NATO STANDARD

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NATO REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS) AIRSPACE INTEGRATION (AI)

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NATO LETTER OF PROMULGATION

24 September 2019

1. The enclosed Allied Air Traffic Management Publication AATMP-51, Edition A, Version 1, NATO REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS) AIRSPACE INTEGRATION (AI), which has been approved by the nations in the AIR TRAFFIC MANAGEMENT – COMMUNICATIONS, NAVIGATION AND SURVEILLENCE ADVISORY GROUP (ATM-CNS AG), is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 7234.

2. AATMP-51, Edition A, Version 1, is effective upon receipt.

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4. This publication shall be handled in accordance with C-M(2002)60.

Zoltán GULYÁS
Brigadier General, HUNAF
Director, NATO Standardization Office

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS

Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.

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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
SVN	When submitting the Flight Plan insert “RPAS” in the field “Remarks”. Slovenia Control is, in accordance with the Act on Provision of Air Navigation Services, provider of aeronautical information services in the Republic of Slovenia. The Republic of Slovenia does not publish FLIP.
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REFERENCES

(a) PO(2015)0342, *Organizational Framework for the Operations and Support of NATO Alliance Ground Surveillance (AGS)*;

(b) ICAO Doc 7300/9, *Convention on International Civil Aviation (Chicago Convention), 2006;*

(c) C-M(2017)0013, *NATO Unmanned Aircraft Systems (UAS) Policy*;

(d) C-M(2015)0006, *NATO Policy for Civil/Military Aircraft Operating in Support of NATO or NATO-Led Missions and Operations;*

(e) C-M(2013)0035, *NATO Airworthiness Policy;*

(f) C-M(2016)0034, *NATO Airworthiness Policy Implementation Plan;*

(g) ATP-3.3.8.1 Ed A Ver. 1, *Guidance for the Training of Unmanned Aircraft Systems (UAS) Operators;*

(h) EASA Technical Opinion, "*Introduction of a regulatory framework for the operation of unmanned aircraft", Dec 18, 2015;*

(i) NATO STANAG 3531 Ed 9, *Safety Investigation and Reporting of Accidents/Incidents involving Military Aircraft, Missiles, and/or UASs*.

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CHAPTER 1 INTRODUCTION

1.1. Purpose: The purpose of this document is to establish a harmonized set of procedures among NATO Nations for the safe and effective airspace integration of military Remotely Piloted Aircraft Systems (RPAS), while respecting national sovereignty. This publication is intended to promote standardization and interoperability among NATO Member and Partner Nation RPAS operations.

1.2. Foundation: In accordance with the agreement of NATO Nations in the *Organizational Framework for the Operations and Support of NATO Alliance Ground Surveillance (AGS)*, NATO AGS will have the right to conduct its operations over the sovereign airspace of all Allies, subject to the appropriate national air traffic regulations (Ref (a)). This STANAGS for RPAS Airspace Integration has been developed in order to establish common and harmonized procedures for the safe and effective airspace integration of military RPAS within the Alliance. These procedures come from a joint effort between current Allies' programs, in coordination with NATO nations who own and operate RPAS, with the European Defence Agency (EDA), and with t he support of EUROCONTROL**.**

1.3. Applicability and Scope: This publication applies to the appropriate Alliance and Partner Nations who adopt them and NATO commands responsible for the operations of military RPAS programs. The scope of this document covers all NATO Unmanned Aircraft Systems (UAS) Class III airspace integration activities. This document is intended to be applicable within the airspace of participating NATO Member Nations and anywhere NATO conducts missions or operations world-wide. Where there are no existing arrangements, this document is intended to be a starting point in the development of national regulations and/or procedures. The information within this document is to be used in conjunction with aircraft flight manuals, national Aeronautical Information Publications (AIP), Flight Information Publications (FLIP) and applicable directives. This document should be the basis for agreements with Partner States and other nations and international organizations NATO coordinates with to conduct its missions with RPAS.

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CHAPTER 2 ASSUMPTIONS

2.1. RPAS Airspace Integration Objective: NATO seeks to achieve RPAS airspace integration into all NATO member nations and international airspace along with manned aircraft, IAW International Civil Aviation Organization (ICAO) standards. Airspace integration may be sought by short-term, possibly localized solutions for immediate RPAS requirements, which may then be developed into standardised long-term procedures and agreements, leading to achievement of the long-term goal of seamless integration.

2.2. Incremental Process: NATO recognizes that achieving seamless integration of RPAS is not yet feasible due to current technological and procedural limitations. Achieving RPAS airspace integration will be an incremental process involving increasingly streamlined access. This process will likely include the continued use of segregated airspace or other means to ensure separation for RPAS. This may include coordinated RPAS specific routes, Temporary Segregated Airspace (TSA), moving segregated airspace (i.e., Dynamic Mobile Area), etc., as well as use of restricted airspace. These and other concepts should be developed to allow the fullest RPAS airspace integration possible under existing national and international regulatory and technical scenarios.

2.3. RPAS as State Aircraft: RPAS used in military services are state aircraft, and therefore are out of the scope of the Convention on International Civil Aviation (Ref (b), Article 3). The Convention does however state that national authorities, when issuing regulations for their state aircraft, shall have due regard for the safety of civil aviation. The safety of third parties and properties on the ground is also a priority. The foundation for this document is rooted in the same ICAO Standards and Recommended Practices (SARPs) and Procedures for Air Navigation Servicers (PANS) developed for all aircraft to a great extent, as well as those developed specifically for UAS. This STANAG balances the previously mentioned needs with the nature of the operational requirements for the employment of military RPAS.

2.4. RPAS Like Manned Military Aircraft: NATO RPAS will be treated as manned aircraft to the maximum extent possible. The exemption policy for manned state aircraft with regard to specific equipage requirements also apply to state RPAS. Military RPAS should operate in accordance with national flight rules of the state in which the flight is to operate, as for military manned aircraft.

2.5. ICAO RPAS Standards: The International Civil Aviation Organization is working to provide the regulatory framework, standards, procedures and guidance to allow routine operations of civil RPAS in a safe, harmonized and seamless manner comparable to that of manned aircraft operations. NATO seeks to achieve the same level of access for military RPAS. NATO's objective for RPAS airspace integration is the seamless integration of unmanned systems into the airspace along with manned systems, in national and

international airspace. NATO seeks to develop the standards and technical enablers to allow RPAS to be treated just as manned systems are currently. (Ref (c), para. 9.2)

2.6. RPAS Air Traffic Management Procedures: Having due regard for the safety of civil aviation, all NATO nations, in the framework of the Aviation Committee (AVC), will coordinate and issue appropriate air traffic management procedures for RPAS operations, on the basis of agreed SOPs, to ensure safe access to airspace, provision of air navigation services and use of required aeronautical facilities.

2.7. Bilateral and Multilateral Agreements: Bilateral and multilateral agreements will be developed and coordinated as necessary to enable NATO RPAS to conduct operations over the sovereign airspace of all Allies and participating Partners, and to use selected forward operating bases (FOBs) or designated emergency divert airfields as required, subject to the appropriate national regulations, and in accordance with the approved diplomatic flight clearance (DFC), while respecting the limitations declared in the MTC and in relevant Technical Publications, as issued by a competent Airworthiness Authority in order to release the Registration Mark/Number.

2.8 Standard Operating Procedures (SOP): SOPs may be developed and added as supporting documents to this STANAG in order to explain procedures for normal, emergency and abnormal conditions and situations for RPAS operations. These may be general or applicable to specific RPAS or types, as required to facilitate airspace access agreements.

2.9. Operating in Support of NATO or NATO-led Missions and Operations: The North Atlantic Council (NAC) has approved the "*NATO Policy for Civil/Military Aircraft Operating in Support of NATO or NATO-led Missions and Operations*", with regard to the status and the conduct of the flights by civil and military aircraft when operating in support of a NATO or NATO-led missions and operations (Ref (d)). Members should consider RPAS flights covered by this document, just as are manned aircraft.

2.10. Airworthiness: The NAC has approved the NATO AW Policy (NAWP) (Ref (e)) and it's Implementation Plan (Ref (f)). The NAWP establishes that all aircraft, manned and unmanned, provided on behalf of NATO shall be certified as airworthy by a NATO recognized AW Authority, properly controlled in accordance with approved continued airworthiness (AW) provisions, operated and maintained in accordance with approved continuing AW provisions. As with all aircraft, Nations retain sovereignty over the AW requirements and certification for unmanned aircraft. NATO will continue to help standardize RPAS AW issues among its Members, Partners and other nations, when they have their origin in the differences arising from the lack of persons on-board the aircraft. RPAS AW considerations should include both the unmanned aircraft and the remote control station(s). (Ref (c), para 8.2)

Note:

NATO AW standards for UAS/RPAS may be found in STANAG 4671 - *UAS Systems AW Requirements (USAR)*, STANAG 4702 - *Rotary Wing UAS AW Requirements*

(USAR-RW), and STANAG 4703 - *Light UAS AW Requirements*.

2.11. Safety Assessments and Safety Case: Nations may have specific safety assessment requirements for RPAS seeking access to their airspace. NATO seeks to standardize these procedures as much as possible in the common baseline attached as a Standards-Related Document (SRD) to this STANAG.

2.12. Pilot Certification: The designated Pilot-in-Command (PIC) is responsible for safe operation of the RPAS. The PIC is the final authority of the operation of the RPAS and will be qualified and current on the respective RPAS. All PICs for RPAS must either be a military rated pilot on 'manned' aircraft or, if allowed by their own national aeronautical military regulations, a military rated pilot for RPAS with a certified level of knowledge, competence and skill equivalent to manned military pilots, IAW ATP 3.3.8.1 Basic UAS Qualification standards (Ref (g)).

2.13. In-flight Procedures, Terminology and ATC Communications: The PIC shall ensure communications with ATC in terms that are readily understandable to air traffic controllers and based on ICAO standard procedures and phraseology. With a few exceptions, these are the same as for manned aircraft.

2.14. Flight Plans and Diplomatic Flight Clearances: Procedures for filing flight plans and requesting diplomatic flight clearances that pertain to other manned military aircraft also pertain to RPAS.

2.15. Cross-Border Agreements: One of NATO's RPAS objectives is that military RPAS, approved for operations by a NATO country, will be acceptable for cross border operations in another NATO nation, along similar lines for existing multilateral agreements for manned military aircraft. Participating nations are encouraged to expand cross-border agreements to include RPAS wherever possible.

2.16. International Airspace: NATO RPAS will operate in international airspace similarly to manned military aircraft and, to the maximum extent possible, incompliance with ICAO standards and recommended practices and in accordance with the RPAS MTC.

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CHAPTER 3 RPAS OPERATING PROCEDURES

3.1. Pilot-in-Command (PIC): For the purposes of Air Traffic Management (ATM), the primary mode of operation of RPAS is oversight by the PIC, who shall at all times be able to intervene in the management of the flight. In the event of loss of the command and control link(s), the Remotely Piloted Aircraft (RPA) reverts to predetermined flight. The PIC will be able to predict the automatic flight behavior and report it to ATM as appropriate. This information should be distributed beforehand whenever practicable.

3.2. RPAS Flight Planning and Operations: RPAS flight planning and operations will be established in accordance with its AW documentation and all related operating procedures and limitations as expressed in its approved flight manual or equivalent documentation, as the case may be, with the general role to avoid the over-flight of published restricted, prohibited and other specified airspace as applies to flight operations of all other military aircraft. RPAS pilots will comply with national RPAS specific overflight restrictions.

NOTE:

The European Aviation Safety Agency (EASA) has published an "*Introduction of a regulatory framework for the operation unmanned aircraft*". Although UAS civil regulations would apply only to civil RPAS, the document may provide useful items for NATO RPAS flight planning and operations procedures. (Ref (h))

3.3. Airspace Access: NATO desires the development of Diplomatic Flight Clearance agreements for NATO-owned RPAS to quickly transit or operate in Member, Partner and other states in order to support NATO operations. NATO may also seek to develop pre-coordinated RPAS routing that can be readily activated for movement of Alliance owned or Member and Partner provided RPAS assets for NATO operations.

3.4. RPAS ISR Collection Activities: RPAS with ISR capabilities will observe standard agreements for collection activity by manned ISR aircraft.

3.5. Separation Minima: Within controlled airspace where separation is provided by ATC, the separation minima between RPAs and other traffic in receipt of a separation service should be the same as for manned aircraft flying in the same class of airspace.

3.6. Remote Pilot Stations (RPS): Multiple RPSs may control an RPA at different times on a single flight. This unique attribute of RPAS allows for redundancy and increased reliability over manned systems, as a malfunction or loss of an RPS from the system may often be overcome by another RPS taking command of the RPA.

3.7 Multiple Aircraft Control: RPSs of some systems are capable of controlling more than one RPA at a time. However, because of the potential for confusion and diversion of attention to each RPA, in NATO operations each PIC shall only be controlling one aircraft at a time. Emerging technologies and procedures may soon allow safe multiple aircraft control. If states acquire this capacity and specify it in an RPAS MTC, this NATO restriction could be lifted.

3.8. Pilot-in-Command Handover: RPAS flights are typically of much longer duration than manned aircraft flights. The presence of one or more RPSs in the system allows for the handover of aircraft control between RPAS pilots and different RPSs. RPAS units will ensure that one PIC is clearly designated for every portion of an RPA's flight, and that procedures are in place for the positive transfer of control between pilots and RPSs.

3.9. Pilot-ATC Communications: Communication with Air Traffic Control (ATC) will generally follow the same procedures and phraseology as for manned aircraft. While in receipt of an air traffic service, the RPAS PIC should ensure maintenance of 2-way communications with ATC.

3.9.1. In the event that radio communications with ATC are lost (either due to radio problems or issues with the link through which the radio calls are passed), the PIC shall hold the telephone numbers of duty supervisors at those ATC units which are expected to provide ANS to their flight, and attempt to re-establish contact through telephone communications. The PIC may also list the RPS phone number(s) in the flight plan comments. Additionally, the RPAS PIC has the ability to any use other means of communications that are not through the aircraft, to establish communication with the applicable ATC unit.

3.9.2. Alternate communications may also apply due to specific system limitations. Many RPAS, for example, are not equipped with HF radios, which are normally used for oceanic position reporting. In such cases, position reports, following standard ATC terminology and format, may be made via telephone or other alternate means agreed to by ATC.

3.10. Lost Link Procedures: If the PIC loses the command and control (C2) link with the aircraft, other than a momentary interruption which causes no safety issues, the PIC shall immediately notify ATC of the situation via an alternative communications means while attempting to restore C2 through any alternate available and approved links. If not successful in restoring a C2 link, the PIC will declare an emergency with ATC.

3.10.1. In case of a lost link, the RPA will follow predictable emergency procedures including but not limited to altitude and routing guidance, based on logic loaded on-board the aircraft. (Lost link procedures may vary based on phase of flight (departure, enroute/operating area, and arrival) and on whether the RPA is self-land (automated/auto-land) capable or not.) The PIC will be able to predict RPA behaviour (unless additional RPA equipment malfunctions or other contingencies occur after the loss of link). When and if feasible, the PIC shall establish contact with ATC by telephone or Line Of Sight (LOS) radio, and inform ATC about the programmed RPA flightpath. If alternate communications are established, the Lost Link

condition still exists. Depending on the system, the RPA may automatically set the transponder Mode3/S to 7600.

NOTE:

The ICAO RPAS Panel has agreed to establish transponder code 7400 to indicate an RPAS Lost Link condition. This has been coordinated with ICAO and agreed in principle. Although ICAO has not yet implemented this, NATO should consider planning to comply as much as possible once it is implemented. (7600 would continue to be the ICAO code for lost communications).

3.11. Transponder: NATO RPAS shall be fitted with an operable transponder that will allow the PIC to respond to ATC requests to alter code settings and squawk identification. In the event of transponder failure, the mission may be recalled on the basis of agreement between the RPAS operator and applicable ATM agencies.

3.12. Frequency Clearance Authorization: National regulatory authorities are responsible for spectrum management of the aeronautical radio spectrum and to provide appropriate frequency assignments for the operation of aeronautical radios and data links which cause no impact to other spectrum users. RPAS spectrum authorization or frequency assignment is an important aspect in the approval process for NATO RPAS operations. It is important to understand the application processes, which will be different for each National Regulatory Authority, and to ensure that there is early coordination during the initial planning phases of any RPAS operations. Applications should be submitted in a timely manner through the appropriate processes in order to meet NATO RPAS airspace access and flight requirements. Additionally, RPAS planners should make appropriate inputs to the NATO Joint Civil and Military Frequency Agreement (NJFA), to ensure required frequencies are available for operations and readiness and training of NATO RPAS forces.

3.13. Security: RPSs must be secured from threats or sabotage across multiple locations, as multiple RPSs may be capable of establishing a link and controlling the aircraft in flight. The C2 link is crucial to RPAS operations. It should be resilient against any malicious or non-malicious interference or unauthorized manipulation, and should be encrypted to the maximum extent possible. Security considerations should also include the communications ground and space based nodes involved throughout the C2 architecture.

3.14. **Communication Navigation Surveillance (CNS) and Equivalent Levels of Performance (ELP):** In order to assure maximum access to airspace for RPAS operations, NATO and participating states should ensure, as far as possible, their RPAS's compliance with global and regional aeronautical CNS equipage plans or demonstrate equivalent levels of performance (ELPs)**.**

3.15. Published RPAS Approaches: RPAS approaches must be pre-coordinated with ATM authorities at each desired location. This coordination may take the form of Local Operating Procedures or published RPAS approaches.

3.16. RPAS Airfields: All airfields or aerodromes eligible for NATO RPAS operations, including Main Operating Bases, Forward, Divert alternate, and Emergency alternate Bases shall be approved by the appropriate national and NATO authorities, as applicable, and coordinated with the appropriate ATC and airfield agencies.

3.17. Airfield Operations: RPAS operations at aerodromes should interface with the aerodrome control service as near as possible in the same way as manned aircraft.

3.18. ATC/Ground Personnel Training: Additional education or training may be required for ATM managers and ATC controllers. This is not intended to preclude any training efforts, which can be conducted by any nation on a bi-lateral basis.

3.19. Accident/Incident investigations: NATO STANAG 3531, *Safety Investigation and Reporting of Accidents/Incidents involving Military Aircraft, Missiles, and/or UASs* (Ref (i), establishes procedures for the safety investigation and reporting of accidents/incidents of military aircraft, missiles and/or RPAS which involve the equipment, property, facilities and/or personnel of two or more nations.

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