making processes through active leadership of and participation in NATO committees, Working Groups and fora.

Fifth Generation Integration Efforts in the European AOR. Integrating fifth generation systems into existing allied forces has been an effort for many years. As the F-35 is now in the European theatre, the effort has been increasing, with much of the 'shared' work primarily being led by three organizations, with significant participation of partner groups, including the JAPCC. The overarching aim of the integration effort is to smoothly incorporate new capability inherent in fifth generation platforms into existing fourth (and older) generation systems, enabling fifth generation platforms to truly become a force multiplier. In 2020, the JAPCC participated in the following (ongoing) 5th generation integration efforts:

- **European Air Group (EAG).** The EAG's Combined Air Interoperability Program (CAIP) began in 2016 as a task from the EAG Steering Group. The aim of the CAIP is 'to resolve the issues that result from integrating existing and 5th generation weapons systems, in order to achieve a higher level of interoperability in future combined air operations'. The CAIP lists 16 'challenges', placed in four subject areas: General, Air Operations, Air Enablers, and Air Command and Control.

The EAG has accomplished the majority of the 5th generation integration goals that they can influence, and as such, are transitioning the remaining work strands into their normal program of work. Although the CAIP is being concluded, the JAPCC was still able to contribute to multiple challenges including 5th Generation Doctrine development and ROE/National Caveat Management.

- **Allied Air Command (AIRCOM).** AIRCOM is the NATO lead for fifth generation integration and maintains the operational perspective, along with advising SACEUR on strategic matters. In November 2016, AIRCOM published a Study Paper entitled Modern Aircraft Integration (MAI) which provided an initial analysis of actions to be taken for effective MAI in AIRCOM's area of responsibility. AIRCOM maintains an 'AIRCOM Work Plan' that addresses items such as Air Policing, AirC2, and Training and Exercises, and it also includes plans for recurring workshops.

Although COVID-19 and a change in personnel at AIRCOM has slowed the overall progress in 2020, JAPCC has maintained involvement primarily by leading national caveat management development and legal considerations with 5th generation capabilities in terms of Positive Identification (PID) and Rules of Engagement (ROE). AIRCOM is planning a revitalization of this critical project beginning early 2021 with the JAPCC as a prime contributor.

- **US Air Forces in Europe (USAFE).** The USAFE A3I (i.e. Operations Integration) branch was formed in December 2017. The A3I team serves as the secretariat of the 'European F-35 Users Group' consisting of a General Officer Steering Group (GOSG) and an OF-5 Working Group. The GOSG, with representatives from each European nation that is procuring the F-35 (including non-NATO nations), meets annually. The Users Group Working Group (UGWG) normally meets twice a year, however, in 2020 the first meeting was cancelled and the second meeting was held virtually. The group focusses on common areas of concern throughout the F-35 nations.

The JAPCC's participation is primarily through participation in USAFE's F-35 Users Group Working Group

(UGWG). Though much of the information presented is non-releasable to NATO, writ large, the Users Group provides a unique insight into the beddown and national level integration of the F-35. This level of access is proving key to understanding where the true friction points for F-35 integration are and allows for educated assessments to identify where future friction may occur. The JAPCC SMEs are also working with national representatives in the F-35 community to enhance 5th generation awareness and education by acquiring and disseminating releasable documents to the Alliance.

Air Force Protection Support to NATO Air Command, Ramstein. This Objective consists of two primary deliverables. First is robust support to Ramstein's Annual Senior Officers' Force Protection Seminar; unfortunately, like many events, this has had to be postponed in 2020. However, the aspiration remains to hold an event in 2021 (provisionally scheduled for 16–18 March 2021) where the JAPCC will discuss, with the wider NATO Air FP community, the future development of ATP-3.3.6, NATO Force Protection Doctrine for Air Operations. The second deliverable is more difficult to quantify where the JAPCC acts as an extension of the AIRCOM Force Protection Cell. It is offered that this remains a superb example of where the JAPCC functions as NATO's dedicated A&S Warfare Centre and provides direct support to the NATO Command Structure (NCS). During 2020 subjects discussed include Air FP Capability Development in the Baltic States and the need to capture the nature and scale of the Air FP challenge facing the Alliance in the era of 360-degree threats.

Alliance Future Surveillance and Control Project (AFSC). The NATO AWACS fleet is scheduled to retire from service in or around 2035. Consequently, the North Atlantic Council tasked the Conference of National Armaments Directors to determine requirements and advice on options and possible ways to deliver a follow-on to the AWACS capability under the heading of the Alliance Future Surveillance and Control initiative, or AFSC.

At the 2016 NATO Warsaw Summit, the North Atlantic Council approved the AFSC Pre-Concept Stage report

and the Heads of State, as well as Government, declared: 'By 2035, the Alliance needs to have a follow-on capability to the E-3 AWACS. Based on high-level military requirements, we have decided to collectively start the process of defining options for future NATO surveillance and control capabilities.'

Based upon the NAC's direction and within the boundaries of the approved AFSC Concept Stage model, the Concept Stage will be conducted in three Phases:

Phase 1 – Development of refined capability requirements and deliverance of AFSC capability architectures capturing alternative operational concepts. Furthermore, the conduct of knowledge gap analysis to identify study objectives to inform Phase 2.

Phase 2 – Studies of selected AFSC High-Level Technical Concepts by capability architectures and related project architectures including down-selection of the preferred AFSC capability architecture and project architectures for which materiel solutions have to be procured in Phase 3.

Phase 3 – Development of programmatic arrangements necessary to initiate procurement programme(s) after the Concept Stage.

Throughout the Concept Stage, each Phase will end with a decision point where Allies will have the opportunity to examine the deliverables and provide direction and guidance to the NSPA (AFSC Host Nation) on how best to proceed.

To govern and manage this effort, an AFSC Support Partnership Committee and AFSC Project Office have been established.

The Concept Stage started in January 2017 and is expected to be concluded in Q4 2022. HQ-SACT requested the support of JAPCC to contribute to the AFSC Program Office venues (i.e. multiple Workshops on Requirement development, Requirement review and Gap Analysis). During Phase 1 and 2, JAPCC personnel supported the preparation and the execution of the assessment of the High-Level Technical

Concepts (HLTC) delivered by industry. JAPCC supported the development of scenarios and vignettes, took an active part in the assessment of the HLTC and the assessment report writing. Currently, the JAPCC is involved in the preparation of Phase 3 of the project. Contribution concerns the preparation of Risk Reduction and Feasibility Studies, the development of an initial CONOPS for AFSC and a review of the operational requirements.

Co-Chair of the NATO STO Study (AVT-359) about Hypersonic Operational Threats and Capabilities.

JAPCC provides one of two chairmen for the NATO S&T study and supports with expertise about Integrated Air and Missile Defence (IAMD). The study focuses on the impact of hypersonic threats and capabilities on the decision cycle from a mainly military perspective on a political/strategic to tactical level. JAPCC is again working in close cooperation with the Competence Centre for Surface Based Air and Missile Defence (CC SBAMD).

Support of GE Workshop about Communication and C2 for Missile Defence. JAPCC is supporting

GE AF with expertise about NATO IAMD, missile defence and hypersonic threats in a series of workshops to identify command, control and communications fundamentals for missile defence.

Close Joint Support Project. The aim of this project was to show how close air support mission operations in the future may be drastically different than what the Alliance has conducted over the last 30 years. It addresses potential shortfalls in available assets resulting in close support coverage limitations as well as describing options to provide close support in highly contested environments. The study was released in June 2020 with follow-on efforts being made to provide briefings to the close support stakeholders in order to evolve the concepts further and provide tangible progress towards cross-service and multinational interoperability throughout the Alliance.

Insights on the Czech Tactical Air Force Structure for 2027 and Beyond.

The Czech Air Force requested the JAPCC to evaluate options to modernize their tactical air forces in order to meet both national and NATO commitments and ambitions. After completing



Available online:
www.japcc.org/publications/

White Papers

a site visit to the Czech AF and holding a requirement refinement meeting at the JAPCC in 2019, a team of JAPCC SMEs released a detailed study to the Czech MOD in May of 2020. Endorsed by General Harrigian, the study provided Czech decision-makers an independent assessment of options to be considered in order to continue to execute the missions that are currently being completed by Czech aircraft. A comparison of the study options was also provided, based primarily on the anticipated capabilities resulting from each option. Additionally, the time required to achieve the capabilities as well as the length of time that the option might remain a valid solution was included. The JAPCC is continuing to support the Czech Air Force by contributing to the Future Combat Air System topic at their upcoming Future Forces Forum.

Support of NATO STO Study SCI-301 Defeat of Low Slow and Small (LSS) Air Threats. JAPCC is contributing to a three-year study headed by the NATO Science and Technology Organization (STO) on the future of Counter-UAS systems. While conventional threats remain of concern, deployment of Small Unmanned Aerial Systems (SUAS) has provided one of the most significant military capability enhancements of recent years. Challenges posed by SUAS are many and range across the complete kill chain. Traditional systems and first-generation C-UAS systems may be unable to cope with this challenge in the future. The Goal of the study is to provide recommendations to support a 'Second Generation' C-UAS networked system. JAPCC is currently involved in drafting the group's final report which is to be provided mid-2021 to the STO.

Space Support in Operations. Our Space SMEs continued their work in the evolution of Space Power within NATO, mainly through their participation in the current main forum for consultation and coordination of Space-based matters, the Bi-Strategic Command Space Working Group (NBISCSWG). Besides, they improved NATO's 'Space Support in Operations' for Education and Individual Training (E&IT) as Department Head for the NATO discipline. Due to the pandemic situation, a full Annual Discipline Conference (ADC) couldn't be conducted, however, alignments with main stakeholders could be realized. Also, the JAPCC contributed expertise to Space related documents

and doctrines as well as designing and executing OPFOR Space Forces in NATO Exercises. Finally the study 'Resiliency in Space as a combined challenge' was finished and will be published in early 2021. A study in the field of 'National military Space Operations Centres' is an ongoing activity in JAPCC's portfolio.

In August the JAPCC published the Flyer 'Space: NATO's Newest Operational Domain' to give a brief explanation of the overall evolution of Space within NATO, showing JAPCC's activities in this domain since 2005 as well as to promote ongoing efforts of the CoE in future planning of NATO's warfare.

Support of NATO STO AVT-329 study. In support of the Project NGRC activity, the Applied Vehicle Technology (AVT) Panel has established a group to conduct a Long Term Scientific Study (LTSS) that will evaluate the trade space relating to a postulated Next Generation Rotorcraft (NGR) to fulfil this requirement. The plan for the LTSS was developed during meetings at JAPCC in September 2019. This identified two specific areas of interest; Projection of Military Power and Enhanced Capabilities, which would be affected by the introduction of new technologies enabling improved performance (speed, range, and endurance), higher levels of survivability, a reduced maintenance burden and greater availability.

The introduction of these enhanced capabilities requires to be quantified against a set of emerging CONOPS representing high priority land and maritime missions. An initial unclassified study is proposed to be undertaken by the AVT LTSS study group. This will be followed by a more detailed assessment using available data.

The aim is to identify the trade space associated with an NGR incorporating advanced technologies that provide significantly enhanced levels of performance, capability and availability. This will support the ongoing pre-concept stage activity that is developing requirements for a postulated future Rotorcraft of this type. In addition, the output from this study will also support the next stage of the programme that will conduct the concept stage culminating in a formal design of a future Rotorcraft by industry.

Support to GE AF/ACT study Artificial Intelligence in Air Command and Control (AirC2). JAPCC has participated in this study since its beginning, with stakeholders such as ACT (sponsor), GE AF (owner/manager), GE JFAC (AirC2 experts), FR AF (support), JAPCC (AirC2 experts) and CAE (contractor).

The study includes research on the AirC2 JFAC planning cycle and exploring and recommending applications of Artificial Intelligence to support the planner and decision-maker in a more dynamic, complex and information-driven environment. Work packages will include overviews and analyses of concepts to be improved in both the planning cycle as well as during training (ETEE).

The study will demonstrate, through a Software Demonstrator, the possible solutions to a more analytical and automated planning process within the JFAC in the 4th quarter of 2021. The first results of the research have been received, and are contributing to more AI-related projects within the JAPCC. JAPCC maintains close coordination with the GE POC of the program to support the endeavour with expertise and knowledge in the field of JFAC processes.

NATO Force Protection Decision Support Tool Development. It is offered, that there is little apparent understanding of the scale and complexity of the FP challenge facing the Alliance. This view was the driving force behind the development of the 'NATO FP On a Knife Edge' think-piece. Part of the problem-set is that FP is being considered differently by each Nation and in isolation for individual assets across many hundreds of locations. To remedy this situation would require a detailed FP Estimate to be conducted at each location using a single, standard approach. Findings would then need to be collated centrally in order to create a single picture. Today this would be a near impossible task due to the sheer scale of the task, the time it would take, the lack of trained manpower and the inability to apply a consistent approach across all locations. This task would not only be achievable with IT support, but the availability of a FP Decision Support tool would allow for scenario modelling which in turn would enhance the ability to dynamically manage Risk. The JAPCC is working

with industry to develop a 'beta' version of a product to be used as a demonstration of what could be achieved if approved for use and further development funded. The development of the aforementioned 'think-piece' provides the basis for the development of a detailed Business Case for submission to NATO Headquarters either directly or through the NATO Command Structure (NCS).

Cyberspace. JAPCC continued collaboration and networking with NATO and European agencies and partners to continue to influence the progress on Cyberspace Policy and Doctrine, Concept Development, and Education and Training. For the second year, JAPCC has been a partner in the European Air Group (EAG) Cyberspace Workshop and a member of the Cyberspace Annual Discipline Conference (ADC). During the EAG Cyberspace meetings held virtually, JAPCC briefed on its organization and high-level projects. EAG members were very interested in the integration of Cyberspace into Air Ops planning and also on accessing JAPCC's publication about conducting Counter-UAS via Cyberspace. JAPCC supported the Annual Discipline Conference for Cyberspace for the second year and provided expertise once again for the Discipline Alignment Plan (DAP), specifically regarding the education and training requirements for both the Training Audience and the Cyberspace SMEs supporting the Exercises either as Opposing Forces (OpFor) or as Exercise Control (ExCon) in the development and execution phases. JAPCC provided a Cyberspace SME as OpFor Cyber for the scripting and execution phases of Exercise Ramstein Ambition 2020. The exercise was, unfortunately, hampered somewhat due to restrictions to combat the spread of COVID-19; the ExCon and OpFor Cyber SME could not be co-located and not all scripted Cyberspace events could be executed. The full impact will not be clear until the After Action Report is assessed.

In December, JAPCC joined the NATO-EuroControl Air Traffic Management Security Coordinating Group Cyber Security Task Force and is looking forward to contributing expertise and working in collaboration with this group of military and civilian stakeholders to find solutions to international Air Traffic Management Cyber Security challenges.



Education and Training

In 2020, the JAPCC supported NATO Education and Training in the following areas:

- Support to Major NATO Exercises;
- Air Transport Exercises;
- Air-to-Air Refuelling Training;
- Air Force Protection (FP) support to the European Air Group (EAG);
- Think-pieces on Force Protection;
- NATO FP on a Knife Edge – A Think Piece;
- NATO Force Protection Training (Introduction to Force Protection in NATO Course);
- Development of NATO Advanced FP (Practitioners) Course;
- Air FP Support to Baltic Air Policing;
- Cyberspace Support;
- NSO Comprehensive Operational Planning Course (COPC);
- Surface Based Air and Missile Defence;
- Education and Training on Space Operations;
- Joint Personnel Recovery Education and Training.

Support to Major NATO Exercises. For Exercise **Trident Jupiter 19-02**, the JAPCC was requested by the Joint Warfare Centre (JWC) to support both the development of the exercise scenario and the actual exercise planning and execution through providing OPFOR Air, Space and related Cyber incidents. A JAPCC team reinforced by a number of external experts, led and coordinated by the ACE SME for support to exercises, prepared the exercise and was ready to go to Stavanger, Norway, in March 2020. This support was stopped by the developing COVID pandemic.

The JAPCC also supported the JWC in the development of the FIKSO scenario which was used in exercise **Steadfast Jupiter-Jackal 20**. Due to the impact of the COVID-19 situation the Incident Development and MEL/MIL Scripting workshops for this exercise were supported through remote working.

JAPCC personnel also led the OPFOR air support to HQ AIRCOM during the preparation of its annual Exercise **Ramstein Ambition 20**. JAPCC provided an OPFOR air team for Exercise Control (EXCON), which executed a highly dynamic air scenario for the training audience. Due to Corona, the team had to work remotely from CAOC Udem.

Air Transport Exercises and Training. The JAPCC continued its cooperation with the European Tactical Airlift Centre. JAPCC provides a Flight Safety Manager in the tactical course and contributes to the EATC Symposium as POC between NATO and EU Air Transport community. The JAPCC is following the development of the centre with the idea of acting as a focal point for future endorsement of the courses. The JAPCC also works together with the EDA for the development of a specific shared program between nations, in order to create a European Undergraduate Military Pilot Training Program.

Air-to-Air Refuelling Training. This year also saw the continued use of the Specialized Heavy Air Refuelling Course, a course created by JAPCC and AIRCOM personnel to train JFAC AAR planners and practitioners, culminating in the graduation of more than 140 multinational students.

Air Force Protection (FP) support to the European Air Group (EAG). For the last 5-years, there has been extensive collaboration between the JAPCC and the European Air Group (EAG) on a range of FP subjects and two joint publications have been developed. Unfortunately, a change of personalities at the EAG in the last 12-months, coupled with the onset of COVID and subsequent cancellation of VOLCANEX, has severed previous links. This is an unacceptable situation and will need to be remedied at the earliest opportunity.

Think-pieces on Force Protection. The concept of producing think-pieces has gained traction with Allied Command Transformation (ACT) as issues can be raised and discussed in order to promote debate, without the need to necessarily provide solutions for which there is consensus.

NATO FP on a Knife Edge – A Think-Piece. Following the success of the last Force Protection-focused think-pieces, the JAPCC has recently completed a critical look at the state of FP across the Alliance. This paper is described as a 'Think-Piece' because it deliberately sets-out to provoke the reader into taking a critical look at the fundamental question of 'can we actually do FP in an effective and resource efficient manner? Or, has the Alliance, for a variety of reasons, 'sleep-walked' into a situation where significant A&S combat power could be rendered useless by a capable and agile adversary, or one who just gets lucky, before any of NATO's asymmetric A&S Power advantage could be brought to bear? The paper describes the contemporary operating environment and what it is that needs to be achieved within it, while simultaneously confronting a range of concurrent threats and hazards. The paper sets out to hopefully leave the reader with the view that FP can no longer be ignored as an avoidable distraction to other 'more important activity' and must be embraced as an essential enabler and revitalized with haste. This is unless of course we wish to be rendered ineffective by activity below the threshold of Article V and/or at the commencement of hostilities as the result of a peer or near-peer adversaries first overt actions.

NATO Force Protection Training (Introduction to Force Protection in NATO Course). The JAPCC has been the Office with Principle Responsibility (OPR) for

this course since 2008 and 3-iterations of the course normally run each year at the NATO School Oberammergau; unfortunately, it has only been possible to deliver one iteration during 2020 as a result of the Pandemic. The aspiration for 2021 is to run additional back-to-back catch-up courses during 2021. This course was significantly restructured in early 2015 following the end of International Security Assistance Force (ISAF) Mission, Afghanistan. The course is continuously evolving as threats change and as counter-threat methodologies develop. The course is consistently well received with a close to 90% student satisfaction rating. The last 10% being almost impossible to achieve due to the ever-changing student dynamic from one course to the next. In terms of attendance and course critique capture, the perspective of students remains that it is consistently one of the best of the 120+ courses run at the NATO School. Consistent feedback on the desire for more advanced training led to the development, by the JAPCC, of a NATO Advanced Force Protection (Practitioners) Course.

Development of NATO Advanced FP (Practitioners) Course. At the NATO Force Protection Working Group (FPWG) of October 2017, the Nations endorsed the requirement for more in-depth training for FP Practitioners both for employment within the NATO Command and Force Structure and within the Nations themselves. This requirement was subsequently supported by both the NATO Command Structure (NCS) and the NATO Force Structure (NFS) in the Force Protection Advisory Group (FPAG) immediately following the FPWG. The JAPCC as the OPR for existing NATO FP Courses was requested by Supreme Headquarters Allied Powers Europe (SHAPE), as the de-facto NATO Requirements Authority for FP, to undertake a Training Needs Analysis (TNA) and subsequently deliver a Training Proposal. This work was undertaken in a series of Working Groups run by and hosted at the JAPCC throughout 2018. The output of this work was then shared with the NATO School Oberammergau and further work undertaken by the JAPCC led to the development of Course Control Documents (CCDs) which in turn underpinned the delivery of a Pilot, NATO Advanced Force Protection (Practitioners) Course, during the first week of June 2019. Feedback from the first batch of students was

extremely positive and whilst a comprehensive course critique was undertaken, it was clear that the stated requirement had been met if not exceeded. Following the Pilot Course, issues raised in the critique have been addressed and both the CCDs and course programme have been revised during 2020. At the time of writing, the CCDs are in the process of being signed and the NATO Advanced Force Protection (Practitioners) Course, will become a NATO Approved Course. Unfortunately, the practical elements of this course and the instructor-intensive manner of delivery mean that courses planned for 2020 have had to be cancelled. However, at the time of writing, the intention is to run additional courses in 2021. In the longer-term, the aspiration is to merge the 2 x FP courses into a single but, modular package.

Air FP Support to Baltic Air Policing. In 2015, the Director tasked the JAPCC to investigate the FP posture of the Baltic Air Policing (BAP) Mission and to then explore how that might need to be enhanced should the BAP Mission ever have to transition to Air Defence. This work, that continued well into 2016 has brought about positive, substantive change to Air FP in the region in terms of both enhanced plans and increased resources. In addition, it has created lasting linkages between the Air FP specialists in the 3 Baltic States and JAPCC Force Protection. In 2019, the JAPCC was requested to provide a week-long, bespoke Air Force Protection package to officers from all three nations attending the Air Force Staff Officers' Course at the Lithuanian Defence College in Vilnius.² This was a substantial undertaking that comprised of 35 lessons and approximately 200 hours of preparation. Feedback from this initial package was extremely positive at the request of the College, the package was developed based on feedback and prepared for delivery during the week 5–9 October 2020. The package had unfortunately got to be delivered via Video Teleconference (VTC) due to COVID restrictions, but appears to have still had positive effect. The module is already scheduled again for Week 41 of 2021 and the 2019 plan to make this event an enduring part of the staff college curriculum has come to fruition.

2. JAPCC Force Protection Temporary Duty to Vilnius 2–8 Nov. 2019.



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Cyberspace Support. For the fifth consecutive year, JAPCC has provided Cyberspace expertise to the Joint Warfare Centre (JWC) in OpFor / ExCon Cyberspace for the development and execution phases of a major exercise. This year JAPCC assisted in the preparation of the Cyberspace injects during the MEL/MIL scripting Phase and as Cyberspace Exercise Control / Opposing Force during the Execution Phase of Ramstein Ambition 2020.

NSO Comprehensive Operational Planning Course (COPC). COPC in NATO School Oberammergau (NSO), being one of the leading courses, is normally run with the expert assistance of Liaison Officers from the functions (navy, army, air, SOF) and JAPCC provided the SME already on site for the current review of the Comprehensive Operational Planning Document. The lack of planners at all levels (tactical and operational) requires the NSO to run 8–10 iterations per year. Those iterations fulfil only approximately 25% of the planning requirements for NATO. This indicates the high value of the course as well as the great demand. Due to COVID-19, courses were cancelled this year. However, for the future JAPCC can be expected to resume support to NSO.

Surface Based Air and Missile Defence. In preparation for the Air and Missile Defence Committee meeting, JAPCC is contributing to the Panel on Air and Missile Defence (PAMD) Large and Focus Group meetings



and the related workshops. In these meetings, significant NATO policy documents, like the NATO IAMD Policy were created and amended.

JAPCC is a member of the Joint Capability Group on Surface Based Air Defence and supports the Capability Area Facilitator GBAD, under the Capability Development Establishment Board (IS/IMS); both under the responsibility of the Conference of National Armaments Directors.

When requested, JAPCC provided subject matter expertise to other workshops, like the GE communications and C2 workshop for missile defence, BMD Operational User group, the NATO ESSM Procurement Group or the NATO Science and Technology studies about Hypersonic Operational Threats (ST-008 and AVT-359). In this regard, JAPCC personnel provided presentations in several national and multinational seminars, conferences and workshops and IAMD insight for related studies, doctrine and policies.

In addition, JAPCC supported SBAMD courses at NATO School Oberammergau and in the GE/NE binational Competence Centre SBAMD. The JAPCC also participates in and supports the European Ground Based Air Defence Working Meeting, an initiative (GE/NE Framework lead) to bundle the scarce GBAD assets in Europe in the areas of Education, Training and Exercises.

Since mid-2015, JAPCC has been an active member of the multinational BMD experiment Nimble Titan and

fills the deputy position in the War Game Control Group as well as support for the Analysis and Reporting Team. Furthermore, JAPCC provides the deputy in the Operational Control Group for the main IAMD exercise in the European theatre, Joint Project Optic Windmill, which is planned to be executed in 2021. Also, SBAMD expertise was provided for the preparation and execution of the Exercise Ramstein Ambition and the Trident series of JWC.

Education and Training on Space Operations

Since May 2016, JAPCC is the Department Head (DH) for the discipline 'Space Support to NATO Operations'. As the DH for Space, the JAPCC coordinates findings and develops solutions for the E&T requirements identified by the Requirements Authority (SHAPE DCOS SDP). Due to the COVID pandemic, the 4th Annual Discipline Conference (ADC) is postponed to 2021 and a small video conference with main stakeholders was held to discuss current and future primary needs in Education and Training issues in the Space discipline. The 2019 Discipline Alignment Plan (DAP) is unchanged and the next update will follow in 2021. This is the result of significant changes following the declaration of Space as an operational area which, due to its influence on all other areas, requires several adjustments in E&T aspects, not only in this area.

The JAPCC also continued to foster the integration of Space into NATO operations by contributing to the Space training experimentation into the Trident and Steadfast exercise series. For that, the design of an

OPFOR Space structure, including all relevant documents, was designed Trident Jupiter 19-02. Within the preparation of Trident Jupiter 19-02 the roles as OPFOR Space as well as an educational role for the training audience were fulfilled. The execution phase of the exercise was finally cancelled due to COVID 19 limitations. The follow-on exercise Steadfast Jupiter 20 was prepared and supported remotely in the full scope in the role as OPFOR Space.

Joint Personnel Recovery Education and Training.

JAPCC supported the 22nd Joint Personnel Recovery Staff Course (JPRSC) and 3rd Joint Personnel Recovery Leadership Course (JPRLC) conducted at the German AOC in the fall of 2020. The JPRSC and JPRLC, as part of the EDA Joint Personnel Recovery Education and Training Courses (JPR-E&TC) are aiming at generating well-trained personnel able to perform as a PR Staff in a Personnel Recovery Coordination Cell (PRCC) or Joint Personnel Recovery Centre (JPRC) within EU, NATO or national HQs, in the planning and/or execution of military operations or exercises. A second request of support by the German AOC was submitted to the JAPCC for a German national JPRSC but was cancelled due to COVID-19.

Active Engagement

The JAPCC continues to actively engage with various air power stakeholders through working groups and other face-to-face meetings. These engagements included but were not limited to:

- Annual Joint Air and Space Power Conference;
- Think Tank Forum (TTF);
- Joint Air and Space Power Network (JASPN) Meeting;
- NATO's Long-Term Military Transformation (LTMT);
- European Safety & Security Professionals Network;
- Aircraft Cross-Servicing (ACS);
- Joint Personnel Recovery (JPR);
- Air-To-Air Refuelling (AAR);
- Maritime Air Coordination Conference (MACC);
- Participation in the Air and Missile Defence Committee and Subordinate Bodies;
- Aerospace Capability Group 2 (ACG2);
- UK military Space Conference;

- AFCEA Europe's Virtual Workshop 'Cyber Security in and for Space Operations';
- NATO Maritime Interdiction Operational Training Centre (NMIOTC) Cybersecurity Conference;
- TIDE Sprint;
- Intelligence Surveillance and Reconnaissance capability study;
- JISR and Big Data;
- AirC2 Cluster;
- Support to ITA AF AI Study concerning the use of AI within C2.

Promote and showcase the effectiveness and relevance of Joint A&S Power as a critical element in Air, Land and Maritime operations.

Annual Joint Air and Space Power Conference.

For the 2020 Conference, the JAPCC invited a number of distinguished speakers and panellists from various nations for the annual Joint A&S Power Conference in Essen, Germany, initially scheduled for October 8 to 10, then rescheduled for early December and finally cancelled due to the COVID pandemic.

The 2020 conference was supposed to explore various aspects regarding the overarching theme 'Leveraging Emerging Technologies in Support of NATO Air & Space Power'.

A very comprehensive Read Ahead was published to provide a good foundation for further discussions. To further promote discussions on this topic of remaining relevance, additional publications including video statements on the JAPCC website and distributed via social media were made available.

Think Tank Forum (TTF). The seventh Think Tank Forum was planned to take place in March 2020 in Mont de Marsan, France, graciously hosted by the 'Centre d'Expertise Aérienne Militaire' (CEAM). The objective of this forum was to have an inter-organizational exchange between national Air Warfare Centres and A&S Power related academic institutions

to share information regarding their programmes of work, initiatives and ideas regarding Air & Space Power related challenges. The Think Tank Forum was the first major event of the JAPCC in 2020 that had to be cancelled on short notice due to the developing COVID pandemic.

Joint Air and Space Power Network (JASPN) Meeting. The 2020 Joint A&S Power Network Meeting was held from 10–11 November 2020 in a VTC format. Similar to the Think Tank Forum, the JASPN meeting helps to develop better synergies within the Air & Space Power community. It brings together NATO and European international organizations. The main objective of the Forum is to share information regarding the transformation of Joint A&S Power in order to gain awareness of key areas of effort and discuss potential areas of cooperation and prevent duplication of effort.

NATO's Long-Term Military Transformation (LTMT). The NATO Long-Term Military Transformation (LTMT) programme addresses the full range of security challenges, applies a unifying vision, and advances a conceptual framework for forces and capabilities required to succeed in future operations. To support this programme, our experts coordinated the JAPCC's participation in workshops and VTC's to support further development of Strategic Foresight Analysis (SFA) and NATO Warfighting Capstone Concept – two of the key overarching documents of the whole Alliance. Implementation of their findings and conclusions across JAPCC activities ensures that its products are relevant to emerging security challenges and coherent with coalition highest level guidance.

European Safety and Security Professionals Network. During 2020, the JAPCC has provided regular input to the network (via VTC) primarily in the form of briefings on FP but also assistance in the area of curriculum development. The network allows JAPCC FP to connect with individuals who are responsible for what the military describes as FP but, are in academia or industry. While there is significant benefit to be gained from participation in the form of capturing emerging best practice (i.e. for incorporation in doc-

trine and/or training), all participants in the network agree that the relationship between participants is symbiotic and the mutually derived benefit is improvements to Safety, Security and FP for all. JAPCC engagement with academia and industry ensures that the JAPCC's FP output is not only multi-national and multi-domain but, also comprehensive. The Hague University of Applied Sciences (THUAS) acts as the facilitator for the network and the JAPCC supports their Counter-Terrorism module, Internship Programme and the applied element of student course. In turn, the sharing of ideas across sectors and the involvement of students with fresh ideas is helping shape the JAPCC's development of initially a 'Critical Asset Protection Handbook' that will hopefully morph, over time, into an International Standard for Asset Protection.

Aircraft Cross-Servicing (ACS). In 2019, SHAPE reactivated the ACS programme. JAPCC is supporting AIRCOM by providing guidance and recommendations on the most effective and efficient way to rebuild the ACS capability in the area of processes, organizational structure, and documentation, and assess potential additional ACS capability options for future employment to enhance this operational capability. JAPCC, as the custodian of the Allied Aircraft Cross-Servicing Publication (AASEP-13), provided the Ratification Draft of the Publication. In April 2020 STANAG 3430 was promulgated. JAPCC is now monitoring and advising on ratification issues. Recently JAPCC has been asked to assist with exploring ACS opportunities for RPAS and the Space domain.

Joint Personnel Recovery (JPR). The JAPCC has been directly involved in the Multinational Capability Development Campaign (MCDC) program, cooperating with and supporting the US Joint Personnel Recovery Agency (JPRA) in the JPR 2040 project. Due to the Covid 19 pandemic, the project stalled for six months, but the team regained momentum and achieved significant progress during the working session hosted in September by the JAPCC.

The JPR 2040 project focuses upon detailed discussion and testing of a number of key questions and tentative recommendations, developed through

our combined Line of Inquiry (LOI) research efforts. This WS helped the team to identify gaps and shortfalls in PR with specific focus on doctrine, policy, C4ISR, and ETEE.

Air-To-Air Refuelling (AAR). JAPCC's AAR personnel conducted 11 presentations for wide-ranging audiences with many of these being moved to virtual platforms to accommodate the travel restrictions imposed by the pandemic. These presentations throughout the year focused on the education of AAR experts and increasing interoperability within the AAR enterprise world-wide. The AAR SMEs continue to meet with NATO HQ IS-DI and EDA on a quarterly basis to ensure that the strategic direction of the three agencies remains pointed in the right direction.

Maritime Air Coordination Conference (MACC). The 2020 MACC was scheduled to take place in Kalkar from 12–14 May 2020. The main theme was 'Carrier Strike Group – C2 within NATO'. Due to restrictions caused by COVID-19 the Conference, together with the Air-Maritime Coordination Working Group (AMCWG) and Maritime Air Control Authority (MACA) was initially postponed to autumn 2020 and finally can-

celled. The next conference is scheduled for May 2021 and will be hosted by the JAPCC in Kalkar.

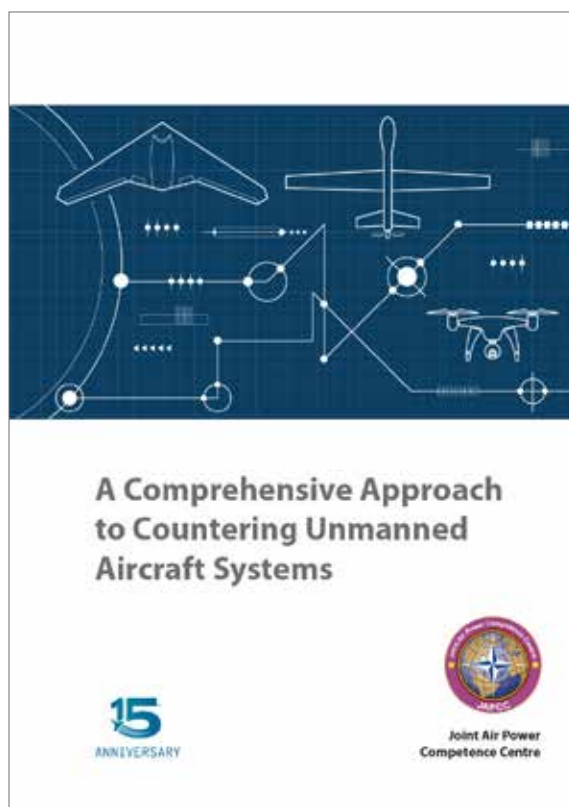
Participation in the Air and Missile Defence Committee and Subordinate Bodies. The JAPCC remains an active participant in the Air and Missile Defence Committee and the PAMD and its subordinate working and focus Groups. Through continuous participation in these various bodies, the JAPCC supports the development of Integrated Air and Missile Defence policy.

Aerospace Capability Group 2 (ACG2). During 2020, workshops on Network Enabled Weapons (NEWs), Digitally Aided Close Air Support (DaCAS), Weapon Effectiveness, and Airborne Electronic Attack (AEA) took place via Teleconference in the 29th and 30th meetings of the Aerospace Capability Group 2 of which JAPCC SMEs are participants. The primary mission of ACG2 is to achieve interoperability between NATO and national forces in Effective Air Engagement by developing and providing standardization in the area of air weapons systems. Among the relevant activities on the meeting agenda, support was provided by the ACG2 to future capabilities and weapon effectiveness methodology for NATO's Targeting Process.



UK Military Space Conference. The Assistant Director provided a speech at a videoconference as part of the UK military Space conference in November. The topic was the role of the JAPCC in the NATO Defence Space environment.

AFCEA Europe's Virtual Workshop 'Cyber Security in and for Space Operations'. JAPCC personnel has participated in an AFCEA workshop called 'Cyber Security in and for Space Operations' and actively presented on the topic 'Technology, Policy and Governance to fix old and prevent new vulnerabilities' in a panel.



Available online: www.japcc.org/publications/ (Books)

NATO Maritime Interdiction Operational Training Centre (NMIOTC) Cybersecurity Conference. The 4th Cyber Security Conference in Maritime Domain was hosted at the NMIOTC in Souda Bay Crete, Greece, end of September 2020. The main subjects which were covered included Planning for Cyberspace Military Defensive Operations, Cybersecurity Aspects, Threats, and Technologies, Cyberspace Situational

Awareness and Capabilities and NATO-EU Cybersecurity collaboration. Apart from the JAPCC representative, the participants originated from across Armed Forces, Academic, Law Enforcement and Industry.

TIDE Sprint. The 'Think-Tank for Information Decision and Execution' (TIDE) Sprint events take place, normally, twice a year, every spring and every fall. This year both events took place virtually due to COVID-19. The aim is to bring together operators, managers, industry and academia to improve the interoperability, resilience and agility of NATO.

Intelligence Surveillance and Reconnaissance Capability Study. The JAPCC started a new study on the feasibility of supporting NATO ISR Enterprise. This project is based on a Request for Support (RfS) from SHAPE and aims at investigating new capabilities for NATO. The project will complement NATO AGSF and propose mitigating capability gaps with new and innovative multi-domain approaches.

JISR and Big Data. JAPCC was engaged (via RfS) by the Italian Air Force to approach an initial study on Big Data and ISR (Intelligence Surveillance and Reconnaissance). The project analysis includes addressing the problem of managing large volumes of data and information for supporting the decision-making process. This kind of approach aims to deliver the first assessment and recommendations with which nations and organizations can develop several new models of analysis. The project is not limited to the ISR community but will engage many interested stakeholders.

AIRC2 Cluster Kalkar and Uedem. In times of crisis or conflict, NATO will stand up a Joint Force Air Component (JFAC) to plan and execute the Air element of a JOINT operation. The JFAC contribution can be NATO Command (NCS)- or NATO Force Structure (NFS)-based. Training, preparation, stand-up and execution of NCS- and NFS JFAC's must be standardized and streamlined to ensure smooth initiation, execution and, if required, seamless handover from one JFAC to another. The fact that a CAOC, an NCS JFAC (GE) and the JAPCC is physically co-located in the Kalkar area, offers the unique possibility

to create a nucleus for a pool of knowledge in the field of C2, the AIRC2 Cluster. The cluster will not re-write doctrine, policies or CONOPs. The cluster will support existing processes from a working level perspective with practical solutions for the workflow in the fields of training, preparation and execution. Furthermore, cluster efforts should highlight problem areas and shortfalls to develop mitigation measures solutions. The JAPCC is contributing with experience and knowledge during workshops and product development.

Support to ITA AF AI Study Concerning the Use of AI within C2.

The Italian AF HQ requested the support of the JAPCC to study current planning capabilities and possible adaptation of technology-assisted / AI applications within the area of Air Command and Control (AIRC2). Specifically, the study shall look into the possibilities to integrate operational and training systems (applications) that may assist the current planning process and/or decision cycle in general. The goal is to produce a study with a proof of concept of the way ahead to implement tools and applications usable for the AirC2 process within the military scope and in the context of Artificial Intelligence.

JAPCC Involvement in NATO Activities and Working Groups

JAPCC personnel fill chairmen, co-chairman, and panel positions on numerous NATO steering bodies as well as providing custodianship to a number of NATO Doctrine documents, as highlighted below.

Chairmanship

- Air Operations Working Group (AOWG);
- Maritime Air Coordination Conference (MACC Co-Chair);
- NATO Air-to-Air Refuelling Working Group (AAR WG);
- NATO Air Transport Working Group (ATWG);
- Doctrine, Organization, and Interoperability (DOI) Panel, NATO Force Protection WG;
- Co-Chair the NATO STO AVT-359 study about hypersonic capabilities.

Exercise/Campaign

- Nimble Titan 20, Wargame Control Group and Analysis Team;
- Operations Control Group Joint Project OPTIC WIND-MILL (JPOW);
- OPFOR Air-, Space- and Cyberspace support to Exercise Trident Jupiter 19-02;
- OPFOR Air, Space and Cyberspace support to Exercise Ramstein Ambition 20.

Panel Member/Working Group

- Allied Future Surveillance & Control Project Group (AFSC PG);
- Air Capability Group 3 and NATO Electronic Warfare Air Group;
- NATO AEW&C Programme Management Organization Board of Directors (NAPMO BOD);
- JPR Forum;
- Air & Missile Defence Committee (AMDC);
- Force Protection (FP) Task Force;
- NATO Special Operations Headquarters (NSHQ) in support of Air Development Program (ADP) for SOF aviation;
- Personnel Recovery / Search and Rescue Working Group (PR/SAR WG);
- NATO Army Armaments Group / Joint Capability Group Vertical Lift (NAAG/JCGVL);
- Helicopter Inter Service Working Group (HISWG);
- Joint Capability Group Unmanned Aircraft Systems (JCGUAS);
- Joint Capability Group Ground Based Air Defence (JCGGBAD);
- Maritime Operations (MAROPS) Working Group;
- Global Helicopter Operations from Ships other Than Aircraft Carriers (HOSTAC) WG;
- Multinational Through-deck and Aircraft Carrier Crossdeck Operations (MTACCOPS) Working Group;
- NATO Bi-Strategic Command Space Working Group (BiSCSWG); NE SBAMD Policy Group;
- NE Knowledge Network on SBAMD;
- Panel on Air & Missile Defence (PAMD) Large Group;
- PAMD Workshops and Focus Group;
- European Air Group Cyberspace Working Group;
- Cyberspace Annual Discipline Conference;

- NATO Cooperative Cyber Defence Centre of Excellence (CCD COE) 12th International Conference on Cyber Conflict;
- TIDE Sprint Events (virtual);
- CNAD/NAFAG/ACG3–Effective survivability, more particular, EW in the aerospace domain;
- NEWAC/NEWWG–NATO EW Concept & Doctrine;
- CNAD/NNAG/AWWCG – EW sessions;
- STO AVT 329 study (NextGen Rotorcraft Impact on Military Operations);
- STO SCI-301 Study Group.

Doctrine Development and Standards

Over the last year, the JAPCC led and participated in the following doctrine efforts:

Author and Custodian of MC-0656, Military Committee (MC) Policy for Force Protection of Alliance Forces.

In 2010 with multiple FP challenges related to the International Security Assistance Force (ISAF) Mission mounting, the JAPCC undertook what eventually became a 7-year project to develop a NATO FP Policy. This document was required to overcome several strategic hurdles to the delivery of effective and resource-efficient NATO FP. The challenge at the time was the plethora of different perspectives on the subject across Nations and the NATO Command Structure (NCS). This 'confusion' led to the inability to reach consensus on a NATO-wide approach and in turn, an inability to agree where responsibility lay. The operational effect of this was an ad-hoc approach to FP which created unnecessary vulnerabilities. NATO FP Policy was promulgated on 24 January 2018 and has had far-reaching implications. NATO FP Training has been revised, updated and expanded and NATO FP publications are being reviewed in accordance with policy. Throughout the review of doctrine and training, a 'feedback' mechanism has remained in place so that once the policy-driven review of subordinate activity is complete, a review of FP Policy can be conducted to ensure that the Alliance's approach to FP remains fit-for-purpose in an era of 360-degree threats. A working copy of the proposed next policy document continues to evolve and a formal review will be offered, likely in the 1st Quarter of 2022.

AJP 3.3 Allied Joint Doctrine for Air and Space Operations.

The JAPCC is the custodian of NATO's doctrine on joint air operations, AJP 3.3, Allied Joint Doctrine for A&S Operations. JAPCC succeeded in drafting a new version of the AJP 3.3 and had it ratified and promulgated (old version was dated 5 November 2009). Simultaneously, JAPCC prepared the request for feedback required for the next edition of AJP 3.3. A new doctrine task was issued in early 2017 and the first draft of Edition C (Working Draft 1) was published in November 2017. The Study Draft 1 (SD1) was published in December 2018 and a new draft (SD2) incorporating all feedback coming from NATO nations and NATO bodies will be published as soon as the new Air C2 CONOPS changes are incorporated. The goal is to have AJP 3.3, Edition C entering the ratification process in 3rd quarter of 2021.

Custodian of AJP-3.14, Allied Joint Doctrine for Force Protection.

The JAPCC has been heavily involved in the development of Joint FP doctrine since 2010 and assumed Custodianship of AJP-3.14 in early 2015. This document went into review following the issue of a Request for Feedback (RfF) distributed to the Nations by Allied Command Transformation (ACT) in December 2017; this led to a Data Fusion Workshop (DFW) being run in the UK during April of 2018. Out of this cascaded the Doctrine Review Task which issued by ACT in March 2019. However, following the DFW, the JAPCC developed a review timeline and commenced work. A first workshop was held at the JAPCC in September 2018 and was followed by two further workshops in 2019. This led to the JAPCC producing a First Study Draft (SD1) that was offered to the Nations via the Allied Joint Operations Doctrine Working Group (AJODWG) Forum on 6 June 2020. This review led to the following changes:

- a. Repetition reduced and cohesion with other publications increased;
- b. Updated to reflect:
 - i. Changes in the NATO Command Structure and NATO Force structure;
 - ii. Latest policy, doctrine and acknowledged best practice;
 - iii. The contemporary operating environment including new threats and hazards;

- iv. The latest policy and doctrine on Cyber operations and Strategic Communication;
- c. Now a more generic, less Afghanistan-centric, publication;
- d. Risk Management updated to reflect ISO 31000, Risk Management Processes;
- e. Annex on categories of force protection measures, effects, actions and tasks added;
- f. Multiple new as well as updated terms and definitions.

By the 5 October 2020 deadline for comments, a total of 710 comments had been received from 15 separate stakeholders. Of these comments, 350 were of a minor nature and will be incorporated by the Custodian by no later than the end of January 2021. The remaining 360 comments are from a single stakeholder who was not involved in the review and as a result, will require a further Writing Team workshop to understand, adjudicate and subsequently incorporate the comments provided. The provisional date for this event will be March/April 2021 with a view to developing a Ratification Draft by Summer 2021 with a Ratification target date of December 2021. While this represents a near 4-year review process, it remains two years less than the previous review.

Author and Custodian of ATP-3.3.6, NATO Force Protection Doctrine for Air Operations. The JAPCC initially authored this publication in 2010 at the re-

quest of the Nations in the forum of the NATO Air Operations Working Group (AOWG). Unfortunately, having produced a substantive draft, the Nations were reluctant to proceed with ratification as the overarching AJP was under review. The ATP was eventually promulgated in April 2016 and as a result, should have gone into review during 2019. However, once again development of this doctrine is being hampered by the laborious and time-consuming task of reviewing the overarching AJP (see above). Notwithstanding this challenge, as Author and Custodian of the ATP, the JAPCC has maintained a working copy of the document into which have been incorporated developments as they have occurred. As a result, AOWG 1 of 2019³ accepted the JAPCC's recommendation that the JAPCC should be authorized to produce a Working Draft of the ATP, without the need for Working Groups. This activity has been completed during 2020 and has led to the development of a First Study Draft (SD1) that incorporates, at the direction of the AOWG, the following developments:

- a. Changes from overarching FP Policy and Joint FP Doctrine;
- b. Introduces the concept of the 'Complex Air All-Domain Environment' (CAADE);
- c. Addresses the need for Counter-Surface to Air Fires (C-SAFIRE);

3. 23 May 2019 at Ramstein Airbase, Germany.



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- d. Provide more detail on FPC2 and offers an Air FPC2 construct;
- e. Explores the relationship between Air FP and Cyber Defence;
- f. How FP contributes to Securing Access to Space;
- g. FP activity to Counter-Unmanned Systems in all environments;
- h. Looks to increasing resilience to Hypersonic Threats.

SD1 was briefed to the AOWG on 14 October 2020. A way forward was agreed that would see ongoing reviews of both ATP-3.3.6 and AJP-3.14 now being completed in parallel. To this end, SD1 of the reviewed ATP-3.3.6 was posted on the AOWG Forum on 1 November 2020 with a deadline for comments of 12 March 2021. The intention is to hold back-to-back Writing Team Workshops 12–16 March and 19–23 March 2021 for AJP-3.14 and ATP-3.3.6 respectively (COVID restrictions permitting). Again, the aspiration is to achieve ratification of a revised ATP-3.3.6 by the end of 2021.

ATP 3.3.4.1/3/4 Custodianship. The new editions of those standards were reviewed during the year and were ratified. The ATP 3.3.4.4 has been reopened and it has been under discussion for a new version. For the time being, it is on the ratification process and it will last until the beginning of the next year. As the JAPCC holds the NATO ATWG Chairmanship, it continues to manage the focus of the AT community. The JAPCC also continues to be a contact point for coordination between NATO and EU organizations involved with AT.

ATP 3.3.4.2. The JAPCC remains active in the management of AAR Doctrine, Standards and Procedures. The JAPCC continued its management of the global AAR compatibility and clearance matrix and built upon its relationships with other key AAR stakeholders, producing, updating and disseminating standardized AAR documents (6 STANAGs/4 NATO Standards Related Documents (SRDs)/1 SRD template/26 National and Organizational SRDs). While the pandemic prohibited in-person AAR working group meetings, the JAPCC hosted the first virtual 'super week,' bringing together air mobility experts from across NATO to meet virtually in support of the AARWG, the ATWG, and numerous EDA Air Mobility Initiatives. These efforts were so suc-

cessful that they could serve as a model for increased working group interaction in the future.

ATP-49 Custodianship. Within the Helicopter Inter Service Working Group (HISWG), the Helicopter Operations Panel (HelOps Panel) is responsible for helicopter standardization. In order to improve the interoperability of staff and operators, the HIS WG is tasked by the MC LSB to restructure the entire HISWG standardization portfolio. The ATP-49 is being revised as ATP-3.2.49. This revised standard will consist of a top-level document supplemented with identified operational areas describing Tactics, Techniques and Procedures. In coordination with the chairman of the HelOps Panel, the JAPCC, as custodian of the ATP-49, is leading the revision task, which started in April 2018 and is expected to be accomplished by end-2021. The future ATP-3.2.49 custodianship will remain within the JAPCC.

Helicopter Underslung Load (USL) and Helicopter Underslung Load Equipment (HUSLE) Certification & Interoperability Database. On request of the HISWG, in close coordination with the HUSLE panel, the JAPCC is developing a Helicopter USL/HUSLE Certification & Interoperability Database. The request is in accordance with the recommendations of the USL Certification study, published by the JAPCC in November 2017.

The database will provide NATO nations and partners an information and guidance tool regarding relevant helicopter USL and HUSLE aspects and procedures. Furthermore, the database is to be used as a reference guide to confirm and/or determine if a USL can be accepted for transportation by any available helicopter.

JAPCC is currently building an initial database with the information provided by the NATO and Partner Nations. IOC is expected in Q1 2021.

Critical Asset Protection Handbook. As can be seen, the JAPCC is Author and/or Custodian of many of NATO's FP documents. It also contributes to the development of other domain-specific FP documents and broader FP-related or connected documents through Chairmanship of NATO's Force Protection Working Group, Doctrine Organization and Interoperability (DOI) Panel. From this unique position, it

became clear that while there are many national differences in approach to the protection of NATO assets, there are equally many similarities. Furthermore, from engagement with the Safety and Security Professionals Network, there are significant overlaps with both the Academic and Industrial approaches to protecting something deemed as 'critical' be this national infrastructure, an industrial production process or a NATO activity. Therefore, during 2020, the JAPCC has continued to incorporate emerging work on FP Policy, Concepts, Doctrine and Directives into a single generic publication with a view to producing what will initially be described as a 'Critical Asset Protection Handbook'.

International Standard for Asset Protection. The aspiration in the medium to long-term is the development of an International Standard for Asset Protection that could, in the future, either provide the core of NATO's approach to Force Protection or ideally, replace some if not all of the current suite of NATO FP publications. Irrespective of whether this goal is achieved (or even achievable), there remains the need to amalgamate and rationalize all NATO FP publications into a single, concise publication. Work on this task has been ongoing throughout 2020 with the intention of having work ready to coincide with the commencement of the next FP publications review cycle, likely to commence (earlier than predicted last year), toward the end of 2022.

NATO Cyberspace Annual Discipline Plan. JAPCC, for the second year, assisted in the writing of the Cyberspace Discipline Alignment Plan (DAP), primarily in the area of identifying the education and training requirements for the Training Audience but also for the Cyberspace SMEs involved as augmentees supporting the Exercises either as Opposing Forces (OpFor) or as Exercise Control (ExCon) in the development and execution phases.

JAPCC Doctrine Development (Custodianship and Contribution)

- MC 064/12 NATO EW Policy;
- MC-0610, FP Policy for NATO-Led Operations Custodian;
- AJP-3.3 Custodian;
- AJP 3.6 (NATO Joint EW Doctrine) Contribution;
- AJP-3.14 Allied Joint Doctrine for FP Custodian;
- AJP-3.3.3 Air-Maritime Coordination;
- AJP-3.7 Allied Joint Doctrine for recovery of personnel in a hostile environment(contribution);
- ALP-4.3 Air Forces Logistic Doctrine and Procedures (contribution);
- ATP 3.6.2 EW in the Land Battle;
- ATP-3.3.3.1 Maritime Air Coordination Procedures;
- ATP 3.3.4 I AT Doctrine (Custodian);
- ATP 3.3.4 II AAR Doctrine (Custodian);
- ATP-3.3.4.1 Tactics, Techniques and Procedures for NATO Air Movement Operations (Custodian);
- ATP-3.3.4.2 Air-to-Air Refuelling (Custodian);
- ATP 3.3.4.2.1 SRD 1 Guide to Obtaining AAR Clearances and Compatibility;
- ATP 3.3.4.2.2 SRD 2 Recommended AAR Aircrew Certification and Currency;
- ATP 3.3.4.2.3 SRD 3 Tanker Capabilities;
- ATP 3.3.4.2.4 SRD 4 Tanker/Receiver Clearance Compatibility Matrix;
- ATP-3.3.4.3 Tactics, Techniques and Procedures for NATO Air Transport Operations (Custodian);
- ATP-3.3.4.4 Tactics, Techniques and Procedures for NATO Airborne Operations (Custodian);
- ATP 3.3.4.5 AAR Boom-Receptacle Requirements;
- ATP 3.3.4.6 AAR Pro-Drogue Characteristics;
- ATP 3.3.4.7 AAR Signal Lights in Hose and Drogue Systems;
- ATP-3.3.4.3 TTPs for NATO AT Operations (Custodian);
- ATP-3.3.6 NATO FP Doctrine for Air Operations (Custodian);
- ATP-49 (STANAG 2999) Use of Helicopters in Land Operations (Custodian);
- AD 80-25 ACO Force Protection Directive Custodian;
- MPP-02 Vol I Helicopter Operations from Ships Other Than Aircraft Carriers (HOSTAC);
- MMP-02 Vol II Multinational Through-Deck and Aircraft Carrier Crossdeck Operation (MTACCOPS);
- AASSEP-13 Allied Aircraft Cross-Servicing Publication (Custodian);
- Functional Planning Guide for Joint Air Operations Planning (FPG AIR);
- Cyberspace Discipline Alignment Plan;
- NATO IAMD Policy;
- NATO SEAD Policy Review.

impact of COVID-19

JAPCC activity was impacted by COVID-19, which forced cancellation of the annual Think Tank Forum and 2020 Joint A&S Power Conference. However, JAPCC was able to conduct our annual Steering and Senior Resource Committee Meetings, as well as our Joint A&S Power Network Meeting via virtual means. Many activities and projects normally worked in face-to-face settings were transitioned to virtual coordination and though some work slowed down or stagnated temporarily, the JAPCC continued to forge ahead and produce in its role as the catalyst for transformation of NATO A&S Power.

2021 outlook

2021 Focus Areas

Introduction. JAPCC regularly reviews and transforms its Focus Areas, PoW and organizational structure to ensure that it can continue to address current and future challenges and to provide key decision-makers effective solutions on A&S Power challenges, in order to safeguard NATO and the Nations' interests. The JAPCC Focus Areas are approved by the Steering Committee at their annual meeting. In the broadest sense, the JAPCC could address any topic or capability within the realm of A&S Power, but closely following current developments throughout the world and within NATO, there are several topics requiring more prominent attention than others.

Space Support in NATO Operations. NATO's operations are heavily dependent on data and services from Space assets, specifically in the areas of Communications, Surveillance and Reconnaissance, Global Positioning, Navigation and Timing, Meteorology, Friendly Force Tracking, Space Situational Awareness and Early Warning. In 2021, the JAPCC will continue to work to ensure NATO's

Space dependencies are understood and addressed appropriately, within the construct of the BiSCSWG (NATO Bi-Strategic Command Space Working Group).

Under the JAPCC's 'Education & Training' Focus Area, JAPCC Space Team, as the Department Head for Space Support in Operations, will prepare and conduct the 4th Annual Discipline Conference (ADC) 2021 to assess the status of NATO Education & Training in the 'Space Support in Operations' discipline. In addition, JAPCC Space Team, in close cooperation with other Space experts from the NATO Command Structure, will support the RAMSTEIN AMBITION 21 as well as the STEADFAST JUPITER 2021 exercises to assess and refine operational concepts, command and control, command relationships for Space support in operations. From the Space operators' perspective, the aim of the exercises is to continue the integration of space capabilities into terrestrial operations as well as pursue space-related training objectives for the TRIDENT and STEADFAST series of exercises.

With respect to JAPCC studies related to Space support in operations, the JAPCC is working on two new studies: 'Space resiliency as a Combined Challenge' and 'Requirements for a National Space Operations Centre with Regards to NATO's Need for Information'. Due to some delays resulting out of the COVID 19 pandemic these white papers are expected to be published in early 2021.

The recognition of Space as NATO's fifth Operational Domain by NATO in December 2019 is changing the significance of Space within NATO and in its space-faring member nations. JAPCC, as a member of NATO Space community will be one of the key actors in the ongoing discussion of the developments in line with the Initial Implementation Plan (IIP) for Space and corresponding documents, activities and actions.

A Comprehensive Approach to Countering Unmanned Aircraft Systems. Technology is developing rapidly, in many cases, faster than the defence industry or NATO can react. Additionally, NATO's focus on the low, slow, and small end of the C-UAS spectrum covers only a fraction of current UAS technology and excludes most military applications. Peer competitors

to NATO can be expected to employ UAS at the same level of technology, and under comparable operational principles, as in the Alliance. Consequently, NATO has to anticipate enemy use of UAS in the same mission sets as with friendly UAS, covering the spectrum from Intelligence, Surveillance & Reconnaissance to unmanned airstrikes, conducted in Line of Sight (LOS) as well as Beyond Line of Sight (BLOS) operations, utilizing the electromagnetic spectrum and the space domain in the same way as NATO.

A comprehensive JAPCC study on C-UAS, to include also perspectives from law enforcement agencies and civil drone defence industry, has been published in December 2020.

Exercise and Experimentation Support. JAPCC will continue to provide substantial support to NATO exercises in 2021 by providing highly dynamic and realistic Opposing Forces (OPFOR) Air, Space as well as A&S related Cyber play in support of OPFOR's Concept of Operations and Exercise Training Objectives by building and executing an OPFOR Air Tasking Order (ATO) and injecting incidents through the Joint Exercise Management Module (JEMM). The expertise brought by the JAPCC OPFOR AIR Team SMEs in a (multi-layered) Air Defence, Tactical Ballistic Missiles, Space, Cyber and Intel play will be integral for upcoming exercises such as Ramstein Ambition 21 (RAAM21) at AIRCOM and the Trident series at the Joint Warfare Centre (JWC), hopefully again as on-site support in Stavanger, Norway. The JAPCC will continue to support the JWC in developing and updating exercise scenarios with the latest developments in joint warfare regarding Air, Space and the related Cyber aspects.

Also, JAPCC will further support Nimble Titan and JPOW in core functions in developing, executing and analysing the overall campaign and events.

Logistics. NATO is required to be able to carry out a range of smaller but demanding operations, and the Alliance must retain the capability to conduct large-scale high-intensity operations, including in support of collective defence. To undertake these missions, the Alliance must be able to launch and sustain these missions. Since only a few Allies can independently de-

ploy and sustain their forces, it is important that NATO and Allies continue to pursue Collective Logistics in order to provide NATO commanders the greatest flexibility on current and future NATO operations. Therefore logistics work in NATO will be pursued along four main lines of effort: develop more capable and interoperable joint logistics capabilities at the required readiness; optimize Command and Control (C2) of logistics support; improve deployability of NATO forces and enhance sustainability of NATO forces. JAPCC is engaged in these topics and will continue to be so.

Resilient Basing. Many NATO members are replacing Space and Airpower capabilities by new technology. Units are being prepared to receive, use and maintain these new resources. Meanwhile in the operational environment, other modern technology is constantly introducing new threat vectors through military capabilities as well as via the Space and Cyberspace Domain. Greater and more insidious threats to our main operating bases and force structure dictate a need to develop, and in some cases re-learn, how they can protect and disperse both force and C2 structure for survivability and resiliency. JAPCC has identified resilient basing as a new focus area. A study is planned to commence in the first quarter of 2021.

Joint Precision Strike, including PGMs. The JAPCC will continue to support ACG2 Programme of Work although COVID-19 restrictions dictate the use of videoconferencing. The advent of network-enabled weapons and recent advances in weapons capabilities have established a need for the Alliance to survey the ACG2 on NEW issues (i.e. implementation of Link 16 STANAG, demonstrations the Group could support, mission planning tools used by Allies, and Information Exchange Requirements) in order to achieve cross-domain synergies on this subject. Since 2016, the JAPCC assumed an important role in the ACG2, which will continue to devote much of its effort in the upcoming years toward addressing this priority area.

Electromagnetic Operations (EMO). Within NATO, EMO involves the deliberate transmission and reception of EM energy in the Electromagnetic Environment (EME) for military operations such as communications, navigation, attack, battlespace awareness, and

targeting. EMO not only enables operations in each domain, but is also the 'glue' that links and integrates military force across the domains of Air, Maritime, Land, Cyber and Space. Even though NATO still recognizes the EME as an operating environment, the Aerospace Capability Group 3 (ACG3) of NAFAG and the top-level EW military committee, the NEWAC/NEWWG, are evolving Electronic Attack (EA), EW, and Suppression of Enemy of Air Defence (SEAD) in order to enable the missions and support a NATO Campaign. JAPCC will continue to engage with the aforementioned bodies in order to provide support with Subject Matter Experts. In 2021, JAPCC will continue leading the review of the SEAD Policy in support of a series of Military Committee tasks intended to facilitate the implementation of the SEAD Concept of Employment.

Cyberspace. JAPCC will continue to assist in the advancement of Cyberspace as an operational domain within NATO. This enhancement will be achieved by maintaining and reinforcing the network of collaboration within the NATO Cyberspace Community of Interest. The research will continue into current and developing trends and technologies in Cyberspace, some of which will be published so that JAPCC SMEs are in the best position to carry on support in the development and understanding of Cyberspace, particularly how it relates to the projection of Joint A&S Power.

The Cyberspace SMEs, specifically, will continue to support major exercises through the development and execution phases as both OpFor and ExCon to ensure training objectives can be met, so challenging scenarios are created for the Training Audience and to raise the collective awareness of Cyberspace for all exercise participants.

JAPCC will also continue to support the development of Cyberspace a NATO Discipline through the ADC and providing expertise on the development of the ADP.

Exchanging information and collaboration will continue so that NATO and its partners can leverage each other's lessons learned and best practices to improve our levels of expertise and proficiency in the rapidly developing area of Cyberspace. This collaboration will include participation in the CCD COE International

Conference on Cyber Conflict, EAG Cyber Committee, NEASCOG Cyber Security Task Force, NMOTIC, and the TSSA. If resources and conditions permit, JAPCC will explore the possibility of greater collaboration with ACT's TIDE SPRINT forum and initiatives.

Of course, JAPCC will continue to assess where its expertise can contribute to projects that emerge in 2021 at the request of NATO, its Member and Partner Nations and JAPCC sponsoring Nations.

Air Support to Special Operations Forces. JAPCC supported the preparation of one of the most important events held by the NSHQ Air Development Program (ADP), the NATO SOF Air Conference. Due to Covid 19 restrictions the conference was cancelled and postponed to next year. The sharing of lessons learned and the discussion on current issues and future solutions related to developing NATO SOF Air capability is still in place. Specifically, the standing cooperation with the ADP on their constant process of reviewing and updating Air SOF documentation.

Maritime Air Coordination Conference. The 2021 MACC is scheduled for May at Kalkar. The consolidated topic for the annual Bi-SC Conference on maritime air component integration will be 'Carrier Strike Group – C2 within NATO'.

JAPCC Joint Air and Space Power Conference, Congress Centre Essen, Germany, 7–9 September 2021.

The 2021 Annual Conference will again be the flagship event on the JAPCC's annual calendar. It will bring together senior NATO and national military and political leaders, members of academia and industry partners in a forum that encourages open discussion of issues of strategic interest to the Alliance and partners. The topic for the JAPCC Conference 2021 will be 'Delivering NATO Air & Space Power at the Speed of Relevance'.

Conclusion. Thank you for taking the time to read the JAPCC Annual report for 2020. We hope you have found this report informative, and that it has given you a greater understanding of and appreciation for the value and relevance of the JAPCC to the Alliance. For more information on the JAPCC, please contact us via email at contact@japcc.org or visit our website at www.japcc.org.

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