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AVIATION COMMITTEE

NATO Aeronautical Communication, Navigation, & Surveillance Strategy

PUBLICALLY RELEASABLE STRATEGY

1. On 24 November 2023, under silence procedure, the Council approved the publicly release of the NATO Aeronautical Communications, Navigation, and Surveillance Strategy, at Annex.

(Signed)
Maria MAS RUEDA for the Chair

1 Annex

3 Appendices

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NATO AERONAUTICAL COMMUNICATIONS, NAVIGATION, AND SURVEILLANCE STRATEGY 2023

Publically Releasable Version

1. This aeronautical Communications, Navigation, and Surveillance (CNS) strategy provides the Alliance a common vision to share with Partners, supporters, the international aeronautical industry, and International Aviation Organisations. It will foster efforts ensuring both military-to-military and civilian-military interoperability, and if properly acknowledged and adopted, will improve resilience in the greater aeronautical system of systems

INTENT & SCOPE

2. The NATO Aeronautical CNS Strategy supports the Alliance's core tasks, with due consideration of global military and civilian aviation developments. It focuses on the reinforcement and evolution of a resilient system of systems¹ across the Alliance, based on National CNS systems, and guided by the Alliance's security and defence needs. It will provide Allies with a coherent CNS strategy that will be used to engage civilian and other external stakeholders, advocating for security and defence requirements in the aviation domain, and facilitate planned development and procurement to address common CNS requirements.

STRATEGIC OVERVIEW

3. In order for the Alliance to succeed in its three core tasks, it must be able to employ aeronautical capabilities in and around all possible terrain and environments, across the Alliance and beyond. To support this, our militaries require resilient and interoperable aeronautical infrastructure,² systems, and services to operate effectively across the spectrum of conflict – from peace to war.³

IDENTIFICATION OF LIMITATIONS AND CRITICAL CONSIDERATIONS

4. This strategy will address the general direction of development of aeronautical CNS capabilities. It does not intend to propose new technological solutions. Three key limitations critical for future developments were identified: resource, electromagnetic spectrum, and procurement processes.

5. Implementation of the strategy must be practicable for all Allies, timescales should be realistic, and they should allow for variations in national CNS acquisition processes – all critical considerations.

¹ To include the ground, air, and space-based sections of the complete network.

² Surface, airborne, and space-based infrastructure, systems, and services.

³ NATO 2030 Fact Sheet, June 2021.

THE ALLIANCE'S CORE VALUES AND GUIDING PRINCIPLES

6. The overarching core value to this aeronautical CNS strategy is that the **Alliance's security and defence needs are of primary importance**. This aeronautical CNS strategy must emphasize, in order of importance, that:

- a) **Military-military Interoperability** across the Alliance is a critical requirement;
- b) **Civil-military Interoperability** across the Alliance is a critical enabler;
- c) **Resilience is necessary** – the ability to maintain the required functionality and services to the essential quality and availability despite adverse impacts on—or changes in—the operational environment. Resilience may require military CNS independence, with stand-alone systems in-case of network degradation or failure;
- d) **Security is indispensable** – all aspects of security, to include physical, operational, information, human factors, and cyber;
- e) We need to respect Allies' sovereign needs – National aeronautical CNS networks support national, multi-national, and Alliance operational needs;
- f) We need to recognize threats to the aeronautical CNS systems, and share threat information across the Alliance, and possibly beyond – within the limits of information security protocols;
- g) We need to acknowledge risk and recommend mitigation measures for national consideration;
- h) We need to drive innovation, based on a clear and measured understanding of present capabilities, emerging and disruptive technologies, and future requirements;
- i) We need to take into consideration, if needed, the CNS-related work and strategies of International Aviation Organisations and Partners;
- j) We acknowledge the realities of Climate Change – this strategy must consider climate change mitigation factors and concepts; and
- k) We can provide strategic guidance on electromagnetic spectrum usage, supporting State and civilian needs in Aviation, and recognizing Nations' sovereignty in this area.

THE ALLIANCE'S AERONAUTICAL CNS OBJECTIVES

7. The key objective of this aeronautical CNS strategy is to support the Allies in building, maintaining, and continually enhancing their aeronautical CNS networks - networks that support the Alliance in its execution of its core tasks. This strategy will provide Alliance-oriented guidance and recommendations for policies, procurement, and use of aeronautical CNS capabilities. This strategy is also intended to influence global aviation development in such a manner that security and defence needs of the Alliance are recognized and supported.

8. Application of this strategy will enhance and improve collective civilian and State readiness, responsiveness, deployability, integration, resilience, and interoperability of the

Alliance's defence, deterrence, and security capabilities. Consistent application should boost NATO's capacity to prepare for, resist, respond to, and quickly recover from strategic shocks and disruptions, and ensure the continuity of the Alliance's activities.⁴

9. The Alliance's aeronautical CNS strategy will look at relevant NATO strategic requirements using an overarching approach to critical air, surface, and space-based infrastructure, systems, and services, before breaking them down into more detailed and individual sections focussing on Communication, Navigation, and Surveillance capabilities. This overall strategic approach will provide overarching guidance to the three interlocking subordinate sections, which support each other, as necessary. Management of the electromagnetic spectrum throughout the communication, navigation, and surveillance arena is important. While respecting national sovereignty, all CNS developments should aim to reduce their impact on the electromagnetic spectrum. This should be achieved through collaborative initiatives that optimize frequency management. All new technologies in the aeronautical CNS domain should strive for a reduction in electromagnetic spectrum and energy use.

THE ALLIANCE'S AERONAUTICAL CNS STRATEGIC GOALS

10. In support of the Alliance's core values and guiding principles, strategic goals need to be defined. These strategic goals need to be situational, measurable, achievable, relevant, and timely. Using NATO's values and principles as a structure, the following goals are necessary to support the establishment and enhancement of a robust and resilient aeronautical CNS network⁵ across the Alliance, based on National CNS systems.

- a) Maintain the aeronautical CNS capabilities that support security and defence needs. The development of any future aeronautical CNS capabilities and technologies must consider and integrate the requirements of security and defence during its entire lifecycle;
- b) Encourage development of national CNS systems that enable an interoperable Alliance CNS "systems of systems," aligned with national policies through bi-lateral, multilateral, or NATO agreements. This is a critical operational requirement, which can be achieved through the development, ratification, and implementation of aeronautical CNS standards and other interoperability fora. Civilian-Military interoperability contributes to a resilient surface, airborne, and space-based aeronautical CNS infrastructure, systems, and services across the Alliance. NATO must continue to work with the Aviation community, exploiting appropriate synergies, but not to the detriment of the States' capabilities;
- c) Make national aeronautical CNS systems robust, reliable and secure enough to ensure necessary levels of service across the Alliance at all times, in support of Alliance needs. Aeronautical CNS capabilities cannot be reliant on each other – they must be able to function independently.
- d) Identify and defend against threats to NATO's aeronautical CNS capabilities;
- e) Identify risks to the aeronautical CNS capabilities of the Alliance and suggest possible mitigations;

⁴ NATO 2022 Strategic Concept.

⁵ To include the ground, air, and space-based sections of the complete network.

- f) Aeronautical CNS capabilities must continue to evolve with interoperability, resilience, and security as key development concepts. New technologies must be taken into account, both as enablers or disruptors of aeronautical CNS capabilities; and
- g) Provide guidance on EM spectrum usage in support of State and civilian aviation capabilities, aiming at optimisation of EM spectrum usage without undermining defence and security capabilities, or national sovereignty.

CONCLUSION

11. This NATO Aeronautical CNS Strategy directly supports the Alliance's core tasks. The strategy acknowledges the continually evolving military and civilian capabilities in the aeronautical domain. The goals, values, and principles highlighted, supported by specific capability strategies, will allow Allies to properly engage civilian and other external stakeholders, when needed, helping them advocate for security and defence requirements in the aviation domain.

NATO AERONAUTICAL COMMUNICATIONS STRATEGY 2023

SITUATIONAL AWARENESS

1. The ability to communicate with aircraft is vital for maintaining aviation safety and providing guidance to an aircraft and its surroundings. Communication systems need to comply with the extant regulation for their use in aviation. For the purpose of ensuring the ability to support NATO operations and missions, the Alliance developed a list of essential and recommended systems for State aircraft and airfields.

BASELINE

2. The absolute minimum capability remains Ultra-High Frequency (UHF) in accordance with NATO standards.

INTENT AND SCOPE

3. To support Alliance air traffic management (ATM) needs, communications must meet the necessary performance standards to enable effective two-way communication between air and ground stations. Communication supports surveillance and navigation by allowing Air Traffic Control (ATC) to give safety advisories and control instructions. Without communication, surveillance merely enables ATC to see but not to control, and navigation may be done in ignorance of other airspace users or impacts.

STRATEGIC ASSESSMENT & ORIENTATION

4. Communication systems should be interoperable and redundant not only to satisfy aviation safety requirements, but also to ensure resilience and enable execution of Alliance-wide operations in peacetime, crisis and conflict. On one side of the spectrum are peacetime activities (day-to-day business), while on the other side is conflict (military heavy/lead intensive air activities) where a minimum capability for State air operations must be ensured even in a non-permissive and hostile environment.

5. Military-military interoperability is a critical requirement and should be pursued through both equipment and procedural standardisation. Civil-military interoperability is a critical enabler and should be pursued through continuous engagement between military and non-military aviation stakeholders. Overall coordination should be achieved at the national level, whereas multinational coordination and synchronisation is also encouraged utilising NATO bodies and international aviation organisations. Higher levels of interoperability not only improves the effective and efficient execution of military operations but also enhances civilian air traffic safety and overall resilience.

6. Since security is indispensable for the entire ATM environment, Allies shall put maximum effort toward the highest level of physical, operational, information, and cyber security, without sacrificing operational effectiveness.

7. Threats and risks should be assessed continuously to increase awareness, facilitate

timely and effective counter measures, maximise security and drive future development.

8. The security and defence needs of the Alliance should take into account and influence innovation by messaging properly articulated requirements during engagements with industry. In particular, this means maintaining awareness of technological advances, understanding implications for security and defence, and influencing the inclusion of military requirements in designing robust solutions.

IMPLEMENTATION OF STRATEGIC GOALS

9. The whole-of-government approach to aeronautical communications should be aimed at a commitment to fill communication gaps and also meet accepted risks and priorities. The consequent decisions must be taken in order to achieve maximum synergy on a national level. This would apply not only to day-to-day business, but could also be used as a powerful way to engage with industry to establish requirements for the development of future, resilient, and spectrum efficient aeronautical communication systems. This approach would also increase interoperability and enhance security.

10. Upholding the agreed requirements for aviation communication demands continuous investment in national aeronautical communication systems and is essential to maintaining the current capabilities.

11. In order to be proactive and influence the development of any future communication systems that recognize the security and defence needs of the Alliance, Allies should have clearly articulated CNS goals built into their overarching national aviation strategies and plans.

12. Allies should interact on a multinational level with all relevant stakeholders to achieve required interoperability, maximize efficiency, enhance security and aviation safety, and minimise risks. NATO could be used as forum or framework to enable such interaction between Allies and with Partners.

13. Risks and threats to aeronautical communication systems should be continuously assessed in order to guarantee uninterrupted, high quality and effective communication between air and ground stations, in contested and non-contested environments.

SHORT TERM GOAL⁶

14. UHF multi-channel communications are the default for military operations. Allies have agreed that UHF communication capabilities, to include transmit and receive functions for air-to-air and air-to-ground communications, are a necessity.⁷

MEDIUM TERM GOALS

15. High-Frequency (HF) communications are of limited utility, but their long range makes

⁶ Throughout this document 'short term' covers up to and including six years in the future ..., the 'medium term' extends from seven years up to and including 19 years in the future, and the 'long term' is defined as starting at least 20 years into the future and beyond.

⁷ In accordance with NATO Standards, where applicable.

them useful for some aircraft types. Very-High Frequency (VHF) and increasingly Satellite Communications (SatCom) systems are widely available to both civil and military Air Navigation Service Providers (ANSPs). Allies have agreed that the following communication capabilities are medium term goals:

- a) VHF multi-channel communications (meeting 8.33kHz frequency spacing regulations) , to include transmit and receive functions, for air-to-air and air-to-ground communications;⁸
- b) HF multi-channel communications, multi-channel communications, to include transmit and receive functions, for air-to-air and air-to-ground communications;⁹
- c) SatCom multi-channel communications, to include transmit and receive functions, air-to-ground-to-air communications;¹⁰ and
- d) Civilian Aviation Datalink, to include transmit and receive functions, with appropriate air-to-ground-to-air communications.¹¹

16. Whilst the ability to communicate using VHF will normally require the fitment of additional radios, such equipment greatly increases interoperability as it enables easy access to civil Air Traffic Services and is in use by many allied military ANSP as well. The use of VHF band enhances both resilience and redundancy. Compliance with recognised standards for Air Traffic Management equipment require multiple levels of functionality.

17. Datalinks are becoming increasingly important to allow increased capacity within civil ATC. Civilian standards are changing and some older aircraft systems are already incompatible with current air traffic management equipment. Therefore, nations should aim to equip their relevant air systems with a globally compatible Civilian Aviation Datalink.

LONG TERM VISION

18. The Alliance's long-term vision is to drive innovation in aviation communication, while respecting the Alliance's core values and guiding principles, as defined earlier in this strategy. Nations need to take into review and consider new communication technologies and developments, as well as consider how these advancements can be integrated into NATO's continually changing deterrence and security environment.

CRITERIA FOR SUCCESS AND EVALUATION

19. Communication success is measured by its ability to support the national agreed capacity in ATM and accepted risk associated with the provision of ATS. This includes the commitment of the NATO allies with regard to supporting NATO missions and operations. The robustness, interoperability, reliability and security of communications in support of NATO missions and operations needs to be agreed/implemented/ensured among allies by using standards. The contribution to spectrum efficiency should also be taken into account

⁸ In accordance with appropriate NATO and European Standards.

⁹ In accordance with NATO Standards.

¹⁰ In accordance with NATO Standards.

¹¹ In accordance with ICAO Doc 4444 & ICAO Doc 100.

in order to determine if a communication solution is fit for NATO purposes.

NATO AERONAUTICAL NAVIGATION STRATEGY 2023

SITUATIONAL AWARENESS

1. The ability for aircraft to navigate, to include approaches and landing at aerodromes, is vital for mission accomplishment and safety. Navigation systems need to comply with the extant regulation for their use in aviation. For the purpose of ensuring the ability to support NATO operations and missions, the Alliance developed a list of essential and recommended systems for State aircraft and aerodromes.

BASELINE

2. The absolute minimum capability remains Tactical Air Navigation (TACAN), in accordance with NATO standards.

INTENT AND SCOPE

3. To support Alliance ATM needs, aeronautical navigation must meet the necessary performance standards to enable safe and effective navigation in inclement weather, to include approach and landing at an aerodrome. Navigation is at the heart of the Alliance's ATM capabilities – without appropriate aeronautical navigation capabilities, NATO cannot achieve mission success.

STRATEGIC ASSESSMENT & ORIENTATION

4. Aeronautical navigation systems should be interoperable and redundant, not only to satisfy aviation safety requirements, but also to ensure resilience and enable execution of Alliance-wide operations in peacetime, crisis and conflict. On one side of the spectrum are peacetime activities (day-to-day business), while on the other side is conflict (military heavy/lead intensive air activities) where a minimum capability for State air operations must be ensured even in a non-permissive and hostile environment.

5. Military-military interoperability is a critical requirement and should be pursued through both equipment and procedural standardisation. Civil-military interoperability is a critical enabler and should be pursued through continuous engagement between military and non-military aviation stakeholders. Overall coordination should be achieved at the national level, whereas multinational coordination and synchronisation is also encouraged utilising relevant NATO bodies and relevant international aviation organisations. Higher levels of interoperability not only improves the effective and efficient execution of military operations but also enhances civilian air traffic safety and overall resilience. On the other side, interoperability that has achieved true standardisation could affect the ability to react to possible malicious intent.

6. Since security is indispensable for the entire ATM environment, Allies must put maximum effort toward the highest level of physical, operational, information, and cyber security, without sacrificing operational effectiveness.

7. Threats and risks should be assessed continuously to increase awareness, facilitate timely and effective counter measures, maximise security and drive future development.
8. The security and defence needs of the Alliance should take into account and influence innovation by messaging properly articulated requirements during engagements with industry. In particular, this means maintaining awareness of technological advances, understanding implications for security and defence and influencing the inclusion of military requirements in designing robust solutions.

IMPLEMENTATION OF STRATEGIC GOALS

9. The whole-of-government approach to aeronautical navigation should be aimed at a commitment to the accepted risks and priorities. The consequent decisions are taken in order to achieve maximum synergy on a national level. This would apply not only to day-to-day business, but could also be used as a powerful way to engage with industry to establish requirements for the development of future, resilient, and spectrum efficient aeronautical navigation systems. This approach would also increase interoperability and enhance security.
10. Upholding the agreed requirements for aviation navigation demands continuous investment in national aeronautical navigation systems and is essential to maintaining the current capabilities.
11. In order to be proactive and influence the development of any future navigation systems to capture the security and defence needs of the Alliance, Allies should have clearly articulated CNS goals built into their overarching aviation strategies and national plans.
12. Allies should interact on a multinational level with all relevant stakeholders to achieve required interoperability, maximize efficiency, enhance security and aviation safety, and minimise risks. NATO could be used as forum or framework to enable such interaction between Allies and with Partners.
13. Risks and threats to aeronautical navigation systems should be continuously assessed in order to guarantee uninterrupted, high quality and effective navigation, approach, and landing capabilities, in contested and non-contested environments.

SHORT TERM GOAL¹²

14. The Allies have indicated that following aeronautical navigation capabilities are required, and are therefore short term goals:
 - l) TACAN;¹³
 - m) Global Positioning System (GPS);¹⁴ and

¹² Throughout this document 'short term' covers up to and including six years in the future ..., the 'medium term' extends from seven years up to and including 19 years in the future, and the 'long term' is defined as starting at least 20 years into the future and beyond.

¹³ In accordance with NATO Standards.

¹⁴ In accordance with NATO Standards.

- n) Precision Approach Radar or Instrument Landing System.¹⁵

15. The recent vulnerabilities of Global Navigation Satellite System (GNSS) revitalized the role/importance of TACAN as a proven and reliable system, not only for military purposes, but also beneficial to the overall aviation community. Maintenance of TACAN capabilities are considered as a long-term objective.

MEDIUM TERM GOAL

16. The Allies have indicated that following aeronautical navigation capabilities are recommended for NATO operations and missions, and are therefore considered medium term goals:

- o) GNSS with a Multi-Constellation, Multi-Frequency (MCMF) capability;¹⁶ and
- p) GNSS Augmentation, to include Air, Ground and Satellite Based Augmentation Systems.¹⁷

LONG TERM VISION

17. The Alliance's long-term vision is to drive innovation in aviation navigation, while respecting the Alliance's core values and guiding principles, as defined earlier in this strategy. Nations need to take into review and consider new navigation technologies and developments, as well as consider how these advancements can be integrated into NATO's continually changing deterrence and security environment.

CRITERIA FOR SUCCESS AND EVALUATION

18. Navigation success is measured by its ability to support the national agreed capacity in ATM and accepted risk associated with the provision of ATS. This includes the commitment of the NATO allies with regard to supporting NATO missions and operations. The robustness, interoperability, reliability and security of navigation capabilities in support of NATO missions and operations needs to be agreed/implemented/ensured among allies by using standards. The contribution to spectrum efficiency should also be taken into account in order to determine if a navigation solution is fit for NATO purposes.

¹⁵ In accordance with NATO Standards & ICAO Annex 10.

¹⁶ In accordance with ICAO Doc 9849 and NATO Requirements.

¹⁷ In accordance with ICAO Doc 9849.

NATO AERONAUTICAL SURVEILLANCE STRATEGY

SITUATIONAL AWARENESS

1. For aeronautical safety, security, and efficient navigation, cooperative and non-cooperative surveillance of airspace is critical. Aeronautical surveillance systems need to comply with the extant regulation for their use in aviation. For the purpose of ensuring the ability to support NATO operations and missions, the Alliance developed a list of essential and recommended systems for State aircraft and aerodromes.

BASELINE

2. The requirements for the ATM use of non-cooperative surveillance vary from nation to nation across the Alliance.

INTENT AND SCOPE

3. To support Alliance ATM needs, aeronautical cooperative and non-cooperative surveillance capabilities must meet stringent performance standards. Cooperative and non-cooperative surveillance are critical for safety, security, and mission effectiveness.

STRATEGIC ASSESSMENT & ORIENTATION

4. Aeronautical surveillance systems should be interoperable and redundant, not only to satisfy aviation safety requirements, but also to ensure resilience and enable execution of Alliance-wide operations in peacetime, crisis and conflict. On one side of the spectrum are peacetime activities (day-to-day business), while on the other side is conflict (military heavy/lead intensive air activities) where a minimum capability for State air operations must be ensured even in a non-permissive and hostile environment.

5. Military-military interoperability is a critical requirement and should be pursued through both equipment and procedural standardisation. Civil-military interoperability is a critical enabler and should be pursued through continuous engagement between military and non-military aviation stakeholders. Overall coordination should be achieved at the national level, whereas multinational coordination and synchronisation is also encouraged utilising relevant NATO bodies and relevant international aviation organisations. Higher levels of interoperability not only improves the effective and efficient execution of military operations but also enhances civilian air traffic safety and overall resilience. On the other side, interoperability that has achieved true standardisation could affect the ability to react to possible malicious intent.

6. Since security is indispensable for the entire ATM environment, Allies must put maximum effort toward the highest level of physical, operational, information, and cyber security, without sacrificing operational effectiveness.

7. Threats and risks should be assessed continuously to increase awareness, facilitate timely and effective counter measures, maximise security and drive future development.
8. The security and defence needs of the Alliance should take into account and influence innovation by messaging properly articulated requirements during engagements with industry. In particular, this means maintaining awareness of technological advances, understanding implications for security and defence and influencing the inclusion of military requirements in designing robust solutions.

IMPLEMENTATION OF STRATEGIC GOALS

9. The whole-of-government approach to aeronautical cooperative and non-cooperative surveillance should be aimed at a commitment to the accepted risks and priorities. The consequent decisions are taken in order to achieve maximum synergy on a national level. This would apply not only to day-to-day business, but could also be used as a powerful way to engage with industry to establish requirements for the development of future, resilient, and spectrum efficient aeronautical surveillance systems. This approach would also increase interoperability and enhance security.
10. Upholding the agreed requirements for aviation surveillance demands continuous investment in national aeronautical surveillance systems and is essential to maintaining the current capabilities.
11. In order to be proactive and influence the development of any future surveillance systems to capture the security and defence needs of the Alliance, Allies should have clearly articulated CNS goals built into their overarching aviation strategies and national plans.
12. Allies should interact on a multinational level with all relevant stakeholders to achieve required interoperability, maximize efficiency, enhance security and aviation safety, and minimise risks. NATO could be used as forum or framework to enable such interaction between Allies and with Partners.
13. Risks and threats to aeronautical surveillance systems should be continuously assessed in order to guarantee uninterrupted, high quality and effective cooperative and non-cooperative surveillance capabilities, in contested and non-contested environments.

SHORT TERM GOAL¹⁸

14. Nations have agreed that the following capabilities are minimum requirements for NATO operations:
 - q) Primary Surveillance Radar – non-cooperative surveillance;¹⁹ and
 - r) Secondary Surveillance Radar – cooperative surveillance.²⁰

¹⁸ Throughout this document ‘short term’ covers up to and including six years in the future ..., the ‘medium term’ extends from seven years up to and including 19 years in the future, and the ‘long term’ is defined as starting at least 20 years into the future and beyond.

¹⁹ In accordance with NATO Standards.

²⁰ Ground-based, using Modes 1, 2, 3A, 3C, & 5, in accordance with NATO Standards.

MEDIUM TERM GOAL

15. Nations are encouraged to identify methods to enable State aircraft to participate in present and future civil surveillance without compromising operational security.

LONG TERM VISION

16. The Alliance's long-term vision is to drive innovation in aviation surveillance, while respecting the Alliance's core values and guiding principles, as defined earlier in this strategy. Nations need to take into review and consider new surveillance technologies and developments, as well as consider how these advancements can be integrated into NATO's continually changing deterrence and security environment. This may mean influencing a change to existing civil cooperative surveillance systems to enable operational security, or adapting a type of tactical mode use for sharing with trusted civil aviation entities.

CRITERIA FOR SUCCESS AND EVALUATION

17. Aeronautical surveillance success is measured by its ability to support the national agreed capacity in air traffic management and accepted risk associated with the provision of air traffic services. This includes the commitment of the NATO allies with regard to supporting NATO missions and operations. The robustness, interoperability, reliability and security of aeronautical surveillance in support of NATO missions and operations needs to be agreed/implemented/ensured among allies by using standards. The contribution to spectrum efficiency should also be taken into account in order to determine if a communication solution is fit for NATO purposes.