A Boeing E-7 Wedgetail in flight with its active electronically scanned array radar.

Alliance Future Surveillance and Control (AFSC)

How Will NATO Continue to Effectively Monitor the Skies?

By Major Patrick Giesenfeld, GE Air Force, JAPCC

Introduction

The NATO E-3A, or AWACS (Airborne Warning and Control System), had its first operational mission in 1982. This remarkable aircraft has the ability to track and detect airborne threats from hundreds of miles away, while simultaneously commanding and controlling friendly forces. Throughout its four decades of service, the AWACS has undergone numerous upgrades to its mission and flight decks, sensors, and communication systems.[1] Despite this highly successful service record, continued use of these aircraft faces additional challenges. One of the primary obstacles lies in the realm of maintenance. As time progresses, the task of maintaining these aircraft becomes increasingly arduous. The scarcity of spare parts, which are often no longer produced or available, exacerbates this issue. Consequently, the already meticulous management of flight hours is resulting in a gradual reduction each passing year.

NATO currently has a fleet of 14 Boeing 707 type AWACS aircraft, stationed in Geilenkirchen, Germany.[2] However, the operational number within the fleet is

NATO aircrew prepare to take off in their E-3A Airborne Warning and Control System (AWACS) aircraft at Šiauliai Air Base in Lithuania.

decreasing considerably. The scarcity of maintenance personnel further compounds the problem, as they grapple with an escalating array of challenges in ensuring the aircraft remain serviceable. In many instances, aircraft are cannibalized for spare parts to sustain the better-maintained ones in the fleet. Nevertheless, technical issues are not the sole hurdle that must be overcome.

In times of worldwide conflict, interoperability and fast data processing are vital, and current systems are struggling to keep pace with the speed of development. To handle the ever-increasing amount of data and information, new technologies may need to be introduced and exploited, such as Big Data Management, Unmanned Aircraft Systems (UAS), Emerging Disruptive Technologies (EDT), Artificial Intelligence (AI), and Machine Learning (ML). In response to these challenges, NATO is already developing a programme for a modern, interoperable, capable, and reliable System-of-Systems (SoS) to ensure the Alliance's future surveillance and C2 needs for 2035 and beyond. This programme is called Alliance Future Surveillance and Control (AFSC). However, recognizing the pressing need to address the current gap, multiple NATO nations have made the strategic decision to accelerate the deployment of an already established platform – the Boeing 737 E-7A AEW&C Wedgetail. This move serves as a crucial component towards achieving the eventual AFSC SoS.[3] This platform should only represent one aspect of the envisioned AFSC capability requirements, as the remaining components of the programme will need to progress in a complementary manner, albeit on their own timeline. Collectively, these approaches beg the

question: Will NATO be able to fuse all the development paths and have a coherent solution in the end?

The Need for a New Capability

In the Warsaw Summit Communique of 9 July 2016, NATO heads-of-state declared that by 2035, the Alliance would need to have a follow-on capability for the E-3A NATO AWACS.[4] In order to keep up with modern airframes and technologies, and to maintain operational effectiveness, the Alliance has acknowledged the necessity for a new capability to fulfill NATO's primary Command and Control (C2) functions, as outlined in the Framework for Future Alliance Operations (FFAO).[5] Consequently, the communique established AFSC with the purpose of addressing the limitations of the E-3A and ushering in a new era of advanced surveillance and control capabilities. NATO Secretary General Jens Stoltenberg stated, 'AFSC is the biggest investment programme of NATO ever to replace the phasing-out of AWACS in 2035.'[6] The aim was to completely redefine how NATO conducts surveillance and C2 in the future.

With the AFSC programme, NATO has already taken a first step towards the future. Significant changes to former operations must be made to fulfil NATO's goal of having AFSC in service by 2035 and to operationalize NATO's new strategic and operational concepts. The new operational requirements underlining the AFSC programme match those defined in the new Multi-Domain Operations (MDO) concept.[7] As a significant evolution of joint operations, MDO started when the Alliance formally recognized cyberspace and space as domains. This recognition was accompanied by the emergence of a challenging new operating environment, marked by the rise of threats such as A2/AD, hybrid warfare, hypersonic weapons, and adversaries' exploitation of EDTs. To effectively address the aforementioned challenges, NATO needs to simultaneously operate in all five operational domains (air, land, maritime, space, and cyberspace) to achieve converging effects at the speed of relevance. Generating a real-time or near real-time common operational picture, shortening the OODA loop, connecting every sensor to the shooters in the fastest possible way, and implementing a cross-domain command capability are the new challenges for AFSC in the MDO environment.

By design, AFSC is not a one-to-one replacement for the AWACS and is intended to be platform agnostic. It is, instead, a SoS based on the MDO approach. As such, the overall AFSC Technical Concept is for an integrated, state-of-the-art, dynamic, adaptable, and federated SoS. This concept is characterized by a resilient, scalable, and flexible distribution of tactical control, battle management, and surveillance functions across its constituent systems, to support a wide range of military requirements across all operational domains and the range of military operations. Currently, NATO considers available surveillance and control assets, evolving surveillance platforms, communications systems, cyber warfare, and cloud computing functions as the key elements of the AFSC.[8] In a military context, the programme refers to integrating various military platforms, technologies, and subsystems to create a comprehensive and interconnected network that enhances military capabilities and effectiveness. AFSC recognizes that modern warfare cannot be effectively addressed by individual structures alone. Assets integrated into AFSC can include fighter aircraft, ground forces, naval vessels, satellites, UAS, communications networks, intelligence data, and more. By integrating these systems, NATO achieves improved situational awareness, distributed C2 capabilities, and cross-domain functions.

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With the development of a project like AFSC, a very long list of challenges and requirements need to be considered. For maintenance, specialist personnel are rare and must have proper training. Also, the new airframe

portion of the AFSC needs to be stationed in tactically favourable regions. These should be central enough to be immediately employed in support of Allied forces in every theatre all over the world, but also not too close to possible threats. Additionally, there is an urgent need for reliable surveillance and control in all five domains, as well as the ability to operate in complex situations as already seen in Ukraine and the Middle East. The new capability must take into consideration the need to also share information with non-NATO entities and partner nations. The system must deliver the right information, to the right place, at the right time.

To always be one step ahead of the opponent, NATO must strive for information dominance. To this end, connectivity is a very important prerequisite for interoperability, which is, in turn, the prerequisite for shared awareness. Moreover, AFSC must have improved system characteristics relative to AWACS to support time-sensitive decision-making. Commanders must be able to identify and retrieve needed information as easily and comprehensibly as possible. AFSC requires the development of standardized communication protocols and data exchange formats. Interoperability can be significantly improved by establishing seamless integration and information sharing between different systems from the beginning. Considering how rapidly crises and conflicts can unfold, decision-making processes will need to be swift, whilst maximizing the commander's ability to delegate authority where applicable. Furthermore, the AFSC programme envisions continued research and development through collaboration with industry partners, academia, and allied nations, and must also build flexibility for unknown future innovations.

The Evolution of AFSC

In 2021, NATO invested over one billion euros in the Final Lifetime Extension Programme (FLEP) to extend the AWACS programme until 2035, leaving enough time for the build-up of AFSC. FLEP includes several upgrades for AWACS, but these are limited to communication, operator systems, and link capabilities.[9] The airframe, the biggest liability concern, was not and will not be upgraded.

The AFSC project is composed of three Stages (Pre-Concept, Concept, and Development) which, in turn, have several phases.[10] Stage one was about defining the project, prioritizing the requirements, and getting was industry involved, and was completed in 2018. It included the development of the AFSC Capability Architecture, the development and refinement of the AFSC Capability Requirements, a gap analysis, and studies in preparation for the next phase. Currently, the initiative is in Stage two, the Concept Stage, which consists of three phases.

Phase two included High-Level Technical Concept (HLTC) studies and in-depth analysis of derived products with the Risk Reduction and Feasibility Studies (RRFS). The RRFS were conducted over a period of one year and resulted in a significant amount of technical information provided by industry on potential technologies and systems concepts that could meet the AFSC Capability Requirements. Industry studies conducted in phase two aimed to understand the availability and feasibility of potential industry solutions to fulfil the AFSC Capability Requirements whilst addressing the future technologies and operating environment by 2035, and beyond.

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In phase three, the final phase of the Concept Stage, capability targets will be established to fulfil the selected AFSC Technical Concept and to develop and procure one or more materiel solutions through the stages that follow. Phase three will include an AFSC capability review to identify available or planned national or NATO elements that could contribute to the AFSC SoS and meet the AFSC Technical Concept and operational requirements. The results will inform the development of NATO Defence Planning Process (NDPP) Capability Targets, as well as the

programmatic arrangements necessary to mitigate potential gaps. Stage two is planned to be completed in 2025.

In the third stage, development, NATO must develop the full slate of capabilities necessary to realize the complete AFSC concept. The development will last until 2035, through a combination of jointly funded multinational groups, and individual nations' contributions. The concept foresees an open architecture in a federated approach, with cross-domain functionalities tailored to the mission and understood as a web of connected capabilities. These capabilities will be a mix of NATO, multinational, and national ones. The project also must ensure coherence between the AFSC and the future NATO Air Command and Control (AirC2) structure. Another challenge is that AFSC must also link to existing capabilities, like national C2 sites, AEW&C sensors, and fourth up to sixth generation air platforms. All of these capabilities should be freely adaptable, customizable, and configurable to suit the mission, rather than being confined to a single platform.

In November 2023, the NATO Support and Procurement Agency (NSPA) announced its acquisition strategy for an initial Alliance Future Surveillance and Control (iAFSC) capability.[11] Based on a US Foreign Military Sales (FMS) case, NSPA intends to acquire six E-7A Airborne Early Warning and Control (AEW&C) Wedgetail aircraft manufactured by Boeing.[12] This consortium, consisting of seven Support Partnership Nations (Belgium, Germany, Luxembourg, the Netherlands, Norway, Romania, and the United States) along with the NSPA, concluded that the Wedgetail is the only known currently available system capable of fulfilling the strategic commands' essential operational requirements in the short term. This capability must be considered as an initial solution to eventually support the overall AFSC. The NATO Wedgetail is expected to reach Initial Operational Capability (IOC) in 2031.[13] An airframe the size of the still-flying AWACS certainly plays a role in deterrence by its pure appearance and could be employed in strategic messaging. However, this single platform is not enough if we want to achieve all the capabilities envisioned in the original AFSC programme.

Implementing AFSC into NATO Strategies and Doctrines

The development of AFSC, with many of its capabilities and implementation still in the future, needs to be in line with and support existing doctrines and strategies of the Alliance. It also needs to satisfy the operational requirements defined in current and future NATO concepts, plans, and processes. Some, for example, include the NATO Warfighting Capstone Concept (NWCC), the MDO concept, and the NATO Defence Planning Process (NDPP). In particular, the NDPP aims to provide a framework within which national and Alliance defence planning activities can be harmonized, enabling Allies to provide the required forces and capabilities most effectively. Through the NDPP, NATO identifies the capabilities that it requires and promotes their development and acquisition by Allies. The NDPP consists of five steps (Political Guidance, Determine Requirements, Apportion Targets, Facilitate Implementation, Review Results) conducted over a period of four years.[14] The next cycle will start again in 2024, which means that AFSC should be incorporated into the next NDPP cycle to make sure that identified capability targets can be developed over the remaining two cycles before 2035.

Doctrines and planning processes will give the AFSC project the guidance needed for its further development. For this reason, nations and industry will have the challenge of keeping such a long and ambitious project current and in line with a constantly changing operating environment, which in turn affects NATO's posture and vision. But not only political influence and economic requirements will play a role. Implementing AFSC in NATO's strategic planning for the next decade and beyond will demand close monitoring and supervision in project management to ensure it reaches all important preset milestones. The configuration (links, radios, sensors, etc) of the iAFSC should be developed following the results of the requirements defined for the original AFSC SoS to guarantee integration. The capability development phase for both iAFSC and AFSC segments needs to be in close coordination between all parties involved. This means especially that industries and companies involved must work together, without 'boxing out'

In coordination with the NATO Support and Procurement Agency, a seven-nation consortium is acquiring the Boeing E-7A Wedgetail as an interim solution on the path to a holistic AFSC system-of-systems.

each other. Harmonizing such disparate but complimentary efforts is a great challenge. NATO should establish common monitoring and controlling phases to ensure interoperability exists between all systems.

Conclusion

The NATO AWACS has been operational for over four decades now. Although communications systems and operational parts like sensors and flight decks have been upgraded, the airframe itself is still the same. As of today, the AWACS capability is presenting a mix of challenges ranging from a smaller fleet to decreased operational readiness, and logistics and personnel shortages. All these factors represent an operational gap when compared with NATO's current level of ambition. So, a new capability for the command and inform military functions is one of the most urgent operational requirements for the Alliance.

With the recent decision to procure six E-7A Wedgetail Airborne Early Warning and Control (AEW&C) aircraft, NATO has wisely decided to lower the risk of not having a capability ready to replace the AWACS by 2035. In other words, the Alliance has decided to give priority to a tangible and concrete answer to the operational gap described above. The approach also recognizes the benefits of economies of scale, commonality, and interoperability derived from multinational acquisition of off-the-shelf military platforms.

AFSC is the largest and most complex capability programme NATO has collectively undertaken to date. NATO's analysis identified that no single industry

concept would meet all capability requirements for AFSC by 2035 across the range of military operations. Even though the Wedgetail represents a suitable 'interim' solution, NATO nations must make sure that they do not lose the momentum generated by the AFSC SoS concepts, which represent much more than a stopgap. The iAFSC acquisition must be considered as just a portion of the original ambitious vision of AFSC. The new challenges will be represented by the need for strong cooperation across industries, to make sure that the iAFSC airframe will be integrated within all the other systems envisioned in the original AFSC SoS. The AFSC project has large potential to operationalize C2 in MDOs and operate successfully in complex future environments around the globe. ●

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ABOUT THE AUTHOR

Major Patrick Giesenfeld

GE Air Force, JAPCC

Major Giesenfeld joined the German Armed Forces in 2007. He completed his officer training course in 2011. Following this, he was transferred to the Tactical Air Command and Control Squadron 21 in Erndtebrück, where he acquired his Aircraft Control Licence in 2013. Since then, he has served as an Aircraft Controller in the Control and Reporting Center 'LONESHIP'. He also fulfilled tasks as an instructor and later as an examiner in the relevant fields. Major Giesenfeld participated in several international programmes in Denmark and Switzerland as well as courses and training, e.g. the Tactical Leadership Programme. He was part of the 'Maritime Pool' in Erndtebrück for several years, which allowed him to experience a deployment in 2018, where he supported the 'Carrier Strike Group 8' on board the frigate 'HESSEN'. Currently, he is assigned at the JAPCC, C4ISR&S Branch, as an Air Command and Control SME.