

POLISH EXPERIENCE IN OPERATIONAL AIR TRAFFIC MANAGEMENT IN THE CONTEXT OF EUROPEAN AIRSPACE INTEGRATION

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Abstract

The continued air traffic growth in Polish airspace requires continuous improvement of the efficiency of the air traffic management (ATM) system in order to meet the needs of all its users and to guarantee the highest level of safety of air operations. Activities in this respect undertaken by the Polish Air Navigation Services Agency (PANSa) in cooperation with military aviation authorities are in line with the objectives of the EU Single European Sky (SES) initiative. In addition to the provision of air navigation services (ANS) for civil aviation (commercial air transport and general aviation), PANSa also provides navigation services for the crews of military aircraft and other state aircraft flying in operational air traffic (OAT). The article describes in general terms flights in operational air traffic, presents the evolution of European regulations concerning this category of air traffic and discusses in detail selected procedures for planning and protecting military aviation flights in Polish airspace.

Key words: Single European Sky initiative, air traffic management, air navigation services, operational air traffic, civil-military cooperation in air traffic management.

Introduction

The dynamically growing demand for the use of Polish airspace¹ by manned and unmanned aircraft is one of the main challenges that the state air traffic management authority - Polish Air Navigation Services Agency (PANSa) has to face at present². In addition to general air traffic (GAT)³, which accounts for more than 90% of all

1 According to PANSa data, in 2017, 793,000 air operations were serviced, compared to 755,000 in the previous year, which is about 5 per cent increase.

2 PANSa provides air navigation services in accordance with the provisions of Article 3 of the Act of 8 December 2006 on the Polish Air Navigation Services Agency (consolidated text: Journal of Laws of 2017, item 1967).

3 General Air Traffic (GAT) means all movements of civil aircraft and State aircraft carried out in accordance with the procedures of the International Civil Aviation Organisation (ICAO).

operations, military aviation (domestic and allied) and other state aviation are also important users of airspace⁴, whose activities largely fall outside the scope of civil aviation and are classified as operational air traffic (OAT)⁵. These two types of air traffic, of a very different nature, must share and safely use appropriately organised and classified airspace.

Previous publications on air traffic management in Europe have focused on analysing the impact on air transport performance of actions taken by the European Union (EU) in the framework of the two programmes for the modernisation of the European ATM system, the Legislative - SES⁶ and the Research and Development - SESAR⁷. The broad and multi-faceted scope of both programmes also inspires the need to define the relationship between the progressive development of European airspace integration and the possibilities of its use by the military aviation of NATO and EU Member States.

The aim of this article is to present the development of harmonised rules of operational air traffic management and to describe the procedures applied to this category of air traffic by civil and military air traffic services (ATS) and air defence system units controlling air traffic in Poland. Apart from a retrospective view of the subject, an attempt was made to answer a question which is a general research problem: *to what extent does the current process of operational air traffic management in Poland take into account the requirements of European airspace integration?* It can be assumed that the solution of such a problem will allow for a better understanding of the subject matter of research and will allow possible proposals to improve the organisation of ATM/ANS⁸ service provision to military users of Polish airspace to be identified.

4 In accordance with Article 3(b) of the Chicago Convention, State aircraft means, for air traffic management purposes, aircraft used in military, customs and police services.

5 Operational Air Traffic (OAT) means all flights which do not comply with the provisions laid down for GAT and for which rules and procedures have been established by the relevant national authorities.

6 SES (*Single European Sky*) - a programme initiated by the European Commission in 1999 to increase safety, airspace capacity and efficiency of the air traffic management system and to facilitate the introduction of new technologies.

7 SESAR (*Single European Sky ATM Research*) is the technological pillar of the SES programme. The main objective of the SESAR programme is to coordinate air traffic management research and development within the EU and to help create a new generation of ATM technical infrastructure capable of sustaining the expected steady growth of air traffic over the coming decades. SESAR has now entered its third and final phase, deployment, where the concepts and technologies developed by the SESAR Joint Undertaking (SJU) will be deployed throughout Europe.

8 The term "ATM/ANS" means air traffic management and air navigation services. ATM functions and services as defined in Article 2(10) of Regulation (EC) no. 549/2004 include air traffic services (ATS), airspace management (ASM) and air traffic flow management (ATFM). Air navigation services (ANS), as defined in Article 2(4) of that Regulation, means air traffic services (ATS), communication, navigation and surveillance services (CNS), meteorological services for air navigation (MET), aeronautical information services (AIS) and the network management functions and services referred to in Article 2(1) of that Regulation. The services referred to in Article 6 of

Rationale, requirements and conditions for operational air traffic

The need to distinguish OAT as a separate category of air traffic is justified by military aviation requirements that go beyond the scope of the GAT flight rules laid down by both the International Civil Aviation Organisation (ICAO) and the European Union aviation legislation⁹. In order to achieve and maintain a high level of operational capability and combat readiness, the military aviation of particular types of the Polish Armed Forces (Air Force, Land Forces, Navy and Special Forces) implements a continuous process of air and tactical training to perform such tasks as: protection of state borders in the airspace, interception of targets and air combat, combating ground objects, conducting air reconnaissance, airborne assaulting of troops and equipment and many others. During their implementation, it is necessary to segregate airspace and apply appropriate procedures taking into account the specificity of military operations, and, therefore, they cannot be protected by air traffic services (ATS) as GAT traffic.

The military aviation requirements for services provided by the ATM system result from the nature of the training and operational activities carried out and concern the provision of services, in particular:

- unrestricted access to all airspace to protect its integrity;
- favourable conditions for the provision of flight training and the testing of new weaponry systems and concepts of operation;
- the operational and economic efficiency of flights to temporary segregated areas, temporary reserved areas and exercise areas (TSA/TRA/EA);
- the possibility of carrying out training tasks in zones established on both sides of the state border (CBA) using civil ATM/ANS services;
- availability of airports used by civil aviation.

In view of the military requirements of airspace users thus defined, operational air traffic management must be subordinated to the achievement of the mission objective by allowing arrival in a defined region, at a defined time, using an optimal flight profile and the tactical and technical capabilities of military aircraft. The scope of the specific requirements includes, inter alia, the provision of access to the required volume of airspace in a short time, the allocation of flexible space structures, the possibility to change the mission profile together with the revision of flight rules, the need to secure formation flights and meet the associated additional

Regulation (EC) no. 551/2004 as well as services strengthening the signal emitted by satellites from the basic GNSS constellations for the use of air navigation, flight procedure projection and data acquisition and processing services and data formatting and transmission services for general air traffic for the purpose of air navigation.

⁹ In particular, reference is made to Annex 2 to the Convention on International Civil Aviation - *Rules of the Air*, ICAO Doc 4444 (PANS-ATM) - *Procedures for air navigation services - Air traffic management* and ICAO SUPPS - Doc 7030/4 - *European (EUR) complementary regional procedures* and Commission Implementing Regulation (EU) no. 923/2012 (SERA). The full list of relevant legislation is included in the bibliography.

requirements (e.g. introduction of restrictions for other airspace users), the need to secure special flights (air to air refuelling, reconnaissance flights, AWACS missions) as well as to safeguard the rapidly growing number of unmanned aerial vehicles (UAV) operations.

Ensuring access to airspace for all airspace users is almost always the result of a compromise between operational needs and the ability of air navigation services to protect them. In order to adapt to the constant growth of air traffic and to best meet the requirements of civil and military aviation, PANSА undertakes a number of activities in the field of modernisation of technical and facilities infrastructure and development of personnel, processes and tools to ensure safe and continuous service of air traffic in the Polish Flight Information Region (FIR Warsaw). The provision of high quality air navigation services to aircrew of aircraft in operational air traffic, as one of the main functions of PANSА, is essential for the overall effectiveness of the performance of military aviation tasks, and in a wider context - for the strengthening of air defence in peacetime.

In order to meet national safety and flight training requirements in terms of number of operations and duration, while ensuring the safety of other airspace users, it is often necessary to introduce general air traffic restrictions in shared public airspace that may interfere with civil aviation's flight efficiency objectives, as flights must then be operated that bypass these areas. As a result, close civil-military coordination and cooperation in all air traffic management activities becomes a key condition for meeting the growing needs of both types of aviation. In order to ensure the efficient performance of military aviation tasks within the framework of operational air traffic (see table 1) and to maintain the required capacity of Polish airspace, PANSА will cooperate closely with the relevant military units providing ATS and military units providing OAT services¹⁰ in the spaces designated for this traffic on the basis of operational agreements concluded.

PANSА is the holder of a certificate confirming compliance with the Community general and specific requirements, including that operating methods and operating procedures comply with the standards contained in Annex 2 (*Rules of the Air*) and Annex 11 (*Air Traffic Services*) to the Chicago Convention. Civil ATS personnel are not licensed or authorised to provide services for OAT flights in relation to air refuelling operations, AWACS missions, test flights and other OAT operations, while they participate in *Air Policing* activities¹¹ in accordance with the regulations

10 Military units providing OAT service in a separate airspace (TSA, TRA, EA) include Control and Reporting Post from the Air Operations Centre - Air Component Command/Control and Reporting Centre - Warsaw, Regional Control and Reporting Centre - Kraków, and Deployable Air Operations Control Unit - Poznań. The military aerodrome ATS units provide their services in MATZ/MCTR zones.

11 *Air Policing* - is a particular type of activities during peacetime and crisis, carried out by crews of NATO Air Defence interceptor aircraft in order to ensure the inviolability of the airspace of Member States, to protect the population and armed forces against aerial attack and to provide assistance to crews of aircraft in distress. The rules for performing the mission and the scope and

Table 1

Classification of flights and manoeuvres of aircraft in operational air traffic

Flights and manoeuvres type	Airspace	Flights rules	Planning options
Training flights/sorties	TSA/TRA	VFR/IFR	Yes
Instruction flights	TSA/TRA	VFR/IFR	Yes
Check ride/flights	TSA/TRA	VFR/IFR	Yes
Formation flights, large force employment (LFE)	TSA/TRA	VFR	Yes
Escort flights	FIR / EA	VFR	Yes
Air Shows and Demos	MATZ/MCTR, TSA/TRA/EA	VFR	Yes
Test flights	TRA	VFR	Yes
Calibration flights	FIR	VFR/IFR	Yes
Air-to-Ground missions, live weapons delivery	D	VFR	Yes
Air-to-Air refuelling (AAR)	TSA/TRA	VFR	Yes
Reconnaissance training	FIR	VFR/IFR	Yes
Recce mission (Hot scramble)	FIR	VFR/IFR	No
Airborne Warning and Control System (AWACS) missions	AWACS orbiting area	IFR	Yes
Air Defence flights (Hot scramble)	FIR	VFR/IFR	No
Air Combat training	TSA/TRA	VFR	Yes
Rapid combat descent, rapid zoom climb	TSA/TRA, EA	VFR	No
Supersonic flights and ceiling flights	TRA, MRT	IFR	Yes
Join-up formation and break-up (split) formation	MATZ/MCTR, TSA/TRA	VFR	Yes
Chaff/flare flights	EA, D	VFR/IFR	Yes
Electronic Warfare flights	EA	VFR/IFR	Yes
Day/night (NVG) low level flights	TSA/TRA, MRT/EA	VFR	Yes
Search and Rescue (SAR) flights	FIR	VFR/IFR	No
Combat Search and Rescue (CSAR) flights	FIR	VFR	No
Emergency drills	TSA, MATZ, MCTR	VFR	Yes
Unmanned Aerial Vehicles flights	TSA/TRA	VFR/IFR	Yes
Composite Air Operation (COMAO)	EA	VFR	Yes

governing the performance of this mission and only within the limits of the permissions contained in the air traffic controller (ATCO) licence. The provision of air traffic control (ATC), flight information services (FIS) and alerting service (ALRS) to crew of military aircraft in operational air traffic in controlled airspace is the responsibility of the civilian Area Control Centre (OAT ACC Warsaw). This unit interacts with the

conditions of information exchange are specified in the *Agreement on operational cooperation between the Polish Air Navigation Agency and the Air Operations Centre - Air Component Command with respect to the performance of the Air Policing mission.*

military ATS units and the military aviation control units by exchanging information on planned and performed military aviation flights. Planning and provision of flexible airspace elements for use by military aviation is the responsibility of the Airspace Management Cell (AMC Poland). This civil-military airspace management (ASM) unit performs its operational tasks in the pre-tactical (ASM 2) and tactical (ASM 3) phases in a manner ensuring flexible use of airspace to satisfy the requirements of both civil and military aviation. With regard to the publication of airspace use plans (AUP/UUP), AMC Poland cooperates with the Network Manager Operations Centre (NMOC)¹² in Brussels.

Development of harmonised rules and procedures for operational air traffic

Although existing air traffic rules have been largely shaped by civil airspace users' requirements, military aviation, due to the nature of its tasks, must have its own regulations to ensure their effective and safe implementation in an increasingly complex operational environment. OAT regulations in Europe were not harmonised before, which required application of:

- the different regulations, standards and procedures for air traffic services (ATS), which place a greater burden on air traffic controllers and military aircraft crews through changes to the GAT/OAT flight conditions, as well as preventing cross-border OAT flights;
- the different airspace organisations, which reduced the benefits of the concept of flexible use of airspace (FUA)¹³ and reduced the potential for increasing the capacity of the air route network and the difficulty of a single European-wide classification of airspace;
- the different organisations for the protection and control of military aircraft in operational air traffic, which was further aggravated by the lack of international interoperability of communication, navigation and surveillance equipment (CNS/ATM).

The European Organisation for the Safety of Air Navigation (Eurocontrol) adopted a package of operational improvements to air traffic management called the *ATM Strategy 2000+* at the end of the 1990s in order to reduce existing efficiency

12 The Network Manager (NM) is the Directorate of Eurocontrol responsible for network capacity planning. The NM shall be responsible for ensuring that air traffic capacity is made available and used in the best possible way in the day-to-day operations of the pan-European ATM network. To this end, the NM closely cooperates with Member States and their national air navigation service providers (in Poland with PANSAs).

13 The FUA concept was developed by Eurocontrol in 1992-1994 and started to be implemented in Western Europe in 1996. In Poland, the principles of flexible use of airspace have been applied since 2001.

constraints on the use of European airspace. Initiated activities also included, as one of the operational improvements, the harmonisation of OAT regulations. It was assumed that the process of implementation of uniform OAT rules and procedures would be carried out in three stages:

- Phase 1: development of the Eurocontrol Specification for harmonised Rules for Operational Air Traffic (OAT) in accordance with instrument flight rules (IFR) in the ECAC States' controlled airspace (EUROAT);
- Phase 2: harmonisation of national procedures for air navigation services (ANS) for OAT-IFR international flights in the European airspace (OATTS);
- Phase 3: development of cross-border military aviation operations in zones established on both sides of national borders (CBO/CBA).

The work of Phase 1 was aimed at preparing OATs for future air traffic management in the Single European Sky (SES) by adapting national OAT regulations for pan-European use. The final result was to develop regulations enabling OAT-IFR flights to be operated in the controlled area while minimising the impact of operational military procedures on GAT-IFR flights, as well as improving safety and successfully completing coordination procedures between OAT/GAT controllers.

It is understood that, wherever possible, the same definitions, regulations and procedures that apply to GAT should also apply to OAT, and that the required additional regulations departing from ICAO provisions will be specified in the relevant document. Furthermore, it is assumed that if deviations from the adopted rules are necessary for operational reasons, flights should be operated in airspace elements requiring reservation (ARES) of the appropriate type and size. Phase 2 sought to harmonise national air navigation service procedures in such a way as to achieve a flexible system for OAT-IFR traffic throughout Europe, providing unrestricted access to airspace at all times, appropriate route and airspace arrangement options and free movement across national borders. The third phase of work intended to develop new opportunities for the use of airspace in border areas in order to meet the growing operational needs of military aviation, but at the same time resulting in an overall increase in the availability and capacity of airspace for civil aviation.

However, proposals for solutions in this area required the willingness of national political and military authorities to share existing training areas or to create zones stretching across national borders (CBA), to accept the use of strength and resources of protecting flights from another country, to derogate from the principle of mutual accountability for the provision of air navigation services to military aviation and, moreover, to define the scope and conditions of legal liability in international agreements. These sensitive issues from the defence and security point of view of the Member States have given rise to considerable difficulties in implementing the results of the work carried out in the last two phases.

In 2010, Eurocontrol published the first agreed version of the harmonised rules for operational air traffic under the instrument flight rules (EUROAT)¹⁴. These include the OAT-IFR flight rules specification and the ATS provision rules specification for OAT in the ECAC area. The national implementation of the rules and procedures set out in this document has made it possible to standardise flights in operational air traffic in accordance with IFR regulations in the controlled post-wind space of all countries that have decided to implement the EUROAT regulation. In parallel to the development of EUROAT regulations, Eurocontrol was involved in the work on the draft implementing regulations of the European Commission for the Single European Sky, which ensured the complementarity of certain legal solutions and facilitated the subsequent harmonisation of GAT and OAT regulations within the European ATM system.

Impact of the Single European Sky legislation on operational air traffic management

The overarching objective of the EU's SES initiative is to create a pan-European airspace, independent of national borders, which will be adapted to increasing air traffic and guarantee the highest level of safety and meet the expected requirements in terms of capacity, operational and economic efficiency and environmental impact of air transport. SES legislation only applies to general air traffic (GAT)¹⁵, but due to its regulatory scope, it also has a significant impact on military activities in European airspace. The first SES constituent package, adopted by the European Parliament and the Council in 2004 (Regulations no. 549-552), recognises the prerogatives of the sovereign EU Member States in the field of security and defence in their national airspace, as demonstrated by the provision of priority and non-restrictive access to airspace for air defence flights and sufficient space structures for the provision of training and operations by military aviation.

In order to meet the operational and economic requirements of airspace users and to safeguard national security and defence interests, the EU Member States adopted a general statement on military issues related to the SES¹⁶ in which they committed themselves, inter alia, to civil-military cooperation and coordination in

14 Since 2013, the second edition of this document, which in the Polish language version was published in the CAA Official Journal as Guidelines no. 19 of the President of the Civil Aviation Authority of 24 December 2014 on the application of requirements established by the European Organisation for the Safety of Air Navigation - *EUROCONTROL Specification for harmonized Rules for Operational Air Traffic (OAT) under the Instrument Flight Rules (IFR) inside controlled Airspace of the ECAC Area (EUROAT)*.

15 Decisions on the type, scope or performance of military operations and training do not fall within the competence of the EU.

16 *Statement by the Member States on military issues related to the SES*. This statement is in addition to Framework Regulation no. 549/2004 (Official Journal of the European Union L 96/9, 31.3.2004).

air traffic management in order to ensure full and uniform application of the Flexible Use of Airspace (FUA) concept. The principles of this concept, according to which the process of European (including Polish) airspace management is currently being implemented, were incorporated into the EU aviation law in 2005¹⁷. The adoption of uniform principles of airspace management (ASM) has optimised its use by all users and has become the most important area of civil-military cooperation in ATM.

Since the first SES regulations came into force, their impact on future arrangements and requirements for civil-military cooperation and coordination in air traffic management has become apparent. First of all, it became clear that:

- the implementation of SES will change the organisation and use of European airspace and harmonise the provision of GAT traffic services at European level;
- airspace safety, military organisation, training, preparedness and combat capabilities will remain a sovereign responsibility of EU Member States, but the implementation of SES regulation will require the adaptation of differentiated national OAT arrangements to standard application in the future environment of the Single European Sky;
- harmonisation of OAT rules will facilitate civil-military coordination and interaction between State forces on all ATM-related matters, in line with the EU Member States' declaration (annexed to Framework Regulation no. 549/2004) and facilitate the achievement of SES objectives.

The provisions of the four SES I basic regulations were amended and extended in 2009 with the second package of SES legislation¹⁸, which introduced, inter alia, a comprehensive air navigation service performance programme with targets setting at EU level. Although the EU SES performance targets are not binding on the military side, the national performance plans must (as a mandatory element) describe the performance of the FUA concept, including the performance of military missions, and, where necessary, relevant performance indicators and targets consistent with other indicators and targets of the performance plan. The performance scheme, therefore, has a civilian-military dimension. The implementing acts adopted for SES II include Commission Regulations nos. 923/2012 and 2016/1185 laying down uniform European rules on air navigation services and procedures (the so-called SERA Regulations)¹⁹.

17 Commission Regulation (EC) no. 2150/2005 of 23 December 2005 laying down common rules for the flexible use of airspace (OJ L 342/20, 24.12.2005).

18 Regulation (EC) no. 1070/2009 of the European Parliament and of the Council of 21 October 2009 amending Regulations (EC) no. 549/2004, (EC) no. 550/2004, (EC) No 551/2004 and (EC) no. 552/2004 in order to improve the operational efficiency and sustainability of the European aviation system (OJ L 300/34, 14.11.2009).

19 Commission Implementing Regulation (EU) no. 923/2012 of 26 September 2012 laying down common rules for aviation and operational rules on air navigation services and procedures (Part A, B SERA, OJ L 281/1, 13.10.2012) and Commission Implementing Regulation (EU) 2016/1185 of 20 July 2016 amending Implementing Regulation (EU) no. 923/2012 as regards updating and supplementing the common rules with regard to aviation and operational rules for air navigation services and procedures (Part C SERA) and repealing Regulation (EC) No 730/2006 (OJ L 196/3, 21.7.2016).

Although they apply to airspace users and aircraft involved in general air traffic, they ensure that the essential defence and security interests of the EU Member States are protected in accordance with Article 13 of the SES Framework Regulation no. 549/2004. The implementation of SES legislation and future ATM solutions and technologies developed by the European ATM Research Programme (SESAR) is intended to ensure the safe, efficient and effective use of airspace to meet the needs of its civil and military users. At institutional level, the European Defence Agency (EDA) represents the military aviation interests of EU Member States in the development of SES legislation, while at operational level, the European ATM Network Manager (NM) represents the military aviation interests of EU Member States. Its tasks include the development of an integrated design of the European route network and the coordination of civil and military requirements through a dynamic Collaborative Decision-Making (CDM) process culminating in the publication of the daily European Airspace Use Plan (AUP) on the day before operations (D-1) and the updated Airspace Use Plans (AUP) on the day of operations. Conditional airways (CDR 2) for civil users of space are activated on the basis of AUP and UUP plans, while for military aviation, they are allocated for specific periods of time zones temporarily separated from public airspace (TSA/TRA or CBA).

The overall SES legislation, although not applicable to OAT traffic, creates a need to adapt military airspace users and military air navigation service providers to operate in a new operational environment. The analysis of individual regulations indicates that the changes introduced have an impact on operational procedures as well as on the equipment of military aircraft, hence the participation of allied and national aviation authorities in the legislative process is necessary. The military involvement to date (including NATO experts) in the work of the Single Sky Committee (SSC) has provided legal protection for military operations and training carried out as part of operational air traffic. However, further action by the military authorities is needed to deliberately achieve the objectives of the SES programme. The policy currently applied by ICAO and the EU of exemptions and transition periods for military aircraft not meeting airborne equipment requirements will be progressively reduced for safety, operational and economic reasons.

In the near future, the flight of such aircraft in air traffic service spaces will be significantly impeded. However, it should be stressed that due to the exceptional nature of some military aviation activities, OAT traffic cannot be subject to crew restrictions, air traffic flow management measures (ATFM) or other ATM restrictions applicable to GAT. The deployment of advanced air traffic management technologies (currently under development in SESAR) will require a significant upgrade of airborne military aircraft equipment and technical infrastructure of military air traffic services, as well as additional training of military flight and controller personnel.

The study of the SES implementation process for civil aviation to date allows the identification and prioritisation of actions that should also be undertaken by national military authorities. These include in particular:

- the establishment (designation) of a military body to oversee the safe operation of military air traffic services units;

- ensuring that military ATS units comply with the common requirements for the provision of air navigation services for the purpose of certification (in any form);
- the licensing of military air traffic controllers in accordance with ICAO provisions in the case of provision of a control service for general air traffic (e.g. at shared airports);
- ensuring interoperability of military CNS/ATM systems and associated procedures with those of the European Air Traffic Management Network (EATMN).

Assessing the impact of the implementation of Single European Sky legislation by military authorities is complex and ambiguous. This is due to the specificities of military aviation training and operations, which make them difficult to measure in economic terms. Overall, it is assumed that the adoption of selected SES regulations for use in the military aviation of EU Member States can bring significant benefits on a continental, regional and national scale. Above all, the harmonisation of OAT traffic management rules and procedures will contribute to enhancing the safety of flights in European airspace and the military aviation activities of NATO and EU Member States outside Europe.

Despite the numerous operational improvements implemented under the SES initiative (e.g. the FUA concept) and SESAR, there is still a need to further improve the efficiency of European airspace. Since 2017, the SESAR Joint Undertaking (SJU), with the support of the Network Manager (NM) and in close coordination with key stakeholders (including the military), has been carrying out a pilot project for the European Commission to develop a study on the future architecture of European airspace. New developments in space design, organisation and use, based on the latest technological developments, can be expected to translate SES strategic objectives in terms of safety, capacity, environmental impact and flight efficiency into operational requirements and the provision of ATM/ANS services for all types of aviation.

Principles of flight planning and ATS provision for operational air traffic

The procedures currently in force in Poland for planning and protecting military OAT flights are fully compliant with the principles of FUA concept and take into account, to the extent required, international (ICAO), EU (SERA) and national air traffic regulations, as well as the Eurocontrol Specification for OAT-IFR flights (EUROAT). Every flight of a military aircraft in the control area (CTA) FIR Warsaw above FL 95 flight level requires air traffic control clearance issued by ATC units on

the basis of a submitted flight plan (FPL)²⁰. The standard time of that the permit is valid is 30 minutes. For flights below FL 95, the obligation to submit a flight plan applies to:

- (a) flights performed in whole or in part within the controlled area;
- (b) instrument flights (IFR) in uncontrolled space except for flights which are to be entirely performed in space managed by AMC Poland;
- (c) IFR flights and visual flights (VFR) for which the submission of plans is governed by separate regulations.

The OAT ACC Warsaw cooperates with the appropriate military authority responsible for air traffic in a given space element: with the military aerodrome tower controller (TWR) - in military air traffic zone (MATZ) or military control zone (MCTR), and with the fighter controller - in TSA, TRA and EA areas. The control permit is issued by telephone to the military aerodrome controller prior to take-off, and by radio to the fighter controller (FC) prior to departure from the zone and to the commander of the aircraft during the flight. The aerodrome reporting office (ARO) at a military aerodrome sends departure messages via the AFTN network²¹. Flights of aircraft which do not comply with the conditions for flight in the controlled area above FL 95 or in the space of ICAO class C, D or G below FL 95 may only take place in separate parts of the space managed by AMC Poland. For this purpose, the AMC operator/ASM specialist shall agree on the conditions for the activation (use) of the separated collision airspace elements with the relevant area control sector (GAT ACC), approach control unit (APP) or aerodrome control tower (TWR). The AMC operator shall also be responsible for providing the appropriate ATS unit with information on the commencement and termination of activities in the elements of the space managed by AMC Poland with the use of the Pegasus 21 system²² functions.

Planning and conducting military activities outside flexible space elements or temporary flight restriction areas is also possible in military training areas (MTA) designated in the lower controlled area (not higher than FL 285), including TMA and CTR, or in uncontrolled space. Flights in MTA shall be operated in accordance with the air traffic rules applicable to the airspace class in question. When planning flights in ICAO class G or D space with instrument speeds above 250 knots (kts), the organiser of military activities must have the permission of the President of the

20 OAT traffic maintains altitude: at flight levels (FL) - at and above the transition level (FL080 or FL090 when QNH pressure is lower than 995 hPa) at STD pressure; in absolute feet (ft) at QNH pressure - at and below the transition altitude (6500 ft). In addition, the use of UTC shall apply.

21 AFTN (*Aeronautical Fixed Telecommunication Network*), a worldwide fixed telecommunication network for the exchange of messages (flight plans, airline information, NOTAM messages and weather information) and digital data between air stations with the same or compatible communication characteristics.

22 Pegasus 21 (*Polish Enhanced Generation ATM System for Unified Solutions of 21st Century*) - an automated air traffic management system used by civil air traffic controllers, deployed at 150 operational positions in PANSA's control centres and at many airport towers.

CAA²³ to exceed this speed. Designation of the MTA area takes place at the request of the organiser to the head of the ATS Office of the Polish Armed Forces (Szefostwo Służby Ruchu Lotniczego Sił Zbrojnych Rzeczypospolitej Polski – SSRL SZ RP) including: type of planned activities, vertical and horizontal borders of the area, planned time of activity and contact data to the organiser and to the commander of military activity. The SSRL sends the application to PANSa no later than 10 working days before the planned date of military activity. PANSa informs SSRL in writing about the acceptance or new parameters of the MTA, defines the conditions of its use and gives it an appropriate designator. In the case of an MTA defined in the lower control area, its class shall not be changed, but certain ATC service requirements may be suspended, e.g. maintenance of radio communication with an ATC unit, submission of a flight plan (FPL) or use of a transponder²⁴.

PANSa, after the acceptance of the MTA, no later than 7 days before the planned date of activity, issues a NOTAM message with a navigation warning of increased military activity in the region. Not later than 10.00 UTC on the last working day preceding military activity, the organiser shall confirm to AMC Poland (by fax or electronically), the intention to activate the MTA, stating: the area designator, type of planned activities and aircraft types, vertical borders of the area, planned duration of activity of the area and contact details of the person in charge of military activity. On the basis of the order received, AMC Poland closes the appropriate airways. Not later than 60 minutes before the planned commencement of operations in the MTA, the organiser shall confirm by telephone in ASM 3 the parameters of use of the area (or provide new ones, but not greater than ordered) and obtain consent for operations in the MTA designated in the controlled area. Flights in this area are performed taking into account internal buffers specified by the PANSa.

Aircraft keeping within the area is the responsibility of the crew performing the flights or the unit specified by the PANSa in the letter. Aircraft other than those carrying out military activities in the MTA separated from the controlled area shall not be permitted to fly through this area during its activity. In the case of MTAs located in uncontrolled airspace, the PANSa issues a navigation warning (without introducing air traffic restrictions for other users of class G space). The MTA organiser or user shall keep AMC Poland and/or relevant ATS units informed about the commencement and termination of activities in the MTA. Flights to/from zones (TSA, TRA, EA) or to/from MATZ/MCTR zones shall be carried out through designated coordination points or other points on the zone boundary as agreed between the cooperating authorities. Coordination points for exercise areas (EA) designated in the CTA are introduced by the Strategic Planning Unit (SPU) of the PANSa at the request of the organiser of the aviation project and after consultation with the OAT ACC.

²³ This is a requirement of SERA 6001(g).

²⁴ Details concerning suspension of some requirements of ATC services are specified by the PANSa in a letter to the SSRL.

If the exercise area coincides with the horizontal borders of the TSA/TRA areas, existing coordination points within the TSA/TRA area can be used. The crew shall, prior to departure from the MATZ/MCTR, liaise with the OAT ACC, APP, FIS or the fighter controller, as appropriate, and perform a flight to the en-route zone with exit to the coordination point or another point on the zone boundary agreed between the cooperating authorities, if a coordination point has not been designated. The transfer of an aircraft/formation to the OAT ACC requires that the fighter controller or controller of the military aerodrome ensure minimum separation from other air traffic in TSA/TRA/MATZ/MCTR zones: horizontally - 7 nautical miles (NM) or vertically - 1000 feet (ft) to FL 285 or 2000 ft above FL 285. The OAT ACC and the fighter controller/aerodrome controller, in direct coordination, may agree other conditions for the transfer of communication and responsibility over the aircraft. 5 minutes before entering the TSA/TRA/EA area, the OAT ACC controller shall transmit to the fighter controller: aircraft position/ coordination point, flight level, call sign, number of aircraft and formation status, aircraft/formation squawk, expected time and FL over the coordination point and additional information. The transfer of the aircraft to the fighter controller shall take place at the boundary of the TSA/TRA/EA zone. The cooperating authorities may determine a different place of transfer of the aircraft depending on the operational situation. At the request of the fighter controller or the formation leader, the ACC may allow the split procedure prior to the inlet to the zone.

Upon completion of a TSA/TRA/EA task, the fighter controller directs the aircraft/formation with a course to the coordination point included in the FPL along the flight path and, 5 minutes before departure, transmits the call sign to OAT ACC, the current transponder code, task completion time, aircraft position, flight level and the number of aircraft in the formation. The OAT ACC shall issue a fighter controller authorisation, specifying the exit conditions for each aircraft/formation, stating: the coordination point of departure or departure course, flight level, transponder code (if different from FPL) and the name and frequency of the authority taking control of the aircraft. The fighter controller accepts the given conditions (or proposes other conditions) and keeps at a safe distance aircraft remaining in the zone from aircraft leaving the zone. When several aircraft/formations depart at the same time, the OAT ACC assigns them different flight levels in order to maintain vertical separation. The fighter controller directs the pilot to accept the agreed conditions and, when reached, transfers the aircraft to the OAT ACC, unless otherwise agreed. If no CTA entry control permit has been issued by the time the coordination point is reached, the pilot shall await the designated co-ordination point.

At least 5 minutes before entering the MATZ/MCTR, the OAT ACC controller shall transmit to the aerodrome controller the: call sign, number of aircraft and formation status, aircraft/formation transponder codes, expected time and flight level above the coordination point. The OAT ACC shall maintain separations for subsequent arrivals at the MATZ, a minimum of 7 NM horizontal or 1000 ft vertical, unless larger ones are agreed. At the request of the aerodrome controller or aircraft commander, OAT ACC may permit the separation of formations prior to the MATZ/

MCTR inlet (split procedure execution). The transfer of the aircraft/formation to the aerodrome controller shall take place at the MATZ border, unless otherwise agreed by the cooperating authorities. For the purpose of conducting aviation exercises, the airspace shall be released by SPU of the PANSa in the form of an area of flight limitations marked with the designator EA. Information concerning the performance of flights is provided by the organiser of the exercise or the National Duty Controller (NDC) to the PANSa 24 hours before the planned commencement of the exercise. The information must include: cryptonyms and operating frequency of military command units (CRP, CRC, AWACS), scheduled flight table, assigned transponder codes, extract from the Air Tasking Order (ATO)²⁵ and other operational information at the request of the OAT ACC. The details or additional data shall be provided by the AOC not later than 2 hours before the start of the exercise. Flight restriction areas are subject to the standard ordering procedure at ASM 2 and activation at ASM 3 by the competent military aerodrome reporting office. Actual restrictions (active areas EA, times and altitudes) apply according to the published Airspace Use Plan (AUP). Arrivals and departures from the exercise area shall be planned through a fixed coordination point or other points agreed between SPU and SSRL. The planned entry point to the exercise area may not be an exit point at the same time. Entry into and exit from the exercise area may be made after coordination between the OAT ACC and the guidance and authorisation fighter controller.

The fighter controller transmits to the OAT ACC an aircraft that is separated from other traffic in the zone. The flight crew departing from the exercise area when communicating with the OAT ACC shall indicate the: call sign, transponder code, flight level and number of aircraft in formation, indicating whether the flight is conducted in a standard²⁶ or a non-standard military formation²⁷. The ATC clearance must contain the: call sign, transponder code, flight level, number of aircraft in formation, aircraft position, time, unit and frequency. Crews flying in demarcated areas (EA, TSA, TRA, D) shall maintain radio communication with the relevant military chain of command, while crews flying within the controlled area outside these areas shall communicate with the relevant OAT ACC or APP sectors. The training coordinator shall be responsible for the coordination of flights in conflict exercise areas with TSA areas. Flights up to 250 kts and FL 195 in areas of flight restrictions shall be operated by the user in accordance with VFR rules at speeds such

25 Air Task Order is a means by which the Joint Forces Air Component Commander controls air forces within a joint operations environment. The ATO is a large document that lists air sorties for a fixed 24-hour period, with individual call signs, aircraft types, and mission types. The ATO is created by an air operations centre which has command and control for a particular theatre. Source: <https://www.definitions.net/definition/air+tasking+order>

26 A standard military formation is a formation in which each aircraft is no more than 1 NM horizontally and 100 ft vertically from the formation leader.

27 In a non-standard military formation, the maximum distance between the first aircraft in formation (formation leader) and the last aircraft in formation (trailer) is 10 NM. The last aircraft in a non-standard formation shall set the ATC assigned transponder code or A "2000".

as to ensure that another movement or obstacle can be observed in sufficient time to avoid collision with traffic outside the area. Crews of aircraft operating flights within flight restriction areas above 250 kts or under IFR or above FL 195 must maintain a distance of 500 ft from the upper and lower limits of the area to FL 285, 1500 ft above FL 285 and 3,5 NM from the horizontal limits of the flight restriction areas. In addition, crews of aircraft participating in the exercise are required to avoid active danger zones (D) not used during training and prohibited zones (P) and restricted zones (R)²⁸.

Organisation and rules for the provision of ATS by the OAT ACC Warsaw

The OAT ACC Warsaw may provide air traffic services (ATC, FIS and ALRS) in three active operational sectors, in different configurations of areas of responsibility related to them. The full-time staff of the OAT sector of ACC Warsaw consists of three operational positions (see figure 1): executive controller (EC), planning controller (PC) and coordinator (CO). However, if there is no military aviation activity in CTA and in zones above FL 95, one-person work is allowed in OAT ACC positions. Supervision over the operational work of OAT ACC Warsaw is the responsibility of the senior controller (SC), who performs the tasks set by the OAT team manager and supervisor (SUP ATM). The basic frequencies of the OAT ACC operating sectors are UHF frequencies. During operational work, OAT ACC personnel ensure as a matter of priority: air traffic safety, continuity of services, required airspace capacity and training at operational positions (OJT).

The OAT ACC Warsaw provides radar service to OAT aircraft operating flights at CTA FIR Warsaw (FL 095 - FL 660) excluding TMA (unless ATS has been delegated to ACC Warsaw) based on secondary imaging presented by the Pegasus 21 system. The scope of provided services includes:

- (a) air traffic monitoring to provide information on deviations from the nominal flight path;
- (b) radar control using available traffic management techniques;
- (c) assistance to aircraft crews in distress;
- (d) alerting and providing information on unidentified air traffic that may pose a threat;

28 The presented procedures were in force, among others, during the *NATO Tiger Meet 2018* military aviation training conducted in Polish airspace on 14-25.05.2018. Almost 80 military aircraft (66 aircraft and 11 helicopters) from 16 countries took part in it. For the purpose of protecting this exercise at the ATS Personnel Training Centre of the PANSA, APP Poznań controllers were additionally trained in the provision of air traffic control services for OAT in the TMA Poznań. The efficient protection of OAT operations during this large airborne exercise was an example of the capabilities of Polish civil and military ATC units.

- (e) coordinating OAT and GAT;
- (f) navigational assistance at the request of the aircraft commander;
- (g) communication of available information on meteorological phenomena relevant to aircraft crews.

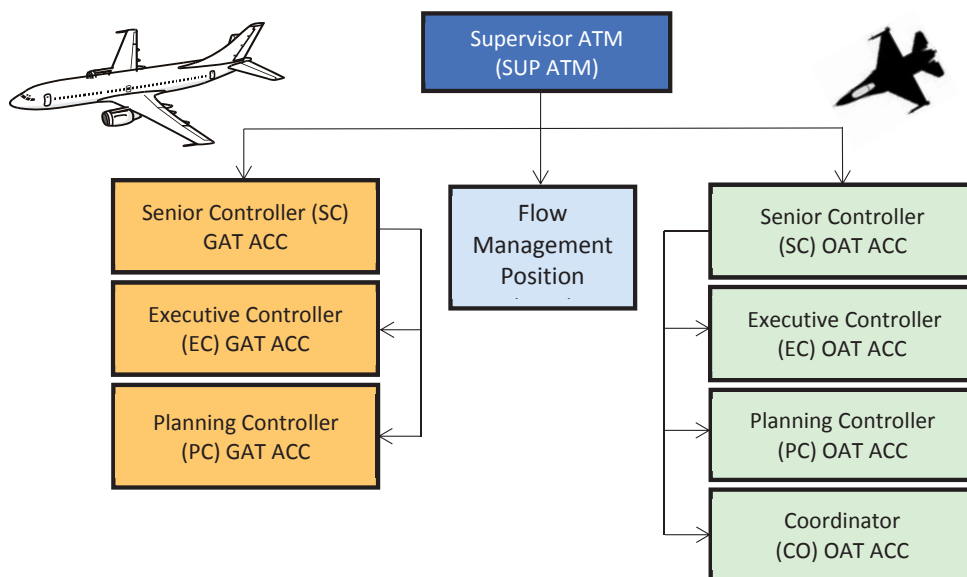


Figure 1. Operational positions of GAT and OAT at the ACC Warsaw

The provision of radar service on and below FL 095 is in each case decided by the executive controller (EC) OAT ACC, taking into account the radar coverage of the Pegasus 21 system. ACC Warsaw issues ATC clearance based on valid flight plans for all flights except those fully performed outside the CTA and, if necessary, determines the duration that the permit is valid. If the aerodrome of the first intended landing is outside the controlled area or if there are traffic reasons preventing the issuance of a permit to the aerodrome of the first intended landing, the limits of the permit shall be determined. The ATC clearance shall contain the assigned intermediate flight level or planned flight level, if lower than the intermediate, the individual transponder code and the allocated flight path. ACC Warsaw authorises other ATS units to transfer ATC clearance in accordance with the relevant provisions of the Letter of Agreement (LoA) or operational instruction (INOP).

The transfer of control between OAT ACC Warsaw sectors takes place at the borderline of responsibility. The minimum separation for aircraft in OAT traffic on the same road line at the transfer of control is 7 NM, provided that the distance is fixed or increasing, and 15 NM if the distance is decreasing. Less separation is allowed provided that there is prior telephone coordination. The transfer of connections between OAT sectors of ACC Warsaw should take place at the latest at the border of areas of responsibility, but not earlier than 15 NM before the border of the area

of responsibility. The minimum radar separation between aircraft in OAT traffic is 7 NM. Radar separation should be increased by 1 NM for aircraft flying in standard formations. The radar separation between two aircraft formations shall be increased by 2 NM. For flights in a non-standard military formation, the radar separation shall be applied to the position of the aircraft leading the formation (leader) and the last aircraft in the formation (trailer) as shown on the radar indicator. The minimum radar separation between aircraft in GAT and aircraft in OAT shall be 10 NM. Moreover, 10 NM radar separation is applied to aircraft that fly at supersonic speed, test flight or honorary aerial assistance mission. Aircraft classified in the *Renegade* category²⁹ shall be separated by 25 NM.

The coordination between GAT ACC and OAT ACC consists in agreeing on the terms and conditions of OAT and GAT flights, ensuring adequate minimum separation between aircraft in OAT and GAT traffic, maintaining fluidity of GAT traffic and enabling the performance of tasks by military aircraft crews. The executive controller (EC) OAT is responsible for ensuring the separation of aircraft in OAT traffic from GAT traffic and between aircraft in OAT traffic. On the basis of ongoing coordination between the coordinator or planning controller (CO/PC) of the OAT and the planning controller (PC) of the GAT, the transfer of state aircraft planned as GAT under EC OAT control and planned as OAT under EC GAT control is allowed, if justified by operational reasons. The minimum longitudinal separation at the transfer of control between GAT and OAT ACC for aircraft on the same road line shall be 10 NM provided that the distance is fixed or increasing, or 15 NM if the distance is reduced. In other cases, the minimum separation for transfer of control between GAT and OAT is 10 NM. Transfer of communication between GAT ACC and OAT ACC should take place at the agreed transfer of control point at the latest, but not earlier than 15 NM before that point.

In order to ensure the safety and efficiency of the performance of tasks by military aviation, OAT ACC Warsaw closely cooperates with AMC Poland at the tactical level (ASM 3). The AMC shall transmit to the relevant OAT ACC operational position the information contained in the AUP/UUP, which has or may have an impact on the provision of ATS. The OAT coordinator or planning controller and the ASM 3 military specialist shall exchange information on the activity and use of particular airspace elements managed by AMC Poland. In particular, OAT ACC shall provide information on: inactivity in an occupied zone, lack of distance to the zone boundary by users, differences between the agreed and actual time of zone usage and any other violation of the agreed zone reservation conditions. There is an exchange of information between OAT ACC and AMC Poland (ASM 3 M) regarding the commencement, termination or delay of flights, with particular emphasis on *Air Policing* flights. When the situation requires it, the OAT controller shall provide to the ASM 3 the route of arrival of fighter planes in the zone and the parameters of

²⁹ *Renegade* - civil aircraft used as a means of aerial terrorist attack. The term is used to refer to the threats posed by the attacks of 11 September 2001 in the United States.

limitation of flexible structures. When an operational reconnaissance flight is required to be performed by an active zone D, TSA, TRA or EA used by a civil user, OAT ACC shall request the AMC (ASM 3) to limit such structure. The ASM specialist agrees with the user new parameters of a given structure and informs the OAT ACC about such agreements. Restoring the previous parameters of space structures may take place after receiving information from OAT ACC about its omission by the reconnaissance flight.

Conclusions

The SES and SESAR programmes, implemented since the beginning of the 21st century, have intensified the process of adapting the national ATM system to the legal, organisational and technical requirements of the European Union. The changes introduced so far have significantly increased the safety and efficiency of the use of Polish airspace by all its users - civil and military. The procedures currently applied by PANSA and military control units for planning and protecting flights of military aircraft in operational air traffic are compliant with the EUROAT principles harmonised on a pan-European scale, which ensures that a high level of safety and interoperability is maintained when cooperating with allied aviation. Due to their tasks, military aircraft should have unrestricted and cost-effective access to all airspace and to all air traffic services, including the civil air navigation system. However, military aviation should comply as far as possible with the GAT regulations and only derogate from these regulations in operational situations requiring it. This need is mainly due to current European airspace capacity constraints, which cause disruption to overall air traffic, resulting in increased delays, operational and environmental costs and flight safety risks.

The FUA concept and closer civil-military cooperation and coordination in ATM are an important enabler to improve capacity and flight efficiency performance. Against the background of the projected increase in air traffic, the further development of this cooperation will be a precondition for providing military aviation with the required access to and flexible use of airspace by manned and unmanned aircraft, without imposing excessive time and space constraints. The scope of civil-military cooperation should include not only the sharing of best practices, but above all ensure the full participation of the military side in decision-making and regulatory processes as well as in research and development for the development of interoperable ATM/CNS systems. Otherwise, the results of European and national civil aviation organisations' efforts to increase the efficiency of the air transport sector may have a negative impact on training, operations and the maintenance of a high level of military aviation combat capabilities.

Bibliography

Legal Acts

- Regulation (EC) no. 549/2004 of the European Parliament and of the Council of 10 March 2004 laying down the framework for the creation of the single European sky (the framework Regulation), OJ of the European Union L 96/1, 31.3.2004.
- Regulation (EC) no.550/2004 of the European Parliament and of the Council of 10 March 2004 on the provision of air navigation services in the single European sky (the service provision Regulation), OJ of the European Union L 96/10, 31.3.2004.
- Regulation (EC) no. 551/2004 of the European Parliament and of the Council of 10 March 2004 on the organisation and use of the airspace in the single European sky (the airspace Regulation), OJ of the European Union L 96/20, 31.3.2004.
- Regulation (EC) no. 552/2004 of the European Parliament and of the Council of 10 March 2004 on the interoperability of the European Air Traffic Management network (the interoperability Regulation), OJ of the European Union L 96/26, 31.3.2004.
- Commission Regulation (EC) no. 2150/2005 of 23 December 2005 laying down common rules for the flexible use of airspace, OJ of the European Union L 342/20, 24.12.2005.
- Regulation (EC) no. 1070/2009 of the European Parliament and of the Council of 21 October 2009 amending Regulations (EC) no. 549/2004, (EC) no. 550/2004, (EC) no. 551/2004 and (EC) no. 552/2004 in order to improve the performance and sustainability of the European aviation system, OJ of the European Union L 300/34, 14.11.2009.
- Commission Implementing Regulation (EU) no. 923/2012 of 26 September 2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Implementing Regulation (EU) no. 1035/2011 and Regulations (EC) no. 1265/2007, (EC) no. 1794/2006, (EC) no. 730/2006, (EC) no. 1033/2006 and (EU) no. 255/2010, OJ of the European Union L 281/1, 13.10.2012.
- Commission Implementing Regulation (EU) 2016/1185 of 20 July 2016 amending Implementing Regulation (EU) no. 923/2012 as regards updating and supplementing the common rules on aviation and operational rules for air navigation services and procedures (Part C SERA) and repealing Regulation (EC) no. 730/2006, OJ of the European Union L 196/3, 21.7.2016.
- Commission Regulation (EU) no.677/2011 of 7 July 2011 laying down detailed rules for the implementation of air traffic management (ATM) network functions and amending Regulation (EU) no. 691/2010, OJ of the European Union L 185/1, 15.7.2011.
- Commission Implementing Regulation (EU) no. 390/2013 of 3 May 2013 laying down a performance scheme for air navigation services and network functions, OJ of the European Union L 128/1, 9.5.2013.
- The Act of 3 July 2002 on Aviation Law (Journal of Laws of 2018, item 1183).
- The Act of 8 December 2006 on the Polish Air Navigation Services Agency (consolidated text: Journal of Laws of 2017, item 1967).
- Regulation of the Council of Ministers of 31 October 2007 on the performance of functions resulting from sovereignty in Polish airspace and strengthening of defence for peacetime (consolidated text of the Journal of Laws of 2015, item 100).
- Regulation of the Minister of Infrastructure of 25 November 2008 on the structure of Polish airspace and the detailed conditions and manner of use of this space (consolidated text of the Journal of Laws of 19 March 2014, item 351).

Documents

Civil-Military ATM Performance Framework, Edition 1.0, Eurocontrol, February 2015.

EUROCONTROL Specification for harmonized Rules for Operational Air Traffic (OAT) Under Instrument Flight Rules (IFR) inside controlled Airspace of the ECAC Area (EUROAT), Edition 1.3, Eurocontrol, October 2010.

Porozumienie o współdziałaniu operacyjnym pomiędzy PANSĄ a Szefostwem Służby Ruchu Lotniczego SZ RP w zakresie zarządzania przestrzenią powietrzną, obowiązujące od 22.04.2014 r.

Porozumienie o współpracy operacyjnej pomiędzy PANSĄ a SSRL SZ RP z dnia 3 sierpnia 2015 r. w sprawie wykonywania lotów wojskowych statków powietrznych w ruchu OAT.

Statement by the Member States on military issues related to the SES, Official Journal of the European Union, L 96, 31.3.2004, p. 9.

Specification for the application of the Flexible Use of Airspace (FUA), Eurocontrol, ed. number 1.1, edition date 10.01.2009.

The ASM Handbook - Airspace Management Handbook for the Application of the Concept of the Flexible Use of Airspace, Eurocontrol, ed. number 5.3, ed. date 17.11.2016.