Cir 330
AN/189

Civil/Military Cooperation in Air Traffic Management

Approved by the Secretary General
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International Civil Aviation Organization

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FOREWORD

There are two major airspace users in the world today — civil and military. The civil aviation sector includes private, commercial and government-owned aircraft that are primarily transporting cargo and passengers, both nationally and internationally. Military aviation comprises State-owned aircraft engaged in transport, training, security and defence. Both aviation sectors are essential to global stability and economies. However, both usually cannot operate simultaneously within the same block of airspace, thus requiring the establishment of boundaries and segregation. States are therefore faced with the challenge of managing their limited airspace in a way that safeguards both civil and military aviation requirements.

In order for international aviation to operate as a safe and harmonious system, States have agreed to collaborate on a common regulatory infrastructure and, among others, have agreed on the air traffic services rendered, which includes the access and use of airspace. The Convention on International Civil Aviation was signed in Chicago in 1944 by 52 States. Pending ratification of the Convention by 26 States, the Provisional International Civil Aviation Organization (PICAO) was established to ensure the safe and orderly growth of international civil aviation throughout the world. Distinguishing civil aircraft operations from State aircraft operations was important enough to warrant the creation of Article 3, which excludes State aircraft used in military, customs and police services from ICAO's regulations. ICAO came into being on 4 April 1947 after the 26th ratification was received.

As airspace becomes more of a scarce and sought after resource, States need to take a balanced approach to airspace management in a way that harmonizes and meets the needs of international traffic flows and national security. This requires communication, collaboration and cooperation.

In October 2009, ICAO[1] hosted the Global Air Traffic Management Forum on Civil/Military Cooperation, which was attended by more than four hundred high-ranking civil and military participants from sixty-seven Member States, six air navigation service providers and forty-six industry organizations. Realizing that there was no existing international framework to bring civil and military authorities together, the Forum recommended that ICAO should play a pivotal role in improving the level of cooperation and coordination between civil and military authorities and should serve as the international facilitating platform.

Recognizing that the growing civil air traffic and mission-oriented military air traffic would benefit greatly from a more flexible use of airspace, the Forum recommended that civil and military experts should jointly develop advice and guidance on the best practices for civil/military cooperation.

This circular was prepared by civil and military experts and offers guidance on and examples of successful practices for civil and military cooperation. It acknowledges that successful cooperation requires collaboration that is based on communication, education, a shared relationship and trust.

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1. In partnership with the Civil Air Navigation Services Organisation (CANSO), European Organisation for the Safety of Air Navigation (EUROCONTROL), International Air Transport Association (IATA), North Atlantic Treaty Organization (NATO) and supported by Air Traffic Control Association, Inc. (ATCA) and Unmanned Vehicle Systems (UVS) International.

DEFINITIONS

Airspace management (ASM). The process by which airspace options are selected and applied to meet the needs of the airspace users.

Air-to-air refuelling (AAR). The process of transferring fuel from one aircraft to another in flight. This is an essential capability that increases the range, endurance, payload and flexibility of the receiving aircraft.

Air traffic flow management (ATFM). A service established with the objective of contributing to a safe, orderly and expeditious flow of air traffic by ensuring that ATC capacity is utilized to the maximum extent possible and that the traffic volume is compatible with the capacities declared by the appropriate ATS authority.

Air traffic management (ATM). The dynamic, integrated management of air traffic and airspace (including air traffic services, airspace management and air traffic flow management) — safely, economically and efficiently — through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions.

Air traffic service (ATS). A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

Air traffic services units. A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.

Air traffic management system. A system that provides ATM through the collaborative integration of humans, information, technology, facilities, and services, supported by air and ground- and/or space-based communications, navigation and surveillance.

ATM in crisis situation. Unforeseen or short-notice situations that occur outside the steady state of the routine global ATM system (for example: earthquakes, hurricanes, conflicts).

ATM security. The contribution of the ATM system to civil aviation security, national security and defence, and law enforcement; and the safeguarding of the ATM system from security threats and vulnerabilities.

All-purpose structured Eurocontrol surveillance information exchange (ASTERIX). ASTERIX is the Eurocontrol standard for the exchange of data between surveillance sensors and data processing systems, and also for the generalized exchange of surveillance data between systems.

Collaborative decision-making (CDM) process. The process whereby all ATM decisions, except tactical ATC decisions, are based on sharing of all information relevant to air traffic operation between all civil and military partners.

Conditional routes. A non-permanent ATS route or portion thereof which can be planned and used under specified conditions.

Cross-border area (CBA). An airspace reservation/segregation established for specific operational requirements over international boundaries.

Customs and border protection (CBP). Secures the State by preventing the illegal entry of people and goods while facilitating legitimate travel and trade.

Flexible use of airspace (FUA). An airspace management concept based on the principle that airspace should not be designated purely as civil or military, but rather as a continuum in which all user requirements are accommodated to the greatest possible extent.

Flight information region (FIR). An airspace of defined dimensions within which flight information service and alerting service are provided.

Global navigation satellite system (GNSS). A worldwide position and time determination system that includes one or more satellite constellations, aircraft receivers and system integrity monitoring, augmented as necessary to support the required navigation performance for the intended operation.

Global Plan initiatives (GPI). Global Plan initiatives are designed to support the planning and implementation of performance objectives in the ICAO regions.

Intelligence, surveillance and reconnaissance (ISR). ISR integrates, where appropriate, capabilities for all military components and some non-military platforms, in order to provide awareness essential to successful planning and conduct of operations, through collection, processing, exploitation and dissemination of accurate and timely information.

Next generation air transportation system (NextGen). NextGen is an umbrella term for the ongoing, wide-ranging transformation of the United States National Airspace System (NAS). At its most basic level, NextGen represents an evolution from a ground-based system of air traffic control to a satellite-based system of air traffic management.

Performance-based navigation (PBN). Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

Procedures for Air Navigation Services (PANS). Procedures for Air Navigation Services are approved by the Council. They comprise, for the most part, operating procedures regarded as not yet having attained a sufficient degree of maturity for adoption as international Standards and Recommended Practices, or material of a more permanent character which is inappropriate or too detailed for incorporation in an Annex.

Regional Supplementary Procedures (SUPPS). Operating procedures supplementary to the Annexes and PANS developed for the greater part through the ICAO regional air navigation meetings to meet the needs of a specific ICAO Region. They deal with matters affecting the safety and regularity of international air navigation. They are published in a single document covering all Regions. The ICAO Regional Supplementary Procedures form part of the Air Navigation Plan developed by regional air navigation meetings to meet those needs of specific areas which are not covered in the worldwide provisions. They complement the statement of requirements for facilities and services contained in the Air Navigation Plan publications.

Remote pilot. The person who manipulates the flight controls of a remotely-piloted aircraft during flight time.

Remote pilot station (RPS). The station at which the remote pilot manages the flight of the unmanned aircraft.

Remotely-piloted aircraft (RPA). An aircraft where the flying pilot is not on board the aircraft.

Remotely-piloted aircraft system (RPAS). A set of configurable elements consisting of a remotely-piloted aircraft, its associated remote pilot station(s), the required command and control links and any other system elements as may be required, at any point during flight operation.

Segregated airspace. Airspace of specified dimensions allocated for exclusive use to a specific user(s).

Single European sky ATM research (SESAR). SESAR is the European air traffic management (EATM) modernization and restructuring programme.

Standards and Recommended Practices (SARPs). Standards and Recommended Practices are adopted by the Council in accordance with Articles 54, 37 and 90 of the Convention on International Civil Aviation and are defined as follows:

Standard. Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which ICAO Member States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice. Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interests of safety, regularity of efficiency of international air navigation, and to which ICAO Member States will endeavour to conform in accordance with the Convention.

System-wide information management (SWIM). An advanced technology programme designed to facilitate greater sharing of air traffic management (ATM) system information such as airport operational status, weather information, flight data or status of special use airspace.

Temporary reserved area (TRA). An airspace temporarily reserved and allocated for the specific use of a particular user during a determined period of time and through which other traffic may be allowed to transit under air traffic control (ATC) clearance.

Temporary segregated area (TSA). An airspace temporarily segregated and allocated for the exclusive use of a particular user during a determined period of time and through which other traffic will not be allowed to transit.

Unmanned aircraft system (UAS). An aircraft and its associated elements which is operated with no pilot on board.

ACRONYMS AND ABBREVIATIONS

AAR	Air-to-air refuelling
ACAS	Airborne collision avoidance system
ADS	Automatic dependent surveillance
AMC	Airspace management cell
ANSP	Air navigation service provider
ASM	Airspace management
ASTERIX	All-purpose structured Eurocontrol surveillance information exchanger
ATC	Air traffic control
ATFM	Air traffic flow management
ATM	Air traffic management
ATS	Air traffic services
CBA	Cross-border area
CBP	Customs and border protection
CDM	Collaborative decision-making
CNS/ATM	Communications, navigation, and surveillance/air traffic management
FAA	Federal Aviation Administration (United States)
FIR	Flight information region
FUA	Flexible use of airspace
GAT	General air traffic
GNSS	Global navigation satellite system
GPI	Global plan initiatives
ISR	Intelligence, surveillance and reconnaissance
LOA	Letter of Agreement
MOA	Military operations area
MOU	Memorandum of Understanding
MSL	Mean sea level
NextGen	Next generation air transportation system
NOTAM	Notice to airmen
PANS	Procedures for air navigation services
PBN	Performance-based navigation
PIRG	Planning and implementation regional group (PIRG)
RPA	Remotely-piloted aircraft
RPAS	Remotely-piloted aircraft system
RPS	Remote pilot station
SAR	Search and rescue
SARPs	Standards and Recommended Practices
SESAR	Single European sky ATM research
SUA	Special use airspace
SUPPS	Regional supplementary procedures
SWIM	System-wide information management
TRA	Temporary reserved area
TSA	Temporary segregated area
UAS	Unmanned aircraft system
UIR	Upper flight information region

Chapter 1

ICAO INSTITUTIONAL AND REGULATORY FRAMEWORK

1.1 INSTITUTIONAL FRAMEWORK

1.1.1 The aims and objectives of ICAO in accordance with Article 44 of the *Convention on International Civil Aviation* (Doc 7300) are to develop the principles and techniques of international air navigation and foster the planning and development of international air transport to, inter alia, ensure safe and orderly growth.

1.1.2 The Convention establishes the privileges and restrictions of all ICAO Member States and provides for the adoption of International Standards and Recommended Practices (SARPs) regulating international air transport. The Convention recognizes and accepts the principle that every State has complete and exclusive sovereignty over the airspace above its territory.

1.1.3 The ICAO Assembly and Council and their subsidiary bodies set the continuing direction of the work of the Organization. One of the major duties of the Council is to adopt SARPs, which are designated as Annexes to the Convention on International Civil Aviation.

1.1.4 Although the Council is responsible for the adoption of SARPs and the approval of Procedures for Air Navigation Services (PANS), the principal body concerned with their development is the ICAO Air Navigation Commission. The Commission is composed of qualified and experienced individuals in the science and practice of aeronautics, nominated by ICAO Member States and appointed by the Council.

1.1.5 Due to increased dialogue and a changing culture, civil/military cooperation is becoming a global topic because of the enormous positive effects for both civil and military air traffic management (ATM) systems and related aviation operations.

1.2 ARTICLE 3 OF THE CONVENTION

1.2.1 Article 3 (a) of the Convention expressly excludes State aircraft from its scope of applicability. Articles 3 (b), (c) and (d) further clarify the definition and scope of application of the Articles of the Convention:

a) This Convention shall be applicable only to civil aircraft, and shall not be applicable to State aircraft.

b) Aircraft used in military, customs and police services shall be deemed to be State aircraft.

c) No State aircraft of a Contracting State shall fly over the territory of another State or land thereon without authorization by special agreement or otherwise, and in accordance with the terms thereof.

d) The ICAO Contracting States undertake, when issuing regulations for their State aircraft, that they will have due regard for the safety of navigation of civil aircraft.

1.2.2 The foregoing notwithstanding, further references to civil/military coordination and cooperation matters are included in the Convention, the Resolutions of ICAO General Assemblies, ICAO Annexes, PANS, and a variety of documents and manuals.

1.2.3 As a consequence of Article 3, in particular subparagraph 3 (d), States are required to safeguard navigation of civil aircraft when setting rules for their State aircraft. This leaves it up to the individual State to regulate these operations and services, generating a wide diversity of military regulations. However, especially in congested airspace, harmonized regulation is a precondition for a safe, efficient and ecologically sustainable aviation system.

1.2.4 At the same time, States are aware of the limitations of ICAO SARPs and designated Annexes to the Convention, including PANS and regional supplementary procedures (SUPPs), as they relate to State/military aircraft and their services. Indeed, as seen above, Article 3 of the Convention specifically exempts State aircraft from compliance with articles of the Convention.

1.2.5 Annex 11 — *Air Traffic Services* allows States to delegate responsibility for the provision of ATS to another State. However, States retain sovereignty over the airspace so delegated, as confirmed by their adherence to the Convention. This factor may require additional effort or coordination in relation to civil/military cooperation and appropriate consideration in bilateral or multilateral agreements.

1.2.6 More and more multinational military operations that cross international boundaries require complex coordination and planning processes to avoid unnecessary segregation or restrictions and to achieve the required level of safety. In light of Article 3 (d) it should be the role of ICAO to support States in harmonizing their State aircraft operations and the respective services in a regional and, ideally, a global context.

1.3 ASSEMBLY RESOLUTIONS

1.3.1 The topic of civil/military coordination has been discussed over the years in the ICAO Assembly, and many resolutions referring to civil/military coordination have been formulated. At the 37th Session of the Assembly, 28 September to 8 October 2010, Resolution A37-15, Appendix O, “Coordination and cooperation of civil and military air traffic” was further articulated.

1.3.2 It was recognized that airspace is a resource common to both civil and military aviation and that many air navigation facilities and services are provided for and used by both civil and military aviation. Further, the shared use of airspace and certain facilities and services by civil and military aviation shall be arranged so as to ensure the safety, regularity and efficiency of international civil aviation as well as the requirements of military air traffic. As a consequence, ICAO Member States may include, when appropriate, representatives of military authorities in their delegations to ICAO meetings.

1.3.3 The 37th Assembly also concluded that ICAO should serve as an international platform to facilitate improved civil/military cooperation, collaboration and the sharing of best practices.

1.4 EXISTING REGULATORY FRAMEWORK

1.4.1 Obligations of ICAO Member States under the Chicago Convention germane to civil/military issues include:

a) rule-making as regards aviation safety rules in compliance with ICAO SARPs contained in the Annexes to the Convention (Article 37); and

b) carrying out tasks which pertain to, for instance, ATM and which are laid down in the Annexes to the Convention, such as the classification of airspace and coordination between civil and military air traffic.

1.4.2 Annex 2 — *Rules of the Air* contains rules relating to the flight and manoeuvre of aircraft within the meaning of Article 12 of the Convention. It includes provisions on the coordination with military authorities for reason of a

State's territorial integrity and sovereignty, namely for air defence reasons. To facilitate coordination with appropriate military units, a flight plan has to be submitted for any flight within or into designated areas or along designated routes. In those instances a flight plan is submitted to facilitate coordination and control of flights with transparent and real-time data exchange.

1.4.3 Annex 11 contains the SARPS that States use as reference for the provision of air traffic services (ATS). Currently, the Annex addresses only the need for coordination with military authorities or units, mainly the degree and level to which State aircraft activities may affect civilian operations or vice versa. Topics covered include activities that may directly affect flight safety, be potentially hazardous to civil aircraft, or require interception of civil aircraft or coordination due to unlawful interference of air traffic.

1.4.4 The *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444), together with the Standards in Annex 2 and the Regional SUPPS, govern the application of the rules of the air and ATS. The PANS-ATM contains procedures applicable to other in-flight contingencies, such as strayed or unidentified aircraft, that involve coordination with military authorities. Some miscellaneous procedures are detailed for the conduct of special military operations.

1.4.5 The *Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations* (Doc 9554) describes the coordination that should take place between military units and ATS units. It details the requirements to establish and maintain close cooperation with military authorities responsible for activities that may affect flights of civil aircraft.

1.4.6 The *Air Traffic Services Planning Manual* (Doc 9426), published in 1984, was one of the first manuals to provide ICAO guidance material on civil/military coordination and cooperation. Most of that guidance material remains valid today.

1.4.7 The *Global Air Navigation Plan* (Doc 9750) has as a final goal the achievement of an integrated, harmonized and globally interoperable ATM system. A global system can be described as a worldwide system that, on a global basis, achieves interoperability and seamlessness across regions for all users during all phases of flight. The Global Plan includes technical, operational, economic, environmental, financial, legal and institutional elements and also offers States practical guidance on implementation and funding strategies. In accordance with the Plan, States and regions will choose objectives and draft their guidance in support of the particular needs of a homogenous ATM system.

1.4.8 Doc 9750 aims to provide initial guidance on, and facilitate implementation of, the civil/military coordination measures and cooperation concepts embedded in the *Global Air Traffic Management Operational Concept* (Doc 9854). Achievements in the integration of the specified Global Plan initiatives (GPI) require the implementation of collaborative airspace design and management, performance-based navigation (PBN), the integration of ground and airborne systems or data link or communications. It is significant to note that the first of the twenty-three detailed GPIs of the Global Air Navigation Plan is GPI-1, "Flexible Use of Airspace".

1.4.9 Doc 9854 is a relatively new document that describes the services that will be required to operate the global air traffic system in the near future and beyond. The Operational Concept highlights the elements needed to increase user flexibility, maximize efficiencies and increase system capacity while at the same time improving safety. Consideration of the interoperability and operations of military systems is an integral part of these elements.

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Chapter 2

CIVIL/MILITARY INTEROPERABILITY

2.1 INTRODUCTION

2.1.1 The ATM Operational Concept presents a vision of an integrated, harmonized and globally interoperable ATM system — a system that meets agreed levels of safety, provides for optimum economic operations, is environmentally sustainable and meets national security requirements for all users during all phases of flight. The vision does not discriminate or make any exceptions about the type of traffic it is designed to serve.

2.1.2 Communications, navigation and surveillance (CNS) systems, and advanced information management technology are to be used to functionally combine the ground-based and airborne system elements into a fully integrated, interoperable ATM system open to all users.

2.1.3 Interoperability can be considered as the ability of “systems” (not exclusively technical systems) to provide information and services to, and accept information and services from, other systems and to use the information and services so exchanged. Interoperability constitutes the driver of standardization, integration and cooperation.

2.1.4 Global standards, uniform principles and agreements are needed to ensure the technical and operational interoperability of the ATM system. However, ATM system interoperability needs to be considered in the broader context of governance, not just technology and procedures, while bearing in mind the requirements users place on the system. After all, ATM aims to enable all airspace users, including the military, to operate their preferred flight/mission profiles, cost-efficiently and effectively, without compromising flight safety or national security.

2.1.5 Interoperability specifics, however, are not always well-defined when considered in relation to the CNS/ATM field. They are often situation-dependent, come in various forms and degrees and can occur at various levels, i.e. strategic, operational and technical.

2.1.6 From the aforementioned, it can be concluded that civil/military coordination and interoperability are very similar. Interoperability can be identified as strategic/political or operational/technical as described in 2.2 and 2.3.

2.2 STRATEGIC AND/OR POLITICAL INTEROPERABILITY

2.2.1 At the strategic/political level, the concept of interoperability can be considered as an enabler for coalition building. It facilitates meaningful contributions by aviation coalition partners, both civil and military. At the highest level, interoperability of aviation issues centres on harmonizing global (e.g. ICAO) or regional (e.g. European Union) views, doctrines and, foremost, a regulatory framework. One main element at this level is the political willingness to cooperate and coordinate over the long term, to achieve and maintain shared interests in aviation safety, environment, efficiency and capacity.

2.2.2 The price of strategic and/or political interoperability at national as well as international levels can be high and finding a common ground can be difficult to achieve. National considerations and culture are potential disablers of affordable interoperability. Nevertheless one can assume that the aviation chain is as strong as its weakest link and that it is therefore in everyone’s interest to cooperate and invest in order to achieve the highest level of interoperability.

2.3 OPERATIONAL AND TECHNICAL INTEROPERABILITY

2.3.1 Interoperability at the operational level occurs when strategic, political and technical interoperability come together, not only to help all aviation partners to shape the environment and manage crisis, but also to support any anticipated aviation growth and its associated impact on aviation safety, environment, efficiency and capacity.

2.3.2 The benefits of interoperability at the operational and technical level generally derive from the inter-changeability of system elements or operational procedures. An example is the system-wide information management (SWIM) concept which is or will be used in a civil (SESAR/NextGen) as well as in a military (Network Centric Warfare) environment. These concepts enable users to randomly use that portion of information viable for their respective operation and can be achieved only through the interoperable technical feeders of the network. For this reason States and military organizations should endeavour to define mutually interoperable systems early in their design phase.

2.3.3 Another benefit of interoperability is modularity, which allows for the possibility of collecting only those technical facilitators that are necessary to conduct one's operation. An example of this is the all-purpose structured Eurocontrol surveillance information, known as the ASTERIX protocol, used for radar data exchange. This exchange protocol, in combination with a multi-radar tracker, can enable a civil air navigation service provider (ANSP) to use externally provided radar data, without necessarily procuring its own radar system, by using radar data provided by military sensors. States and military organizations should ensure a level of modularity in their respective systems to allow those systems access to a free exchange of information as required.

2.3.4 Costs associated with interoperability at the operational and tactical level very often derive from inefficiencies caused by a number of factors outside the direct control of the involved parties, such as strategic objectives, system impossibilities and institutional or governmental changes. States and military organizations should consider interoperability from the early stages of system design to ensure that costs are kept low and to ensure system compatibility.

2.4 REGULATION AND STANDARDIZATION

2.4.1 CNS/ATM regulations in any form can have an impact on the military either when military ground systems are integrated into a CNS/ATM network, when military units provide air navigation services to civil aviation or when carriage requirements are imposed on airspace users. Therefore, States and service providers implementing regulations or designing procedures should consider and minimize the impact of such actions on military users and systems (ground or airborne).

2.4.2 Existing civil standards and specifications are adequate to support technical compliance of civil CNS/ATM systems but tend to overlook the specific characteristics of available military CNS/ATM systems. To enable solutions that would promote civil/military interoperability, States should ensure that such specifications respond to the fulfilment of defined performance levels, using multiple means of compliance, rather than mandating particular equipage fits.

2.4.3 Historically, the supporting technical infrastructure enabling military operations, comprising multiple ground-based and airborne CNS/ATM systems, has been procured with the primary objective of satisfying the very demanding wartime requirements of military command and control.

2.4.4 The resulting lack of interoperability between the underlying civil ATM infrastructure and many military ground systems and tactical aircraft avionics is difficult to overcome due to:

a) lengthy military procurement cycles;

b) public budget constraints;

c) lack of space in the cockpit for extra avionics;

d) absence of supporting military requirements;

e) lack of recognized certification processes;

f) security and institutional aspects; and

g) difficulty monitoring civil CNS/ATM developments.

2.4.5 One of the most significant consequences of this situation is evidenced whenever a military aircraft that intends to use civil route structures has to be accommodated using special handling or by applying exemption policies or derogations for the airborne equipage. It needs to be realized that the need for an exemption for State aircraft should be based on compelling technical or military reasons and used only as a measure of last resort.

2.4.6 With the future predominance of strategic ATM capabilities, reduction of tactical interventions and consequent automation of the associated ATC tools and information flows in a network-centric environment (SESAR/NextGen), military platforms may face serious difficulties when attempting to freely access the airspace designated for civil aviation if they lack the required levels of connectivity with the underlying civil ATM system.

2.4.7 This possible situation entails the urgent need to identify valid solutions for interoperability between civil and military CNS/ATM systems at an early stage in their development and to define a migration path towards long-term avionics convergence and integration. States and service providers should establish a formal process of consultation with military users at an early stage of future avionics development with the aim of achieving maximum system interoperability between civil systems and military units.

Chapter 3

AIRSPACE ORGANIZATION AND MANAGEMENT

3.1 GENERAL PRINCIPLES

3.1.1 With reference to the ATM Operational Concept, airspace management (ASM) is the process by which airspace options are selected and applied to meet the needs of airspace users. Competing interests for the use of airspace make ASM a highly complex exercise, necessitating a process that equitably balances those interests. The ultimate goal of ASM is to achieve the most efficient use of the airspace based on actual needs and, when possible, avoid permanent airspace segregation.

3.1.2 The management of airspace should follow these guiding principles and strategies:

a) all available airspace should be managed flexibly;

b) airspace management processes should accommodate dynamic flight trajectories and provide optimum operational solutions;

c) when conditions require different types of traffic to be segregated by airspace organization, the size, shape, and time regulation of that airspace should be set so as to minimize the impact on operations;

d) airspace use should be coordinated and monitored in order to accommodate the conflicting requirements of all users and to minimize any constraints on operations;

e) airspace reservations should be planned in advance with changes made dynamically whenever possible. The system also needs to accommodate short-notice unplanned requirements; and

f) complexity of operations may limit the degree of flexibility.

3.1.3 The effective implementation of an ASM process demands commitment from all stakeholders involved. A first step towards an effective implementation of the flexible use of airspace (FUA) concept would be to allow civilian users temporary access to military restricted and reserved airspace for optimum use of the airspace. Another step would be to allow military users temporary access to civilian restricted and reserved airspace.

3.2 THE FLEXIBLE USE OF AIRSPACE CONCEPT

3.2.1 Flexible use of airspace (FUA) is an airspace management concept based on the principle that airspace should not be designated as purely civil or military, but rather as a continuum in which all user requirements are accommodated to the greatest possible extent.

3.2.2 The FUA concept includes consideration of effective communication, cooperation and coordination necessary to ensure a safe, efficient and predictable use of airspace. The establishment of joint civil/military coordination entities for airspace organization and management is essential to the realization of current and future CNS/ATM initiatives. Meeting future air traffic requirements for increased safety, security, capacity, efficiency, environmental sustainability, and sovereignty depends on effective civil/military coordination.

3.2.3 The civil aviation authorities of some States are already working with military authorities, using coordinated processes to manage civilian use of active military airspace. Jointly, civil and military authorities have put in place procedures to apply airspace reservations or restrictions only during limited periods of time, based on actual use. On completion of the activation requiring segregation, capacity is made available again to civil traffic. Examples of the coordination process in several States between civil and military sectors are contained in Appendices A, B and C.

3.2.4 Even when States have agreements such as the one in Appendix A, there continues to be numerous occasions when restricted or reserved airspace, with no planned military missions, has gone unused. Temporarily segregating airspace based on actual military requirements, through an effective collaborative civil/military process, should be pursued to recapture this unused capacity and release it for effective use by civil aviation. In order to enable effective flexible use of airspace, some basic prerequisites should be observed by States:

a) establishment of a national, high-level civil/military coordination body;

b) development of a consistent, collaborative national airspace planning process taking into consideration the needs of all airspace users and national security, defence and law enforcement requirements;

c) establishment of communication, negotiation and priority rules and procedures for civil/military coordination;

d) establishment and publication of procedures for activities which require airspace reservation or restriction. Airspace reservations or restrictions should be applied only for limited periods of time and based on actual use;

e) development of framework agreements between civil and military authorities to facilitate coordination;

f) establishment of a system to periodically review airspace needs, organization and management; and

g) predictive and timely access to restricted or reserved airspace whenever possible in order to maximize benefits and flexibility for all users.

3.2.5 Today aircraft are more capable of accurate navigation than in the past. Using global navigation satellite systems (GNSS) and performance-based navigation (PBN), aircraft can fly between terminals and en-route phases of flight with negligible deviations. However, lack of civil/military coordination of airspace management has resulted in inefficient airspace use and limited use of aircraft capabilities.

3.2.6 The safe and efficient joint use of airspace by civil and military operations rests on understanding and accommodating the airspace requirements of all users on a fair and equitable basis, while respecting State sovereignty and national/international security, defence and law enforcement obligations.

3.3 FUA PRINCIPLES

3.3.1 An FUA concept should embrace the following principles:

a) Coordination between civil and military authorities should be carried out at the strategic, pre-tactical and tactical levels (see Figure 3-1) in order to increase safety and airspace capacity and to improve the efficiency of aircraft operations.

b) Consistency between ASM, air traffic flow management (ATFM) and ATS should be established and maintained at the three levels of ASM.

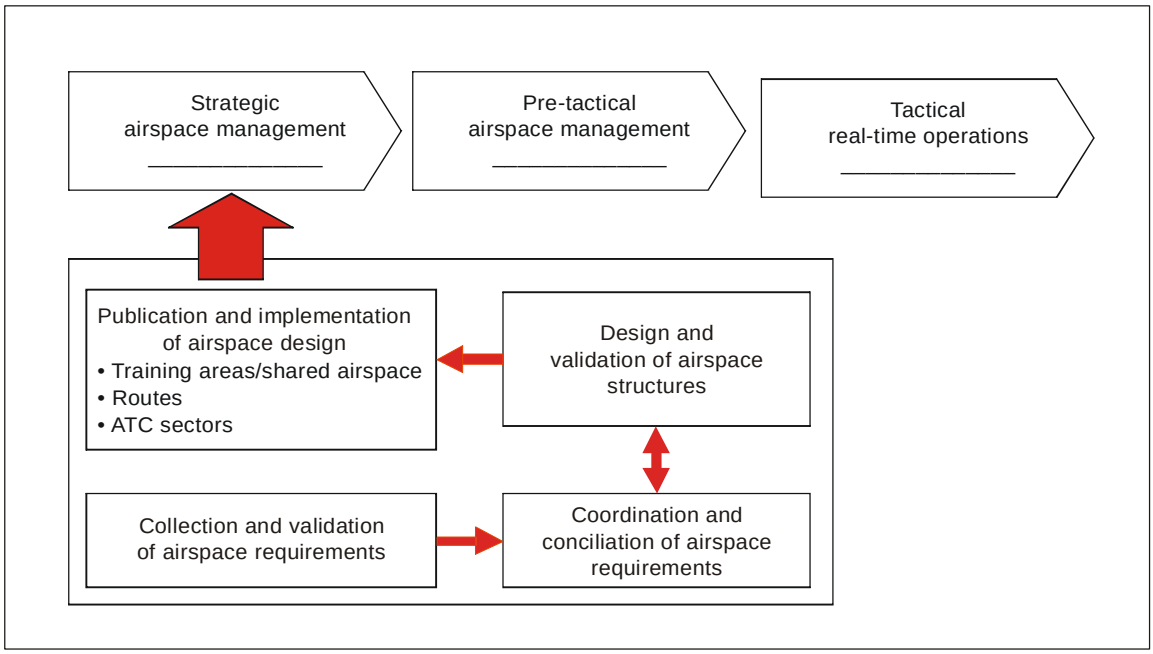

Figure 3-1. Coordination between civil and military authorities carried out at the strategic, pre-tactical and tactical levels

c) Airspace reservations should be of a temporary nature, applied only for limited periods of time and based on actual use of airspace.

d) The FUA concept should, whenever possible, be applied across national borders and/or the boundaries of flight information regions (FIRs).

Strategic airspace management

3.3.2 At the strategic ASM level, the following tasks need to be performed in order to ensure the overall application of the FUA concept:

a) establish airspace structures;

b) develop coordination procedures and airspace management procedures; and

c) develop cross-border coordination and separation standards between civil and military flights.

Pre-tactical airspace management

3.3.3 States should establish an ASM entity to allocate airspace in accordance with the conditions and procedures agreed upon at the strategic level.

3.3.4 The ASM entity should take the form of a joint civil-military cell, if both civil and military authorities are responsible for airspace management in a given State. It can also be a joint cell of two or more States. States should provide to the ASM entities adequate supporting systems to ensure a timely and efficient ASM process.

Tactical airspace management

3.3.5 Tactical ASM should be carried out at the level of ATS units and controlling military units. Dedicated coordination procedures and communication facilities should enable mutual provision of airspace data in a timely manner to allow effective real-time activation, deactivation or reallocation of the airspace allocated at the pre-tactical level. All affected users should be notified of the current status of the airspace.

3.3.6 Direct communication between civil and military ATS units should be available with a high degree of reliability to permit the resolution of specific traffic situations if and where civil and military controllers are providing services in the same airspace. If required to meet minimum safety levels, exchange of flight data, including the position and flight intention of the aircraft, should be available between civil ATC units and controlling military units.

3.4 FLEXIBLE AND ADAPTABLE AIRSPACE STRUCTURES AND PROCEDURES

3.4.1 An FUA concept can be based on the potential offered by flexible and adaptable airspace structures and procedures that are especially suited to temporary allocation and utilization like conditional routes, temporary reserved area (TRA), temporary segregated airspace (TSA) and cross-border area (CBA).

3.4.2 ***Conditional route.*** A conditional route (Figure 3-2) is a non-permanent ATS route or portion thereof which can be planned and used under specified conditions. According to its foreseen availability, flight planning possibilities and the expected level of activity of the possible associated TSA, a conditional route can be divided into the following categories:

a) Category one: permanently plannable;

b) Category two: non-permanently plannable; and

c) Category three: not plannable.

3.4.3 ***Temporary reserved area (TRA).*** A TRA (Figure 3-2) is airspace temporarily reserved and allocated for the specific use of a particular user for a determined period of time and through which other traffic may be allowed to transit under ATC clearance.

3.4.4 ***Temporary segregated airspace (TSA).*** A TSA (Figure 3-2) is airspace temporarily segregated and allocated for the exclusive use of a particular user during a determined period of time and through which other traffic will not be allowed to transit.

3.4.5 ***Cross-border areas (CBA).*** A CBA (Figure 3-3) is an airspace reservation/segregation established for specific operational requirements over international boundaries. CBAs are established to allow military training and other operational flights on both sides of a border. CBAs, not being constrained by national boundaries, can be located so as to benefit both civil and military aviation. CBAs, combined with the potential use of conditional routes through them, permit the improvement of the airspace structure in border areas and assist in the improvement of the ATS route network. Political, legal, technical and operational agreements between the States concerned are required prior to the establishment of CBAs. Formal agreements for the establishment and use of CBAs have to address issues of sovereignty, defence, legality, operations, the environment and search and rescue.

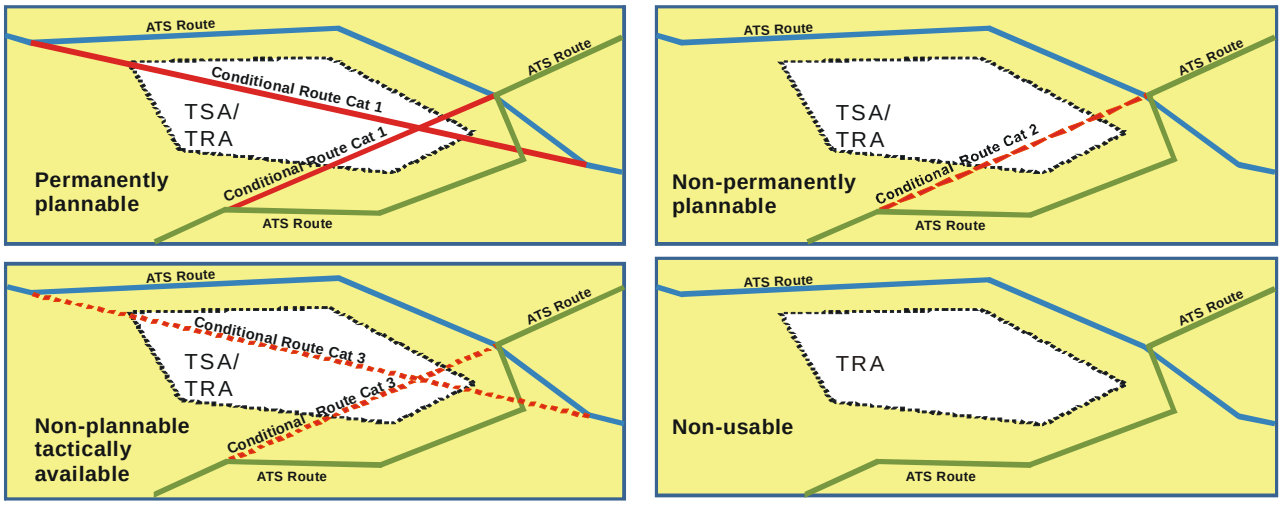

Figure 3-2. Conditional route

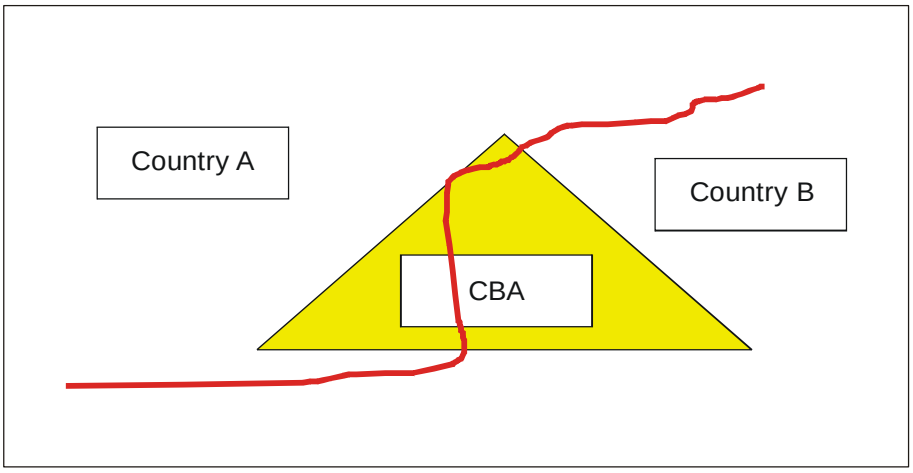

Figure 3-3. Cross-border area (CBA)

3.5 COLLABORATIVE DECISION-MAKING

3.5.1 Collaborative decision-making (CDM) (Figure 3-4) is the process whereby all ATM decisions, except tactical ATC decisions, are based on sharing all information relevant to air traffic operations among all civil and military partners. The principles of CDM should be adopted by States and service providers, with the participation of military planners, as a tool to support ASM.

3.5.2 CDM brings together airlines, civil and military aviation authorities and airports in an effort to improve ATM through information exchange, data sharing and improved automated decision support tools.

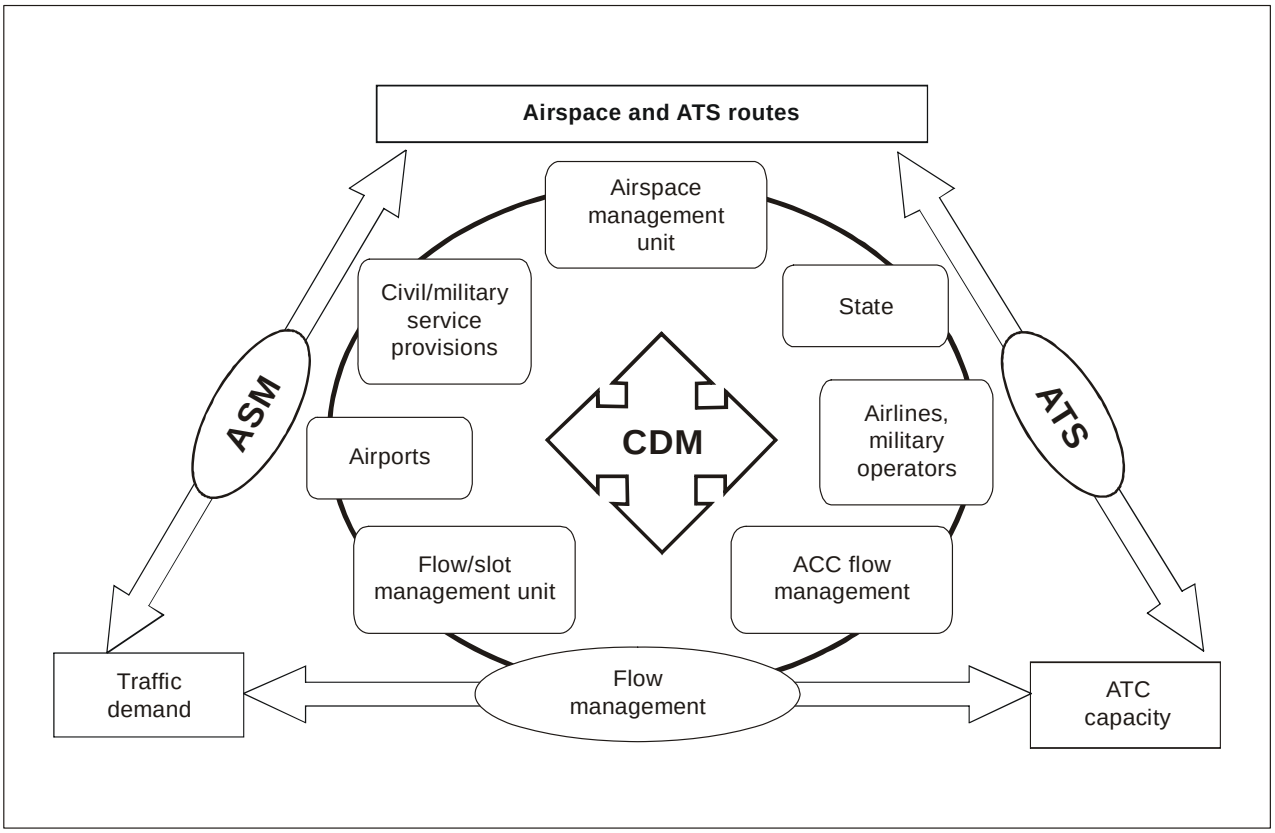

Figure 3-4. Collaborative decision-marking

3.5.3 The philosophy of collaboration promises to become the standard in aviation. CDM enables information-sharing and facilitates decision-making processes by ensuring that stakeholders are provided with timely and accurate information essential for the planning of their operations be they civil or military.

3.5.4 For example, accurate estimates of arrival and departure times improve aircraft handling, apron services, stand and gate management, ATC and ATFM. Involvement of military airspace users and military airspace planners in national or regional airspace planning ensures adequate planning both in time and dimension, which serves military aviation but also de-conflicts with civil traffic flows to the maximum extent possible.

3.5.5 By enabling decision-making based on accurate shared information, CDM increases predictability in case of unforeseen events or disruption. Properly carried out, CDM also leads to optimum airspace utilization with benefits to all participants in the system.

Chapter 4

ATM SECURITY AND ATM IN CRISIS SITUATIONS

4.1 ATM SECURITY

4.1.1 ATM security is a growing concern for all involved in aviation. The implementation of the new security SARPs for ATS providers, adopted as Amendment 12 to Annex 17 — *Security — Safeguarding International Civil Aviation Against Acts of Unlawful Interference*, requires a more comprehensive approach to the security of the civil aviation system through the contribution of ATS providers in the ATM system, thereby driving the need to formalize and reinforce guiding principles for ATM security in the ATM system. Although aviation security remains essentially a national responsibility, the increased international threat of terrorism makes it necessary to improve cooperation between all stakeholders, civil and military, so that a collaborative, cooperative ATM security framework focusing on security policy, legislation and procedures to counter unlawful interference, terrorism and disruption can be achieved.

4.1.2 More specifically, Amendment 12 to Annex 17 states, inter alia, that "each Contracting State shall require air traffic services providers operating in that State to establish and implement appropriate security provisions to meet the requirements of the national civil aviation security programme of that State".

4.1.3 A review of the ICAO definitions in the PANS-ATM (Doc 4444) and a review of expectations for security in the ATM Operational Concept provide the foundation for understanding the meaning of ATM security.

Security references in the ATM Operational Concept (Doc 9854)

4.1.4 ***Vision statement.*** To achieve an interoperable global air traffic management system, for all users during all phases of flight, that meets agreed levels of safety, provides for optimum economic operations, is environmentally sustainable and meets national security requirements.

4.1.5 ***Guiding principle — Continuity.*** The realization of the concept requires contingency measures to provide maximum continuity of service in the face of major outages, natural disasters, civil unrest, security threats or other unusual circumstances.

4.1.6 Air defence and military control systems will need timely and accurate information on flights and ATM system intentions. They will be involved in airspace reservations, notification of air activities and enforcing measures related to security.

4.1.7 Law enforcement (including customs and police authorities) will need flight identification and flight trajectory data, as well as information about traffic at aerodromes.

4.1.8 The airspace provider is responsible for addressing and resolving issues such as airspace sovereignty, diplomatic clearance and national security (e.g. air defence) requirements.

4.1.9 ***Security.*** Security refers to the protection against threats that stem from intentional acts (e.g. terrorism) or unintentional acts (e.g. human error, natural disaster) affecting aircraft, people or installations on the ground. Adequate security is a major expectation of the ATM community. The ATM system should therefore contribute to security, and the ATM system, as well as ATM-related information, should be protected against security threats. Security risk management

should balance the needs of the members of the ATM community that require access to the system, with the need to protect the ATM system. In the event of threats to aircraft or threats using aircraft, ATM should provide the authorities responsible with appropriate assistance and information.

4.1.10 ATM security should be considered as the safeguarding of the ATM system from security threats and vulnerabilities and the contribution of the ATM system to civil aviation security, national security and defence, and law enforcement.

4.1.11 To elaborate, ATM security should provide collaborative support to the security of the airspace and ATC assistance to airlines, the military, and law enforcement in responding to non-compliant aircraft and disruptive passengers on board aircraft. At the same time, ATM security should protect the ATM system assets from service degradation; physical attack (e.g. terrorist/criminals); insider ill-doing; cyber attack on information or data processing (e.g. by a hacker or computer malware); electromagnetic attack (e.g. causing interference with communications, navigation and surveillance equipment).

4.1.12 Overall, ATM security should enable effective response to security incidents affecting the ATM infrastructure or airspace and should enable planning for service/business continuity and recovery. Service continuity and recovery refers to the provision of ATS. Business continuity and recovery refers to the integrity of continued business operations.

ATM security management for protection of the ATM system

4.1.13 Ideally, ATM security management for protection of the ATM system should provide a comprehensive framework for the ATM service provider to manage security of the organization. Security management should enable an organization to develop and implement a security policy and programme that takes into account various regulatory requirements and other goals and objectives to which the organization subscribes. It applies to the security aspects that the organization identifies as those which it can control or influence and provides a mechanism to assure itself of meeting the stated security objectives.

4.1.14 ATM security management should consist of five key activities:

a) ***Policy-making.*** An organization's commitment to meeting customers' and stakeholders' expectations through active participation and leadership from senior management. This commitment and leadership should manifest itself in the organization's security policy and provide the resources for the security management programmes. An essential foundation of cooperation is a collaborative regulatory framework to ensure that compatible standards and security management practices are systematically applied and the legal framework is adapted to the requirements of ATM security.

b) ***Security risk assessment and planning.*** A systematic assessment of the organization's security risks against potential threats. This action should collect and analyse data to identify the organization's risk posture. The results of these analyses should identify gaps and priorities which would form the basis for the development of an implementation plan to manage security risk.

c) ***Implementation and operation.*** The security management plan becomes a reality only with a formal organizational structure, the building of competence, and a clear, consistent communication of the operational requirements. The measures that are introduced to enhance ATM security must be a reasonable response to the threats that are posed and affordable by the various stakeholders. Synergies with other security initiatives, in relation to the response of ATM to security threats, should be maximized to ensure cost-effectiveness.

d) ***Auditing and corrective action.*** A quality assurance programme of checks and balances to provide the objective review and feedback needed for continuing improvements.

e) ***Management review.*** The overall security management system and programme should be periodically reviewed by senior management to ensure continuing relevance, adequacy and effectiveness of the system and programme.

4.1.15 Security management should provide a structure allowing the organization and others to objectively evaluate performance against security objectives. A consistent and continuing use of security management should lead to continuous improvement of the organization's security performance, resulting in progressive improvement of protection for the ATM system.

4.1.16 Further guidance material on the protection of air navigation facilities and systems can be found in the *Aviation Security Manual*.

ATM security — The contribution of the ATM system to national security, aviation security and law enforcement

4.1.17 The general objective of ATM security is to determine effective mechanisms and procedures to enhance the response of ATM to security threats that affect flights (aircraft, passengers and crew) or the ATM system itself. Within this context, the purpose of airspace security is the safeguarding of the airspace from unauthorized use, intrusion, illegal activities or any other violation. This safeguarding of the airspace and protection of the ATM system itself requires that ATSPs provide ATM security services which enable military, law enforcement and aviation security authorities to carry out their roles and responsibilities within the ATM system.

4.1.18 The national governments and the public should have confidence that the airspace and all other aspects of the ATM system (people, infrastructure and data) are secure and well-protected from any unlawful activities that could potentially cause disruption to civil air transport.

4.1.19 Therefore, to adequately provide for national security and defence, aviation security and law enforcement, the following three levels of security objectives should be considered:

a) tactical operations security should provide daily ATM security oversight and coordination that maximizes awareness of security situations within the ATM system via layered security processes;

b) strategic operations security should ensure continuity of the ATM system via long-range planning, crisis management, analysis and support functions; and

c) special interoperations security should feature enhanced ATM security cooperation and use of liaisons for civil/military/law enforcement operations.

4.1.20 The combination of organization, means and doctrines (regulations, procedures) established to protect the ATM system must be able to assist the responsible authorities by providing protective measures as early as possible against threats, attacks and acts of unlawful interference, whenever and wherever necessary and possible.

4.1.21 Enhancing the security measures of the ATM system will have a positive effect both on the prevention of incidents and on the ability to respond to acts of unlawful interference. This includes security measures adopted by all parts of the ATM system, both technical and operational. In particular, this includes fostering of security awareness, improving the dissemination of information, developing ATM security standards and coordination procedures, and addressing all security requirements in the communications, navigation and surveillance domains and for the ATM infrastructure.

4.1.22 A more effective cooperation between civil and military authorities should be achieved by the enhancement of coordination and communications procedures and by the application of improved communications technology.

4.2 ATM IN CRISIS SITUATIONS

4.2.1 During any crisis situation,[1] there will be a requirement for increased coordination between civil and military ATM authorities in order to allow civil air traffic to continue to operate to the maximum extent possible, while facilitating operational freedom for military air operations. The extent of any changes to the normal peacetime ATM system will depend upon decisions made at the time in light of the prevailing situation. These ATM changes would be introduced progressively, but may, under certain circumstances, be effected immediately depending on the nature of the crisis. A crisis may cause unusual military traffic flows in the airspace of nations whether or not they are directly involved in the crisis. Regional variations may also be applicable depending on which part of the globe the crisis situation is centred.

4.2.2 Whatever the circumstances, the requirement for increased civil/military coordination would be greatly enhanced by the development of contingency plans. Such plans should address the requirements for the expeditious handling of increased air traffic in support of any future crisis within their flight information regions (FIRs)/upper flight information regions (UIRs) and through any cross-border area shared with neighbouring nations. Procedures covering the requirements for diplomatic clearances for overflying aircraft should also be included.

4.2.3 Initially, there could be a need for augmentation of tactical air units and airlifts by military and civil transport aircraft which, together with associated air-to-air refuelling operations, would have to be accommodated within the routine air traffic environment. The initial phase could also comprise a number of repatriation flights or VIP flights which would require a high degree of priority. In addition to the increase in military air activity, civil humanitarian aid operations must also be taken into account. Although normal peacetime ATM measures would be applied initially to deal with changes in the pattern and density of air traffic, it is expected that these measures may prove to be insufficient. Consequently, national contingency plans should be able to respond to the increased complexity of airspace requirements and any subsequent changes. They should consider the establishment and manning of a national ATS crisis entity which would be responsible for maintaining close coordination between national authorities and the relevant international aviation organizations.

4.2.4 It is of paramount importance from the early stage of a crisis that, immediately following a political decision to take action during a crisis situation, civil and/or military aircraft employed in support of the military operations be afforded maximum priority in the use of the airspace and the ATM resources of participating nations.

4.2.5 The interrelationship and a safe and balanced coexistence of civil and military activities are crucial. Military operational requirements and consequent planning will need to be considered at the earliest possible opportunity against an assessment of the impact that any planned action may have on civil operations in the airspace, and priorities allocated accordingly. Continual reassessment of the impact will be necessary as the situation and military requirements develop.

4.2.6 Guidance material on the contribution of air traffic control to national security during a crisis can be found in the *Aviation Security Manual*.

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1. Unforeseen or short-notice situations that occur outside the steady state of the routine global ATM system (for example, earthquakes, hurricanes, conflicts).

Chapter 5

STATE AIRCRAFT OPERATIONS

5.1 INTRODUCTION

5.1.1 In accordance with the Chicago Convention, Article 3 (b), “Aircraft used in military, customs and police services shall be deemed to be State aircraft”. In broad terms, the right to access all airspace, within the limits of the operational needs, is a crucial requirement to enable the military, customs and police to perform the security, defence and law enforcement missions mandated by their States and by international agreements. It is, therefore, a fundamental requirement that each State be able to train and operate its State aircraft effectively. In this manner, it is vital for State aircraft to be provided access to sufficient space, enabling adequate opportunities for the training and execution of security, defence and law enforcement elements.

5.1.2 In pursuit of their tasks, operators of State aircraft should, where practicable, respect international, regional and State civil aviation legislation and aim for compliancy. However, it is recognized that the nature of the defence and security tasks can create unique situations that need special handling and considerations. In this regard, this chapter will first explain what roles are performed by military and non-military flights under the title of “State aircraft”. It will then highlight circumstances when State aircraft can be fully compliant or partially compliant with international civil aviation rules and procedures, as provided for in ICAO SARPs, and the general expectations for handling such aircraft by an air navigation service provider (ANSP).

5.2 STATE AIRCRAFT ROLES

5.2.1 Without restating the definition from the Convention, it is nevertheless crucial to re-emphasize that State aircraft can consist of military and non-military air assets, given that it is the nature of their actual tasks that frame the character of the definition (i.e. in support of the State or the State’s interests or obligations). Furthermore, the provision of Article 3 (b) does not preclude ICAO Member States from defining what constitutes a State aircraft. Consequently, the diversity of aircraft types that can be considered as State aircraft vary considerably, ranging from a highly-agile military air defence fighter aircraft to a fisheries protection twin-engined turboprop. A more detailed description of the roles that should be considered under the title of “State aircraft” follows.

5.2.2 ***Airlift.*** Airlift aircraft enable the movement and sustainment of forces anywhere in the world and across the entire range of operations. They provide rapid and flexible mobility options to military, national and international government agencies to quickly respond to various crisis situations worldwide. Such operations include airlift support to military crisis operations and also humanitarian relief operations. Airlift flights can be either military or civilian registered, but under the terms of State aircraft, the aircraft are operated on behalf of the State. The aircraft are predominantly multi-engined transport aircraft, engaged in passenger and freight carriage.

5.2.3 ***Counter-air.*** Exclusively a military task, the purpose of counter-air operations is to achieve a desired or necessary level of control of the air, through the destruction, degradation or disruption of enemy aircraft and missiles, in order to allow friendly forces greater freedom of action, while minimizing their vulnerability to detection and attack. Furthermore, air policing and patrol missions to safeguard nations against threats are practised and conducted with high priority. During crisis situations, control of the air is achieved through counter-air operations, which use a variety of integrated weapons systems and sensors to counter threats. These systems consist of manned and unmanned aircraft, ballistic missiles and air/land and sea-launched cruise missiles.

5.2.4 ***Space operations.*** Air and space power contribute to space operations through offensive or defensive operations conducted to help attain and maintain a desired degree of space superiority to allow friendly forces to exploit space capabilities.

5.2.5 ***Air power contribution to land and maritime operations.*** Predominantly military, but also including some non-military air platforms, air power provides the advantage of finding, fixing and engaging targets of interest without many of the physical, spatial and environmental limitations imposed on surface forces. However, integration between air and surface forces creates greater synergy of action and can be a more overwhelming force than in cases where a single component cannot be as effective. Such activities include air interdiction, close air support, electronic warfare, anti-surface warfare, anti-submarine warfare and aerial mining. Air assets involved in these roles are numerous and wide-ranging, including helicopters, combat fighter/bomber jet aircraft, unmanned air systems and multi-engined widebodied aircraft.

5.2.6 ***Airborne operations.*** Airborne operations provide air-delivered combat power to seize ground or installations through the airdrop or air-landing of land forces directly onto an objective. This is predominantly a military activity and generally involves helicopters and/or multi-engined widebodied aircraft.

5.2.7 ***Aeromedical evacuation.*** Aeromedical evacuation is a specialized form of airlift for transporting ill or injured personnel under medical supervision to appropriate medical treatment facilities. Although predominantly a military task in hostile environments, aeromedical evacuation can be conducted by military or non-military aircraft, ranging from helicopters to multi-engined widebodied aircraft.

5.2.8 ***Intelligence, surveillance and reconnaissance.*** Intelligence, surveillance and reconnaissance (ISR) integrates, where appropriate, capabilities from all military components and some non-military platforms, in order to provide awareness essential to successful planning and conduct of operations, through collection, processing, exploitation and dissemination of accurate and timely information. Air assets involve various manned and unmanned systems, which can require dedicated volumes of airspace.

5.2.9 ***Special air operations.*** Special operations forces are specifically organized military units manned by carefully selected people using modified equipment and trained in unconventional applications of tactics against strategic and operational objectives. Special air operations are a key enabler for Special Forces to conduct their missions. The nature of their tasks requires surprise and covert handling. The types of aircraft involved include helicopters and multi-engined widebodied aircraft.

5.2.10 ***Air-to-air refuelling.*** Air-to-air refuelling (AAR) is predominantly a military task but can be conducted by non-military registered aircraft. AAR is an essential capability that increases the range, endurance, payload and flexibility of all capable receiving aircraft. AAR is predominantly delivered from multi-engined widebodied aircraft to smaller combat jet aircraft; however, combinations of air assets ranging from helicopters, through combat jet aircraft to multi-engined widebodied aircraft can be involved. AAR requires dedicated airspace, either in the form of a statutory routine area or a temporary, mobile airspace block that enables aircraft to refuel in transit.

5.2.11 ***Search and rescue.*** The provision of search and rescue (SAR) services by ICAO Member States is a fundamental obligation under the Convention on International Civil Aviation. SAR is essentially a humanitarian activity with the primary aim of saving lives. In many countries, the military is responsible for SAR operations. However, non-military air assets can have either a shared or leading role in this vital capability. The aircraft types involved include helicopters and multi-engined aircraft which, during actual SAR emergencies, will require priority handling and unrestricted access to appropriate airspace.

5.2.12 ***Police/customs.*** Air operations in support of police operations and customs and border protection (CBP) services are predominantly undertaken by non-military law enforcement air assets. Police aerial units are often tasked to assist in surface vehicle pursuits and surveillance, which allows surface police/law enforcement units to disengage and follow from a discreet distance, making the pursuit less dangerous but still allowing for surface police/law enforcement units to be directed to apprehend suspects, as necessary. Air operations by police services are generally conducted

through the use of helicopters; however, multi-engined fixed-wing aircraft are also used, which allow higher and quieter surveillance, making it less likely suspects will become aware that they are being watched. In a similar manner, CBP services utilize helicopters for some surveillance operations. However, given the larger scale and distances involved with CBP operations, multi-engined aircraft and unmanned air systems can have a more enhanced capability and role.

5.2.13 ***Meteorological support.*** Military and non-military aircraft are employed by some nations in support of collection, research and modification of weather systems. Due to the nature of the tasks, multi-engined fixed-wing aircraft fitted with unique on-board meteorological equipment are predominantly utilized, although unmanned air systems offer increasing utility.

5.2.14 ***Geographic and hydrographic support.*** The measurement and description of the physical features and conditions of terrain, navigable waters and adjoining coastal areas, including oceans, rivers and lakes, involve land, maritime, space and air assets. Military and non-military manned and unmanned aircraft take a key role in complementing the other environments in this work.

5.2.15 ***Aerial fire fighting.*** Aerial fire fighting is the use of aircraft and other aerial resources to combat wildfires. The types of aircraft used include helicopters and multi-engined fixed-wing aircraft, from military and non-military sources, which deliver fire suppressants and/or “smokejumpers”.

5.2.16 ***Experimental/trial aircraft.*** Experimental/trial aircraft activity includes acceptance testing for new aircraft, aerodynamics and systems research on military and non-military aircraft. The activities range in variety and ATM requirements; however, each will most likely require temporary dedicated airspace to ensure safety.

5.2.17 ***VIP aircraft.*** Some nations maintain one or more dedicated aircraft to transport their heads of State and government. These aircraft can consist of a mix of helicopters and multi-engined fixed-wing aircraft.

5.2.18 ***Unmanned aircraft systems.*** Unmanned aircraft system (UAS) operations can take place both by night and day, in all weather conditions. They are an increasingly important air asset that offers flexibility and utility within military and non-military services. Generally, UAS operate in segregated airspace; however, UAS may need to operate with greater flexibility on certain missions. Individual States may therefore approve UAS operations outside of segregated airspace on a case-by-case basis.

5.3 STATE NON-AVIATION AIRSPACE REQUIREMENTS

State non-aviation operations in some circumstances require access to national airspace. Often these operations will not be compatible with other concurrent aviation activity and will render airspace non-compliant with FUA principles. Operations including surface/naval weapons firing, research, development and exercising of non-kinetic weaponry, jamming, and weapons storage will normally require the use of segregated airspace in order to ensure the safety of non-participants.

5.4 STATE AIRCRAFT CONSTRAINTS

5.4.1 Having highlighted the variety of typical roles that State aircraft undertake, it is necessary to also set the context within which these aircraft operate and the associated constraints that State aircraft have. These constraints cover three broad areas.

5.4.2 ***Institutional constraints.*** State aircraft operations are not profit-making but are more attuned to serving a function or carrying out a requirement. Mandated to meet security and defence interests as demanded by governments, State aircraft operations require cost-effective access to training areas that need to be economically viable from home

bases while also operationally achievable. Furthermore, aging fleets and constraints on defence budget spending, create the financial challenge of fitting State aircraft with new equipment to satisfy global developments in new ATM programmes.

5.4.3 ***Operational constraints.*** Defence and security threats set operational imperatives that State aircraft operations must be prepared for and able to conduct effectively. These demands give rise to unique situations that need special handling and considerations, placing operational constraints that must be considered in terms of ATM measures. For example, activities such as SAR, air policing/patrol, aerial fire fighting and special air operations create mission-critical criteria that demand utmost priority for the safety of the public for which they serve. ATM delays or denied access to relevant airspace should not occur during these types of missions.

5.4.4 ***Technical constraints.*** Equipage of State aircraft is predominantly focused on the output and nature of the task that the aircraft is expected to deliver. Consequently, the provision of ATM and CNS equipment on board State aircraft may have certain constraints due to limited space, together with the potential areas of operation expected of particular State aircraft to fulfil the nature of their assigned tasks.

5.5 FULLY-COMPLIANT OPERATIONS

5.5.1 Despite the institutional, operational and technical constraints highlighted in 5.4, State aircraft operations will, where possible, aim for compliance with civilian requirements. Specific roles that can reasonably be expected to conform and be fully compliant are as follows.

5.5.2 ***Airlift.*** Airlift transport and freight aircraft are normally equipped to the same standard as commercial transport aircraft, either through actual equipment or performance, and can be fully compliant with international civil aviation rules and procedures. However, there are circumstances in which airlift operations of State aircraft require the execution of a-typical manoeuvres or self-separation which can differ, sometimes significantly, from the SARPs.

5.5.3 ***VIP aircraft.*** Fixed-wing aircraft operating in the VIP role can be expected to be fully compliant with ICAO SARPS; however, the associated VIP status may require additional handling and prioritization, consistent with the ATM capacity and flow management at the time.

5.6 PARTIALLY-COMPLIANT OPERATIONS

5.6.1 The following State aircraft roles are unlikely to be fully compliant with ICAO SARPs for the duration of their activity but may, where required, offer partial compliancy.

5.6.2 ***Counter-air missions.*** Counter-air missions including quick reaction alert, air policing/patrol and interceptions of suspected hijacked aircraft can offer partial compliancy during training missions, where practicable. However, it is most likely, due to the flexibility that is critical to achieving their missions, that their operations will largely differ from civil aviation rules and procedures. Further, the aircraft may require short-notice penetration of airspace, heavily congested by civil air traffic, and expeditious handling.

5.6.3 ***Aeromedical evacuation.*** When the aircraft being used for aeromedical evacuation is a multi-engined widebodied aircraft, it may be feasible for the aircraft to offer compliancy during the en-route phase of flight. Nevertheless, certain medical situations may require slower rates of climb and/or descent than might otherwise be expected of this type of aircraft.

5.6.4 ***ISR.*** Some ISR platforms can offer compliancy during the en-route, take-off and landing phases of flight; however, it is most likely that dedicated volumes of airspace will be required for surveillance operating areas. Such operating areas can be enduring and/or require short-notice relocation depending on mission tasking.

5.6.5 ***Unmanned aircraft systems.*** Whether an unmanned aircraft is State or civil, if it is to be integrated into the civil ATM system, it must be remotely-piloted. Autonomous unmanned aircraft will not, in the foreseeable future, be integrated; however they may be accommodated in segregated airspace or by using special ATC provisions in non-segregated airspace. The provision of ATS should be one and the same whether the aircraft is State or civil or is piloted from on board or remotely. The introduction of UAS must not increase the risk to other aircraft or third parties and should not prevent or restrict access to airspace. ATM procedures for handling UAS should mirror those for manned aircraft whenever possible. There will be some instances where the remote pilot cannot respond in the same manner as an on-board pilot (e.g. to follow the blue C172, report flight conditions, meteorological reports). ATM procedures will need to take account of these differences. The *Unmanned Aircraft Systems (UAS)* circular (Cir 328) contains expanded information on each of the topics above. ICAO is in the early stages of developing the international regulatory framework for UAS that will facilitate their integration into non-segregated airspace. However, it will be many years before a comprehensive set of SARPs, procedures and guidance material will be completed.

5.6.6 ***SAR.*** SAR flights, whether civil or military, must be given high priority and handled as expeditiously as possible. Although SAR activities are normally performed at lower altitudes, aircraft are sometimes used at medium altitudes as airborne relay units or as an on-scene SAR coordinator/commander. Larger multi-engined fixed-wing aircraft may offer partial compliancy as long as their contribution to the actual SAR mission remains uncompromised.

5.6.7 ***Large-scale exercises.*** Large-scale exercises predominantly require access to large volumes of airspace and, if carried out within controlled airspace, considerable ATC capacity en route. Such exercises require appropriate planning and coordination, which enable timely reservation and promulgation of suitable airspace for the activity. Large-scale exercises often require segregation of large segments of airspace, and for this reason all efforts must be made to closely monitor airspace usage in order to release segregated airspace for public use as quickly as feasible.

5.6.8 ***Police/customs.*** State aircraft operations involving police forces and customs services will generally be conducted at lower altitudes but medium-level surveillance, both by manned and unmanned air vehicles. These operations may be achievable with partial compliancy on a case-by-case basis. Nevertheless, short-notice access to controlled airspace and expeditious handling may be required.

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Chapter 6

CIVIL/MILITARY COLLABORATION — A NEW GLOBAL CHALLENGE

6.1 Historically, State agreements between military aviation units and ANSP have focused on the needs of State defence, security and emergency procedures as well as military readiness and response requirements. There is now a clearly defined need to establish procedures that support the efficient integration of military and civil aviation in day-to-day operations.

6.2 Collaboration begins with good communication. ATM stakeholders should meet regularly to better understand the needs, desires, constraints and challenges that each operator and service provider faces in operating within State airspace. Good communication and mutual understanding enable building collaboration upon a solid foundation. Good civil/military communication and collaboration are the key to success for ATM around the world.

6.3 ATM stakeholders should approach and decide on each change-process on a collaborative basis. Optimized decision-making is the result when the interests of all ATM stakeholders are represented and the impact of the required changes is weighed and balanced against the needs and issues of military, civil and State aviation.

6.4 Aviation operations of all types contribute significantly to the economy of a State, and, as such, their growth needs to be protected and encouraged. In this regard, each State will benefit from a strong commitment to civil/military collaboration. Collaboration on the design and management of State airspace, technical requirements, and data and information collection and dissemination will allow civil aviation to flourish and military aviation to perform their required missions. Further, aviation is a global business with an economic impact that crosses State borders. Strong State commitments to civil/military collaboration will be conducive to international harmonized approaches to aviation and the building of national and international agreements that benefit State and international civil aviation stakeholders alike.

6.5 This circular provides several examples of successful State civil/military collaboration resulting in benefits to airspace management and ATM system operations. These examples demonstrate that collaboration:

a) attains higher levels of safety;

b) increases airspace capacity;

c) enhances national security; and

d) increases operational efficiencies through:

1) interoperability of civil and military aircraft;

2) reduction in distances flown;

3) establishment of optimal flight profiles; and

4) reduction in fuel consumption and carbon emissions.

6.6 Not only does collaboration have a positive impact on day-to-day airspace management but it also allows for improved planning and execution of future technical and operational concepts. Collaborative assessments of costs and benefits will allow States to meet the future demands of civil and military aviation with much greater certainty. As a result of collaboration, States will likely be encouraged to consider common requirements for technology, capabilities, performance and procedures to meet future ATM demands.

6.7 This guidance should be considered as the first attempt to show a path forward. It not only indicates the strategic direction of ICAO, but also attests to the readiness of numerous global and regional partners in the aviation industry, military entities, ATM, and aviation service provision to engage in a mutually rewarding collaborative effort.

Appendix A

CIVIL/MILITARY COOPERATION IN THE UNITED STATES

Part I — General description of United States national airspace system

Legislative framework
Civil and military Organizations involved in air traffic management
Civil/military management and procedures

Part II — Flexible use of airspace in the United States

FUA concept of the United States
Special use of airspace (United States)
Military SUA
Special use airspace management system

Attachment to Appendix A — Example of joint use restricted area letter of procedure for use of restricted areas.

PART I — GENERAL DESCRIPTION OF UNITED STATES NATIONAL AIRSPACE SYSTEM

1. The size and complexity of the United States (U.S.) National Airspace System (NAS) necessitated development and implementation of numerous procedures to ensure civil and military cooperation. The following provides a selected and strategic-level overview of U.S. arrangements and activities in the topical areas of interest discussed in the main body of this Guide.

2. Key civil/military cooperative interactions involve strategic activities, tactical operations, and inter-operations. Figure A-1 displays some of the components of cooperation.

3. The U.S. developed and maintains a single, integrated system of air navigation services to permit the efficient use of modern aircraft capabilities required for defence, economy and the safety of persons and property. The single air navigation service system:

a) satisfies the basic requirements of all civil and military air operations (excluding special military needs peculiar to air warfare);

b) assures safe and reliable operations under all prevalent conditions; and

c) enables immediate integration with the air defence system of the U.S.

4. The following sections discuss the legislative framework of U.S. air traffic management, civil and military organizations involved in air traffic management, and civil/military management and procedures.

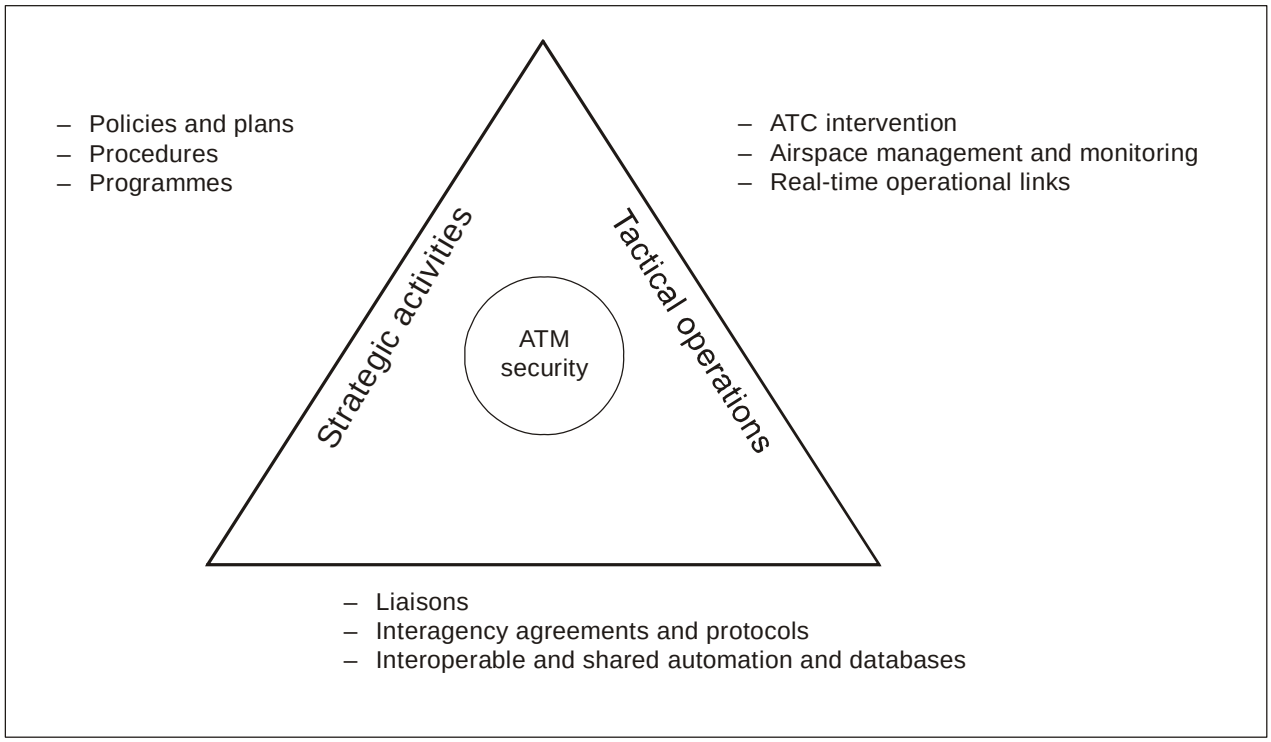

Figure A-1. Key civil/military cooperation components

Legislative framework

5. The United States created the Federal Aviation Administration, under the Federal Aviation Act of 1958, to provide a centralized focus for aviation in the national airspace. The legislation includes such provisions as one indicating that a military officer may serve as the Deputy Administrator of the FAA. Further, the law obligates the FAA Administrator to, among other things, consider the requirements of national defence, regulate civil and military operations in the airspace, and consult with the Secretary of Defence, to establish areas in the airspace determined necessary in the interest of national defence. A statutory provision explicitly provides for the transfer of a duty, power, activity or facility of the FAA to the military in the event of war. In 1967 the FAA was incorporated into the newly-created U.S. Department of Transportation (DOT) under Title 49, U.S. Code.

6. Other national laws assign specific responsibilities to governmental agencies involved in use of the NAS, but the FAA continues to be the sole authority for airspace management, air traffic regulatory authority, and use of airspace. The Homeland Security Act of 2002, the Aviation and Transportation Security Act of 2001, and the formation of the Department of Homeland Security (DHS) and the Transportation Security Administration (TSA) did not alter the FAA's status. For example, agencies in the DHS, such as the U.S. Coast Guard (USCG), Customs and Border Protection (CBP), the Federal Emergency Management Agency (FEMA) and TSA work closely with and consult and coordinate with the FAA as appropriate, but have no authority to circumvent FAA's operational control.

7. Other laws impact airspace management. For example, the FAA publishes Air Defence Identification Zones (ADIZ), Defence Areas, Special Flight Rules Areas (SFRA), and Temporary Flight Restrictions (TFR) in accordance with the Code of Federal Regulations (CFR) 14 Part 99.7, Special Security Instructions. The FAA and DOD serve as

cooperating agencies in the airspace proposal process to ensure compliance with the National Environmental Policy Act (Public Law 91-190) on all SUA proposals. Additionally, all SUA proposals must comply with the Administrative Procedure Act (Public Law 79-404), which encourages the general public to comment on such proposals.

8. Through these laws and other legislation, the U.S. has established the continuing policy to:

a) provide for a single, national, common civil/military system of air navigation and ATC that satisfies the air navigation and ATC requirements of all civil and military air operations, except for special military requirements; and

b) provide for an accelerated joint civil/military programme of research and development to bring and keep the system abreast of current and foreseeable future operational requirements.

Civil and military organizations involved in air traffic management (ATM)

9. The U.S. has established an extensive, complex network for civil/military ATM coordination and cooperation, which facilitates problem resolution at the appropriate level as required. The network operates effectively through the exchange and interaction of personnel. For example, active-duty military representatives are assigned to all three FAA service centres. Further, active-duty military personnel are assigned as military liaisons at FAA Headquarters. Military operations functions are performed at FAA ATC facilities, primarily Air Route Traffic Control Centres (ARTCCs). Similarly, FAA personnel are assigned as air traffic representatives (ATREPs) at selected military facilities, and FAA liaison personnel are assigned to select military Major Command Headquarters. The FAA also allows the United States Air Force (USAF) to assign a tower officer to ATC towers at joint use airports to observe and advise of possible ATC issues.

10. Key actions, activities and organizations involved in this network are highlighted below.

11. The FAA has designated the System Operations Security (AJR-2) Office of the Air Traffic Organization (ATO) as the lead office to ensure effective partnering on ATM security issues with the Department of Homeland Security, Department of Defence and other key agencies involved in aviation security, national defence, homeland security, law enforcement, and emergency operations including disaster response. Key objectives include harmonizing defence and homeland security requirements with the safety and efficiency needs of the NAS. The scope of activities ranges from tactical operations to policy and strategic planning.

12. The FAA shares radar data with the North American Aerospace Defence Command (NORAD). NORAD is the bi-national U.S.-Canadian military organization responsible for the aerospace and maritime defence of the U.S. and Canada, to enable early warning of air threats.

13. The DOD Policy Board on Federal Aviation (PBFA), chaired by the Assistant Secretary of Defence for Networks and Information Integration/Chief Information Officer (NII/DOD CIO) ensures effective partnering with the FAA on policy issues affecting all military services. The Secretary of the Air Force designates an Executive Director of the DOD PBFA who serves as the DOD liaison with the Department of Transportation and FAA on federal aviation and national airspace matters. The Executive Secretary also represents the DOD in dealing with international aviation. In addition, all branches of the armed services have offices or agencies that jointly develop procedures with FAA counterparts. The USAF provides flight crews that operate jointly with FAA flight crews and aircraft to perform flight checks of navigation aids at airports in the U.S. and DOD facilities overseas where they perform air traffic management services. The USAF also provides a liaison at FAA Headquarters to work with FAA Flight Standards on inspection of charter aircraft used to transport military personnel.

14. Within the FAA Command Centre is an Air Traffic Services Cell also known as the “the military cell”. The Air Traffic Services Cell was created by the FAA and the Defence Department to coordinate priority aircraft movement during warfare or emergencies as needed.

15. The Joint Planning and Development Office (JPDO) serves as the central organization that coordinates the specialized efforts of the DOT, DOD, DHS, Department of Commerce, National Aeronautics and Space Administration (NASA), and the White House Office of Science and Technology Policy. The JPDO manages the multi-agency, public/private partnership for the development of the Next Generation Air Transportation System (NextGen) that will allow the U.S. to meet increasing national security needs and ensure that travellers benefit from the highest levels of safety.

16. The FAA established and operates the Domestic Events Network (DEN), an interagency teleconferencing system that permits agencies across the U.S. to communicate instantly and immediately take action in response to violations of restricted airspace, aircraft not in communication with ATC, aircraft identified as tracks of interest (TOIs), and other suspicious incidents.

17. FAA Air Traffic Security Coordinators (ATSCs) at the FAA Headquarters, the National Capitol Region Coordination Centre (NCRCC), NORAD Headquarters, and the Continental NORAD Region facilitate rapid coordination and information exchange among the participating civil/military agencies, thereby enhancing the ability of these agencies to fulfil their own air security or defence responsibilities in the prevention, deterrence and, where necessary, interdiction of air threats.

18. The DOD Defence Threat Reduction Agency (DTRA) works directly with the FAA to coordinate priority air traffic operations in support of flights operating in the U.S. under the Open Skies Treaty.

19. The DHS FEMA is the lead agency for activation of Emergency Support Functions (ESFs) during crisis response and management. The FAA staffs the ESF-01 Aviation Desk that, when activated at the FEMA National Response Coordination Centre, supports the ESF-01 transportation functions and represents the FAA at FEMA Headquarters. The ESF-01 Aviation Desk makes sure civil and military aviation and airspace requirements during crisis response and management are integrated into a single coordinated plan for approval and implementation by the FAA Headquarters Crisis Operations Response Desk (CORD).

20. The DHS CBP Air Marine Operations Centre (AMOC) provides the radar surveillance data for the FAA's common oriented air picture across the U.S. and provides communications for the CBP airspace security system in place over Washington, D.C.

21. Other agencies and organizations have responsibilities in ATM coordination and communication with the FAA, especially via the DEN. Some of these are: the DHS Federal Air Marshals Mission Operations Centre (MOC); the United States Secret Service (USSS); the Joint Operations Centre (JOC) and temporary Command Posts (CPs) throughout the U.S.; the Department of Health and Human Services (HHS) Centres for Disease Control (CDC); and the Department of Justice (DOJ) Federal Bureau of Investigation (FBI) Strategic Information and Operations Centre (SIOC).

22. Commercial airlines and aviation special interest groups participate in the network through information sharing strategies such as Notices to Airmen (NOTAM), and liaison personnel working with the FAA at ATC facilities and at FAA Headquarters on various working groups and committees.

Civil/military management and procedures

23. The primary means of managing operational arrangements and procedures for the U.S. network include the issuance of FAA orders and directives and the use of interagency agreements. The latter includes Memorandums of Understanding (MOU), LOA, Interagency Agreements (IA) and other legal and administrative instruments. These documents are contained in an FAA Order that outlines procedures dealing with military operations, law enforcement initiatives, and any special procedures that are outside of normal air traffic control.

24. Numerous MOUs are in effect to outline cooperation/coordination between FAA and military commands and to accommodate specific military operational procedures. In addition, the FAA issues waivers or exemptions to

accommodate unique military mission requirements that cannot be conducted under normal procedures. Among the agreements on operational arrangements and procedures that the FAA has entered into with the military and other agencies those outlined below.

25. Authorization for the FAA Administrator to provide the necessary facilities and personnel for the regulation and protection of air traffic. (There are three separate agreements in effect between the FAA and the Army, Air Force, and Navy, respectively, relating to the operation of ATC facilities on military installations.)

26. Provision of a mutually agreed upon arrangement on the responsibilities and working relationship of the FAA, NORAD, and Pacific Air Forces (PACAF) to ensure accomplishment of the air defence mission.

27. Implementation of Emergency Security Control of Air Traffic (ESCAT), providing for joint action to be taken by appropriate elements of the DOD, the DOT, and the DHS in the interest of national security to control air traffic under emergency conditions. ESCAT procedures published in U.S. Federal Regulations, 32 CFR, Part 245 affect both general and commercial aviation.

28. Establishment of agreements with various military branches to provide FAA liaison support and procedures to support the NASA space missions.

PART II — FLEXIBLE USE OF AIRSPACE IN THE UNITED STATES

1. The U.S. Special Use Airspace (SUA) programme, which is more commonly recognized by ICAO as FUA (see paragraphs 8 to 13) establishes, charts, and manages airspace required by federal (military, NASA, etc.) and state government agencies for specific aviation, security or user requirements. SUA policies limit the numbers and times SUA areas are used to the minimum required. Restricted, prohibited and warning areas are established over sovereign territory, coastal and offshore areas. Warning areas are established offshore in international airspace where no regulatory restriction can be imposed on flights within that airspace. Instrument flight rules (IFR) clearances may be issued by ATC for flight through warning areas, only when operations are not taking place.

2. The policy of the Department of Defence (DOD) is to ensure that the military services have sufficient airspace to meet military, training, and test and evaluation requirements for peacetime, contingency and wartime operations. Airspace designated for military purposes, when not required by the DOD, is made available to the FAA for civil use. DOD cooperates with the FAA for the effective and efficient management of the NAS and SUA.

3. Through such cooperation, the United States has developed Joint Use Areas. These areas are established by the military and can be released to the FAA when they are no longer in use. The areas are identified as having both a controlling and using agency. The FAA (controlling agency) and the military (using agency) will execute a Letter of Agreement (LOA) and a Letter of Procedure (LOP) to assign the FAA controlling facility and define the conditions under which non-participating civil and military traffic may be authorized to operate within the area (Attachment to Appendix A refers). Through the Joint Use concept, the using agency, which schedules the SUA, will release the SUA to the FAA during periods when it is not required for its intended military use. This permits greater flexibility in managing traffic within the NAS.

4. Historically, offshore airspace is regarded as optimal for conducting hazardous air activity due to its natural separation from both people and property and from other air activity. As a result, much of the offshore airspace around the U.S. has been designated as SUA. Corridors to accommodate oceanic route access to U.S. airspace are provided on a full or part-time basis. In addition, activities not considered inherently hazardous to nonparticipation users are contained in other airspace areas through the use of procedural segregation.

5. Further, the FAA has established Special Activity Airspace (SAA) to provide additional flexibility. SAA includes SUA and other types of airspace, such as temporary flight restrictions, ATC Assigned Airspace (ATCAA), altitude reservations, aerial refuelling tracks and anchors, and military training routes to name a few examples.

6. The FAA is the authority for SUA management. The agency has established LOAs on SUA activation and release to military units. The FAA also has developed the Special Airspace Management System (SAMS) and Military Airspace Data Entry (MADE) tools to ensure that the real-time usage of SUA is posted, allowing the civil aviation community to optimize flight plan parameters involving fuel and flying time. In times of crisis, other U.S. agencies work through the FAA to restrict use of airspace to ensure safety and national security.

7. All SUA is designated and codified through the Federal Rulemaking process. Through the Rulemaking process, the U.S. government seeks public opinion on the proposal from the aviation industry and the general public before proceeding further. It is a consultation process and all comments/submissions are evaluated and assessed with a view to incorporating any necessary changes prior to formal promulgation as law. The Notice of Proposed Rule Making (NPRM) process is a notification and consultation procedure. All submissions will be evaluated and assessed with a view to incorporating any necessary changes prior to formal promulgation as law. Air Traffic Control Assigned Airspace (ATCAA) is established by LOAs to specify coordination requirements for their use. The following sections provide more details on the U.S. SUA programme.

The FUA concept of the U.S.

8. The United States based on its geographic area and political structure has formally incorporated flexible use airspace for over 50 years. To accommodate military air traffic in the NAS, the military requirements are divided into two categories: 1) operations that could be hazardous to nonparticipation aircraft or activities on the ground; and 2) those that are not. Inherently hazardous operations are conducted in segregated airspace termed special use airspace (SUA); the term SUA and its applications are more commonly recognized by ICAO as flexible use of airspace (FUA). In addition, the U.S. utilizes the terms warning, prohibited and restricted areas, in lieu of the more common ICAO terms of danger, prohibited and restricted areas to indicate the type of activity contained in selected areas.

9. In the United States flexible airspace has been incorporated and continually refined into the National Airspace System (NAS) for over 50 years. The Federal Aviation Administration (FAA) is an agency of the U.S. DOT with authority to regulate and oversee all aspects of civil aviation. The Federal Aviation Act of 1958 created the organization under the name “Federal Aviation Agency” and adopted the current name in 1967 when it became a part of the DOT.

10. The FAA’s major roles include regulating civil aviation to promote safety:

a) encouraging and developing civil aeronautics, including new aviation technology;

b) issuing, suspending or revoking pilot certificates;

c) researching and developing the National Airspace System and civil aeronautics;

d) developing and carrying out programmes to control aircraft noise and other environmental effects of civil aviation;

e) regulating U.S. commercial space transportation; and

f) developing and operating a system of air traffic control and navigation for both civil and military aircraft.

11. It is in this last major role where the concept of flexible use of airspace is incorporated.

12. Airspace is defined as the space that lies above a nation and comes under its jurisdiction. Although it is generally viewed as being unlimited, airspace is a finite resource that can be defined vertically and horizontally, as well as temporally, when describing its use for aviation purposes. Under Public Law 85 725, the FAA is charged with the safe and efficient use of the nation’s airspace and has therefore established certain criteria and limits for its use. In order to

accomplish its task, the FAA developed the NAS. The NAS is a common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; and rules, regulations and procedures, technical information and manpower and material.

13. Within the United States, the FAA classifies airspace as either controlled or uncontrolled. Controlled airspace is an airspace within which ATC service is provided to IFR flights and visual flight rules (VFR) flights in accordance with a specific airspace classification (Class A, B, C, D or E). Within controlled airspace, all aircraft operators are subject to certain pilot qualifications, operating rules, and equipment requirements. Uncontrolled airspace (Class G) is an airspace that is not classified by the FAA.

Special use of airspace (U.S.)

14. Since all airspace is available for use by civil or State aircraft the recommendations of the ICAO *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444), paragraphs 3.1.5, 3.1.5.1, and 3.1.5.2 are applied. Instead of airspace being identified for civil use, airspace that is needed for the protection of people and property or for special training, testing or operations is identified and made available for that purpose. In these cases civil aircraft are instructed not to enter the airspace or are informed of the hazards and advised to use extreme caution if they choose to enter the area.

15. SUA consists of airspace wherein activities must be confined because of their nature or wherein limitations are imposed upon aircraft operations that are not a part of those activities, or both. Special use airspace is depicted on aeronautical charts, except for controlled firing areas where firing ceases when aircraft approach.

16. United States law as stated in U.S. Code Title 49, Subtitle VII, Part A Subpart 1, Chapter 401, Sec. 40103 (3) (A) makes provision for the establishment of areas in the airspace the FAA Administrator (in consultation with the Secretary of Defence) decides are necessary in the interest of national defence. These areas are now called SUA areas. There are many types of SUA areas which will only be briefly covered here.

17. CFR Title 14 Part 73 establishes prohibited and restricted SUA areas. This means that the establishment of these two types of SUAs is subject to a process where the citizens are able to make comments and recommendations as to the placement of these two types of SUAs. All other SUAs, which are not as restrictive, are non-regulatory. All SUAs are published and revised yearly in FAA Order 7400.8R, which provides the public with the information recommended in ICAO Doc 4444. In addition Internet-based graphical information is also available.

18. Other than the special use airspace identified below, all airspace within Alternative A is Class A, Class C, Class D or Class E controlled airspace, within which some or all aircraft may be subject to ATC. Within Class E airspace, separation service is provided for IFR aircraft only, and to the extent practical, traffic advisories are provided for aircraft operating under VFR. The Class E airspace has a floor of 1 200 feet or greater above the surface, except for the areas around the numerous airports within Alternative A, where the Class E airspace has a floor of 700 feet above the surface. There is no Class B airspace within Alternative A. All airspace above FL 600 is uncontrolled (Class E) airspace.

19. SUAs fall within these general categories:

a) prohibited areas — no overflight of a surface area due to national security or environmental protection. No operations without using agency permission;

b) restricted areas — established where ongoing or intermittent activities create unusual/invisible hazards to aircraft, such as artillery firing, aerial gunnery, practice bomb dropping and guided missile testing that have been designated as restricted for use by DOD, NASA and other government agencies;

c) military operations area (MOA) — designated for military training activities including acrobatic and abrupt flight manoeuvres;

d) alert areas — contain a high volume of pilot training or an unusual type of aerial activity that could present a hazard to other aircraft;

e) warning areas — contain the same kind of hazardous flight activity as restricted areas and MOAs, but have a different title since they are located offshore over domestic and international waters; and

f) controlled firing areas (CFAs) — differ from others due to suspension of activities when aircraft approach the area.

20. SUA general operations policy is as follows:

a) prohibited areas — no operations without using agency permission;

b) restricted areas — penetration without using or controlling agency authorization may be extremely hazardous. When not active, ATC will allow penetration;

c) MOA — when active, IFR flights are separated from MOAs, VFR should contact the responsible Flight Service Station (FSS) and controlling agency and use extreme caution;

d) alert areas — may contain a high volume of pilot training or an unusual type of aerial activity that could present a hazard to other aircraft;

e) warning areas — same as restricted areas; and

f) controlled areas — no special rules to civil traffic due to suspension of activities when aircraft approach the area.

21. Although not being defined as SUA, other types of airspace management terms/techniques are available to protect people and property. The most recognizable example is temporary flight restrictions (TFRs) — established to protect people or property from a temporary hazard when the presence of low-flying aircraft would magnify, alter, spread or compound the hazard.

22. When an operational unit within one of the four military departments/services (Army, Navy, Marine Corps or Air Force) of the DOD has a mission need which will require the establishment of an SUA area or a modification to an existing SUA area it will use the following general criteria to determine what is required.

Military SUA

23. Military SUA establishment requirements are:

a) volume — enough airspace to accomplish training/testing objectives;

b) proximity — distance to operating airfields or installations;

c) time — available when required; and

d) attributes — physical characteristics (includes environmental and safety concerns).

24. The FAA has organizational subdivisions called “service areas” (Western, Central, Eastern) covering the U.S. In each of the service areas, a small cadre of military officers are assigned who liaise with the FAA on issues impacting the NAS. When an operational unit requires a new or modified airspace proposal, the unit’s airspace manager will coordinate the proposal with the service area military representative. The unit’s airspace manager will send detailed

descriptions and maps depicting the new or modified proposal to his/her liaison officer. The liaison officer will work the proposal (case by case) with the service area's air traffic operations staff. All aspects of safety and environmental protection are incorporated into the process, which is described in FAA Order JO 7400.2 as amended and further detailed in applicable Military Department procedures. The FAA has the responsibility for airspace analysis and to write the notice of proposed rule-making, if required, for public comment on the proposal. If the proposal is approved, it will appear as a NOTAM until FAA Order 7400.8R is updated. The reverse is true when the FAA service area's air traffic staff proposes to delete or modify SUA area(s). The FAA would work with the military liaison officer who would then contact the appropriate military operational unit's airspace manager and discuss the FAA request.

Special Use Airspace Management System (SAMS)

25. U.S. Public Law (PL) 100-223 required the "Dynamic Special Use Airspace Management Programme". The law stated, "Operational procedures will be developed for real-time and dynamic coordination between the FAA and DOD so that DOD SUA requests can be accommodated rapidly with minimum disruptions of civil aviation operations". In 1988, Congress and the General Accounting Office (GAO) recommended the FAA more effectively manage SUA to ensure its efficient and appropriate use. The GAO recommended the FAA improve standards for measuring the effectiveness of SUA utilization. Congress envisioned a Dynamic Special Use Airspace Management Programme for a joint coordination effort between the FAA and DOD that would develop procedures and establish automation requirements for increasing flexibility in the allocation and use of SUA by civil and military users. To comply with the legislative guidance, SAMS was developed as an "open systems" architecture and is capable of interfacing with other systems such as the Enhanced Traffic Management System (ETMA) to collect and disseminate data as required. FAA Order 7450.1 establishes SAMS' operation and maintenance policy.

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Attachment to Appendix A

EXAMPLE OF A JOINT USE LETTER OF PROCEDURE FOR USE OF RESTRICTED AREAS

SUBJECT: Joint Use Letter of Procedure for Use of Restricted Areas R-6302A, R-6302B, R-6302C, R-6302D, and R-6302E.

EFFECTIVE: September 1, 2005.

In accordance with Federal Aviation Regulations 73.13 and 73.15, the following letter establishes procedures for the use of Restricted Areas R-6302A, R-6302B, R-6302C, R-6302D, and R-6302E by the Houston ARTC Centre,[1] the Controlling Agency; and by the Commanding General, Fort Hood, Texas, the Using Agency. Airspace under the jurisdiction of ARAC is depicted in Annex 1. This letter cancels and supersedes the Joint Use Restricted Area Letter of Procedure, Subject: Joint Use Letter of Procedure for Use of Restricted Areas R-6302A, R-6302B, R-6302C, R-6302D, and R-6302E, dated July 17, 1997.

1. Directorate of Plans Training and Security (DPTS) Range Control supervisory personnel are the liaison between the Using Agency and the Controlling Agency.

2. The Using Agency shall:

    a. Coordinate activation/release times for R-6302A, R-6302B, R-6302C, R-6302D, and R-6302E with Houston ARTC Centre Military Automation Coordinator (MAC).

    b. Notify Houston MAC at least 30 minutes prior to activation of airspace above 12 000 feet MSL in R-6302A, R-6302C and R-6302D.

    c. Notify Houston MAC at least 2 hours prior to activation of airspace during other than published times in R-6302B, R-6302C and R-6302D.

    d. Notify Robert Gray ARAC at least 30 minutes prior to activation of airspace at and below 11 000 feet MSL in R-6302B.

    e. Notify Houston MAC at least 48 hours prior to activation of airspace in R-6302E (FL 300 through FL 450).

    f. Release R-6302, or sub-areas as appropriate, above 12 000 feet MSL to Houston ARTC Centre when not in use for the purpose designated.

    g. Release R-6302, or sub-areas as appropriate, at the highest required altitudes above 12 000 feet MSL to Houston ARTC Centre for emergency traffic situations. Release of airspace to Houston ARTC Centre shall be accomplished within 30 minutes after the request has been made.

3. The Controlling Agency shall:

1. "ARTC Centre" is equivalent to the ICAO term "Area Control Centre (ACC)".

a. Exhaust all other traffic management procedures before requesting airspace release from the Using Agency as specified in paragraph 2 g.

b. Return R6302 airspace to the Using Agency in a timely manner after the emergency traffic situation is resolved.

c. Be responsible for issuing the appropriate NOTAMs for airspace in use above 12 000 feet MSL in R-6302A, R-6302C, R-6302D and R-6302E.

d. Notify Fort Worth ARTC Centre Operations Specialist (COS) of release times for R-6302 airspace.

e. Upon written request from the Using Agency, provide in writing reasons for recall of restricted area airspace.

4. Robert Gray ARAC shall be responsible for issuing the appropriate NOTAMs for airspace in use at and below 12 000 feet MSL in R-6302A, R-6302B, R-6302C and R-6302D.

5. During times when the airspace is released to the Controlling Agency, Houston ARTC Centre, Fort Worth ARTC Centre, and/or Robert Gray ARAC may clear instrument flight rules (IFR) traffic and authorize visual flight rules (VFR) traffic into/through R-6302A, R-6302B, R-6302C, R-6302D and/or R-6302E.

6. The decision to recall restricted area airspace, by the Controlling Agency, shall be made by supervisory personnel.

Note.— Houston non-supervisory personnel in the MAC position may act as liaison for release/recall of R6302 with the Using Agency.

(ORIGINAL SIGNED BY)

Air Traffic Manager
Houston ARTC Centre
Houston, Texas

(ORIGINAL SIGNED BY)

Air Traffic Manager
Fort Worth ARTC Centre
Fort Worth, Texas

(ORIGINAL SIGNED BY)

Airspace Manager
Fort Hood, Texas

(ORIGINAL SIGNED BY)

Chief, Air Traffic Control
Fort Hood, Texas

(ORIGINAL SIGNED BY)

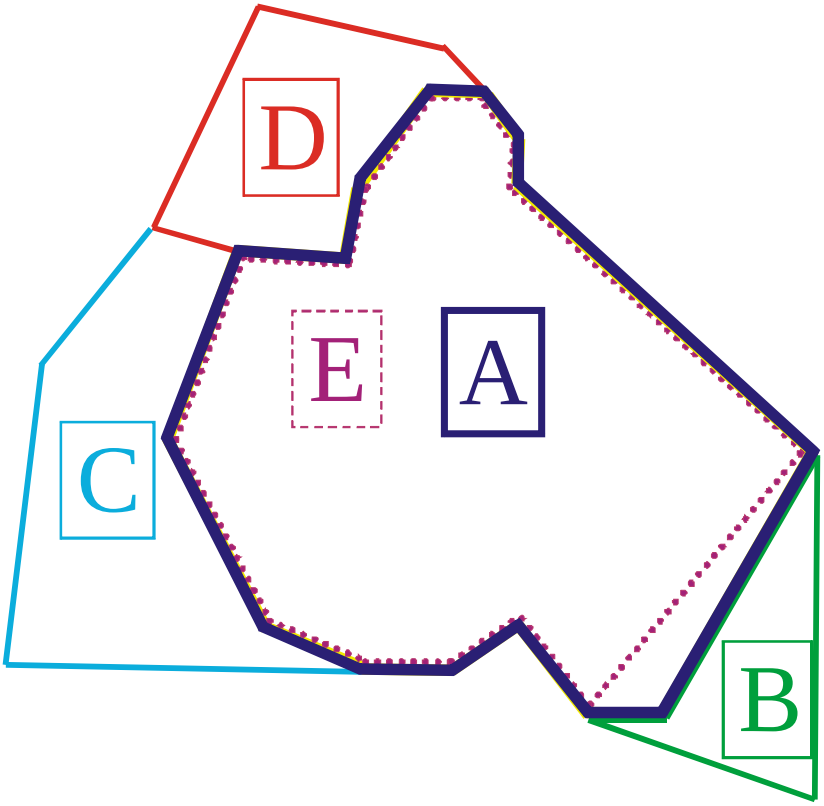
Installation Range Officer
Fort Hood, Texas

(ORIGINAL SIGNED BY)

Department of the Army
Southwest Region Representative
Fort Worth, Texas

ANNEX 1
JOINT USE RESTRICTED AREA LETTER OF PROCEDURE
EFFECTIVE: September 1, 2005

R-6302**A** Surface to FL 300
R-6302**B** Surface to 11 000 MSL
R-6302**C** Surface to FL 300
R-6302**D** Surface to FL 300
R-6302**E** FL 300 to FL 450



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Appendix B

CIVIL/MILITARY COOPERATION IN GERMANY

1. GERMANY'S AIRSPACE ENVIRONMENT

1.1 Germany has a long tradition of civil/military cooperation. The relatively small airspace of Germany forced the ATM community to organize itself safely and in a more efficient manner. This is paramount when there is a substantial amount of military and civil aviation sharing the same airspace.

1.2 Aviation has changed considerably in recent years. Military traffic volume has dropped significantly while civil traffic volume has continued to rise. As of 2009, more than three million IFR flights — about one-third of all European IFR flights — have been using German airspace annually. It is difficult to organize and manage military flight operations and their training needs in this complex and congested airspace environment. No rigid airspace models or segregated structures can suit the demand.

1.3 Germany has always understood that civil/military cooperation in ATM is essential for meeting commonly agreed goals and methods, instead of working independently or in competition. Cooperation has become routine for integrated and harmonious ATM operations.

1.4 As a consequence, the original flexible use of airspace (FUA) concept could no longer offer the required mechanism to cope with the demands of the complex German airspace scenario. Therefore, Germany moved to a more advanced state of FUA, that being the dynamic management of airspace (see Figure B-1). The model is called the Military Variable Profile Areas (MVPA).

1.5 This dynamic management of airspace led to the provision of integrated and combined ATM services for all regional traffic. At the same time, military ATM at airbases, whether for civil/military co-use or exclusive military use, remains under the responsibility of the military.

2. FIFTY YEARS OF CIVIL/MILITARY DEVELOPMENT

2.1 Before 1970, Germany had separate civil and military organizations and operations. To enhance safety, a civil/military coordination office was established.

2.2 In 1973, the government decided to collocate the military area radar units and civil service provision in the respective area control centres. Thereafter, military and civilian controllers worked with the same systems, using harmonized coordination principles. However military airbases and approach services remained under military jurisdiction.

2.3 In 1985, Germany took the first steps towards FUA with a field trial. The breakthrough for civil/military cooperation came at the end of the 1980s when the government decided to integrate the military area radar services and to corporatize the civil air navigation services. In November 1991, the principles of integration were agreed between the ministries concerned, and 270 military controllers and flight data assistants were released by the Luftwaffe to serve in the civil ANSP.

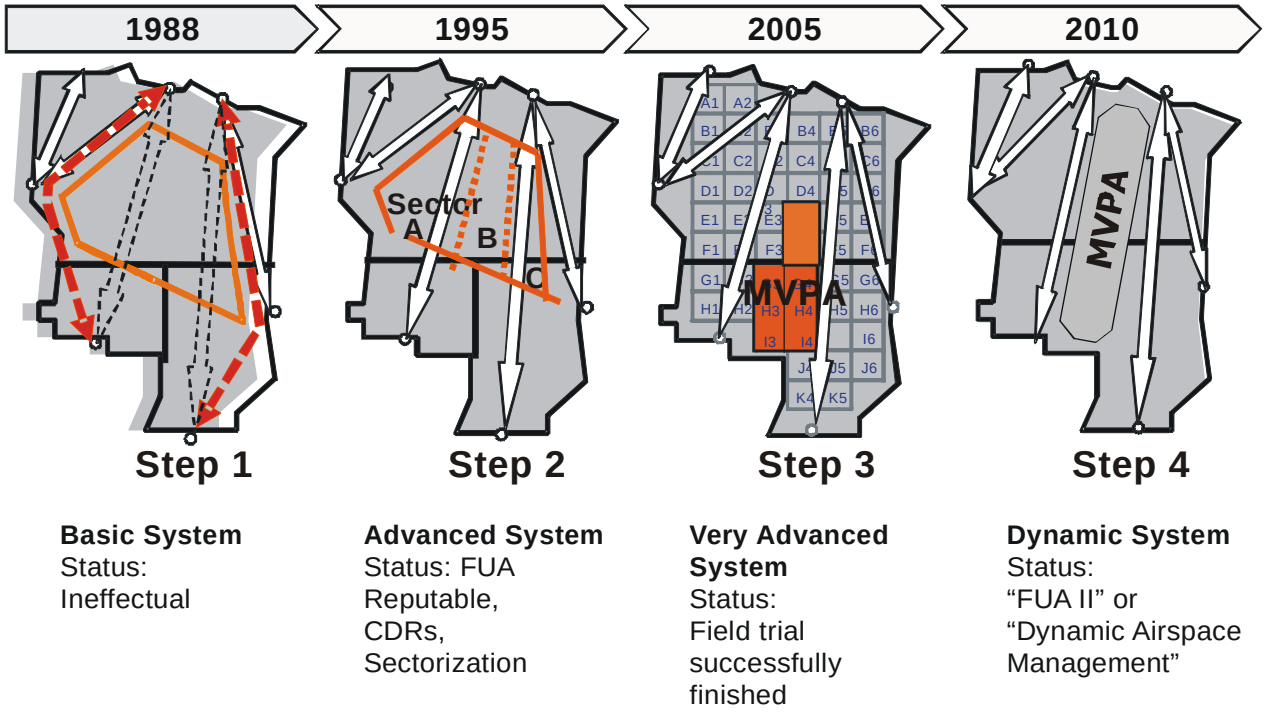

Figure B-1. Towards dynamic airspace management

3. FACETS OF CIVIL/MILITARY COOPERATION

3.1 The complexity of civil and military traffic in central European airspace necessitated enhanced civil/military cooperation. Generally, military aviation activities do not allow for inflexible handling and discrete or segregated management of military traffic flows.

3.2 In Germany, civil/military cooperation generated a wide range of valuable activities including the following:

a) the integration of civil and military en-route services;

b) common airspace organization and management which reaches beyond the European FUA principles;

c) harmonized operational procedures and institutional training or specific training programmes for civil and military controllers;

d) interoperable ATM systems and CNS infrastructure;

e) ICAO flight planning for operational military flights; and

f) harmonized mapping, publications and procedure design.

3.3 ATM and air transport systems (civil and military) are designed, built and operated to ensure harmonized and seamless operations for all phases of flight. Future technical and operational concepts will incorporate interoperability for reduced costs and benefits.

4. ACHIEVEMENTS OF FUA IN GERMANY

4.1 The complexity of civil and military traffic is, and will remain, a constant challenge. Additionally, military aviation will continue to exist with different demands on airspace and mission profiles, although presumably in a reduced quantity.

4.2 What has been achieved in the past twenty years through good civil/military collaboration is the guideline for the future. This includes:

a) a very high level of safety;

b) more than doubling of capacity;

c) a guarantee of national security; and

d) fulfilled military requirements even in crisis.

4.3 What was nationally beneficial in the past requires multinational consideration today because cooperation does not end at national boundaries. Today, the integration of military requirements into cross-border operational concepts is essential. This is even more important than ever because the proliferation of standards, local technology solutions and equipage requirements or projects have failed to realize the full potential of advanced technologies or operating procedures. Neither airlines, ANSPs nor State aircraft operators can afford to continue funding diverse solutions.

5. MILITARY CONCEPT OF THE FUA

5.1 Framework for military aviation

5.1.1 The national military flexible use of airspace concept (FUA-C) is a follow-up activity of the comprehensive European ATM harmonization and optimization programme in order to cope with the increasing demand for airspace in Europe. General air traffic (GAT) and operational (military) air traffic (OAT) formulate different demands for the use of airspace. The airspace outlined for military purposes prevents economic and efficient air traffic routes, and the training airspace available to the air force is limited due to the existing ATS route network.

5.1.2 Measures must therefore be taken to ensure the efficient civil/military management of the available airspace resources in order to increase flexibility in the utilization of this airspace. In this way, the limited airspace above Germany can be used to full capacity for the benefit of both civil and military air traffic.

5.1.3 Due to the increasing density of air traffic, the availability of airspace becomes even more important. Therefore, it is no longer regarded as civil or military property, but as a continuum, which is allocated in a flexible way and always on a temporary basis — to civil and/or military users according to their requirements.

5.1.4 Since the flexible use of airspace has a considerable impact on the planning procedures of military airspace users, additional internal regulations in this field for the armed forces are necessary. These regulations are listed in 5.5.

5.1.5 The German “military FUA concept” is based on the common understanding of European countries that airspace is a valuable common property and that its users must commit themselves to utilizing it in an economic way. This concept applies to:

a) flexible airspace structures;

b) an organization for airspace management and utilization;

c) the application of the appropriate operating procedures; and

d) the capability for dynamic airspace management and utilization.

5.2 Organizational levels

5.2.1 FUA in terms of this military concept means the availability of airspace for military purposes, which is temporarily segregated for reasons of flight safety, and flexible ATS routes (conditional routes) for general air traffic. These routes supplement the existing ATS route network and lead through temporary segregated airspace (TSA).

5.2.2 Airspace management is performed at three organizational levels:

a) ***Level 1 (policy matters and strategic planning).*** A civil/military body at government level which takes policy decisions about the airspace structure and issues guidelines on airspace management.

b) ***Level 2 (tactical preplanning).*** The planning, coordination and definition of the activation of segregated airspace and conditional routes for the following day in accordance with current requirements. This is the task of the national Airspace Management Cells (AMCs).

c) ***Level 3 (tactical civil/military coordination).*** This is the operational part and puts the FUA concept into practice in everyday flight operations. The ad hoc management of airspace and airspace utilization is performed in close cooperation with the operating positions established in the air traffic control units for monitoring training airspace and controlling/supporting controlled air traffic. In Germany, this task is fulfilled by the ATC units of the Deutsche Flugsicherung GmbH (DFS) in cooperation with the tactical air control service as well as the Control and Reporting Centre (CRC).

5.3 Purpose and principles

5.3.1 This military concept is applicable to peacetime operations. It defines responsibilities and tasks in airspace management, the multilateral management of military airspace utilization and the management of military utilization of training airspace on a local or regional level.

5.3.2 The rules governing the management of airspace utilization are different for general air traffic (GAT) and operational (military) air traffic (OAT). In general GAT is subject to air traffic flow management (ATFM), whereas the airspace movements of OAT are not subject to any air traffic flow management measures.

5.3.3 Military air exercises have to be carried out in accordance with the pertinent FUA regulations. Responsibility for managing the special military airspace utilization and for the comprehensive coordination and de-confliction of specific military activities in the entire airspace above Germany rests with the Coordination Centre for Military Airspace Utilization (COMIL).

5.3.4 Military utilization of the TSA is managed by the Planning and Coordinating Authorities (PCAs), which are subordinate to the major commands of the army, the air force and the navy or the main armaments division of the Ministry of Defence (MOD). They have the status of an "approved agency" in the sense of the European “concept of the flexible use of airspace”.

5.3.5 The unrestricted mission accomplishment of the armed forces is to be ensured by the FUA and cooperation with general air traffic.

5.3.6 The military contribution to FUA ensures the required long-term planning, predictability and flexibility in the military use of airspace and provides for changing military requirements.

5.3.7 To meet the training requirements of the armed forces, sufficiently large portions of airspace are kept in reserve for military priority use. The military airspace user opens this airspace and makes it available to other users for those periods of time during which no military activities are taking place.

5.3.8 Military training airspace may be used by military exercise traffic and other controlled aircraft performing transit flights at the same time, provided that this is not detrimental to the military exercise, it does not have an impact on flight safety and does not transgress international standards such as separation criteria.

5.3.9 Armed Forces Germany is required and obliged to use airspace in a responsible and economic manner.

5.4 FUA organization

In Germany, the responsibility for airspace matters rests in principle with the Federal Ministry of Transport (MOT). Military interests are handled by a joint ministerial committee of the MOT and MOD (see Figure B-2). Other elements of the FUA organization are:

a) committee on civil/military airspace policy;

b) civil and military service providers with the adjoining AMC;

c) committee on airspace issues (Ausschuß für Luftraumfragen (ALF));

d) major commands and defence administration with the relevant PCAs; and

e) the AMC manages the conditional routes (CDRs) in close cooperation with the ATC units of the DFS, neighbouring AMCs and the European Central Flow Management Unit (CFMU) in Brussels.

5.5 Priority regulations

5.5.1 Registered military air traffic is to be given priority in the utilization of published TSAs. TSAs registered (reserved) with the AMC by the PCA are earmarked for military use. At the request of the AMC, however, changes to the reservation in terms of time and/or space are to be accepted to accommodate urgent civil requirements unless this is made impossible for overriding military reasons.

5.5.2 The flying units as well as the units of the German Armed Forces and the allied forces stationed in Germany are priority users of temporary segregated areas (TSAs).

5.5.3 In exceptional cases, for which a justification must be provided, TSAs not reserved on the previous day can be earmarked for military priority use by the AMC on the day of the event. General air traffic on “conditional routes” is then routed around the TSA by air traffic control if GAT transit flights cannot be safely separated from the military activities. In these cases, however, the flying units will in principle have to accept ad hoc restrictions in favour of GAT transit flights.

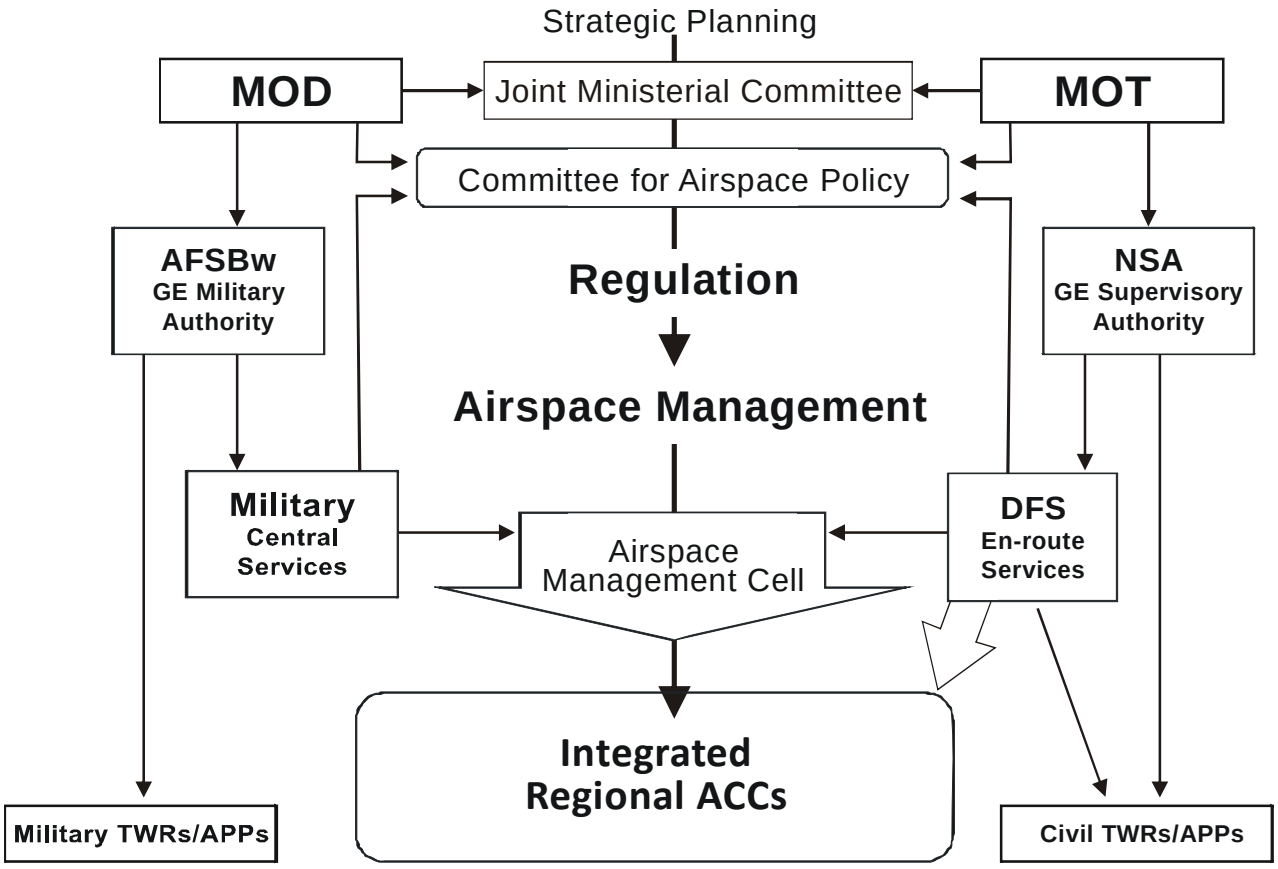

Figure B-2. German FUA/ASM system (Integration of regional AN services)

Appendix C

CIVIL/MILITARY CNS/ATM INTEROPERABILITY ROADMAP — EUROCONTROL

1. Civil/military interoperability in the area of communications, navigation and surveillance (CNS) infrastructure will enable the future capacity gains and safety improvements necessary to cater to the forecast increase in civil air traffic. Ultimately, when the foreseen operational improvements to the air traffic management (ATM) system are in place, operations will be conducted in a highly automated environment dictated by increased traffic levels and the need for advanced tools and real-time information exchanges. These stringent conditions can be met only if both civil and military authorities cooperate fully.

2. However, there are some well-known deficiencies in the harmonization and interoperability of civil and military CNS systems used to support ATM operations. Historically, military CNS systems have been procured with the primary objective of satisfying very demanding military operational requirements which often take precedence over the common ATM requirements. At the same time, on the civil side, in some cases there are visible difficulties in accommodating relevant military requirements, and a stable vision of future ATM developments is not always available to guide military planners. Such lack of civil/military interoperability is sometimes the consequence of one or more of the following reasons:

a) longer military procurement cycles and public budget constraints;

b) lack of space in the cockpit for extra avionics;

c) difficulty monitoring civil CNS/ATM developments;

d) absence of supporting military requirements;

e) lack of recognized certification processes; and

f) security and institutional aspects.

3. The end result is that, in some cases, military airspace users have to perform operations within the general air traffic (GAT) environment, carrying additional aircraft equipment that is not essential to military tasks; this entails the application of exemption policies. Not only must the ATM network satisfy the national security and defence requirements but it must also cope with the increasing pressure for higher air traffic capacity while maintaining the required level of safety. This can be achieved in the future only through further improvements in civil/military coordination to raise the level of civil/military interoperability implying a phased reduction in exemptions.

4. To that end, Eurocontrol developed a Civil/Military CNS/ATM Interoperability Roadmap in close cooperation with national military authorities and other stakeholders. The Roadmap describes a common framework for the evolution of European civil and military CNS/ATM systems through to 2020 and beyond. The plan will identify, in the short-term, a minimum set of interoperability requirements and the progressive convergence of related CNS technologies leading to the future integration of systems supporting ATM.

5. The Interoperability Roadmap, which is expected to be an important source of guidance for civil and military ATM planners, was developed taking as the basis the current European CNS/ATM strategies and a set of known military requirements.

6. The Roadmap provides a great level of detail in the domains of communications, navigation and surveillance. It identifies a number of recommended actions considered as fundamental to achieving the proposed levels of interoperability and long-term integration of civil and military CNS enablers.

Communications

7. The communications systems that supports air traffic control (ATC) functions still rely on aging techniques, but the situation is likely to evolve in the future to the use of state-of-the-art communications technologies in aviation. Nevertheless, the level of interoperability between civil and military communications systems remains insufficient not only for fixed ground-ground communications but also for military avionics used in the air-ground segment. Military communications and information systems (CIS) are mainly focused on military-driven command and control functions and thus rely on technologies mainly driven by military operational requirements and security aspects (e.g. information security).

Navigation

8. The need for seamless interoperability between civil and military navigation systems is of utmost importance when flights are conducted in controlled airspace. In the future the continuing increase in system integration and the overall airborne/ATM architecture may influence civil/military interoperability and systems convergence in this domain. Although military operational requirements with regard to positioning, navigation and timing are met in specific national and international documents, the increasing influence of civil navigation requirements needs to be taken into account when military aircraft are flying as GAT.

Surveillance

9. Surveillance systems are an essential element of integrated ATM operations serving both civil and military users. Interoperability in this area requires not only the continued provision of primary surveillance radar (PSR) and secondary surveillance radar (SSR) but also the proper consideration of future surveillance tools such as multilateration and automatic dependent surveillance (ADS). The increased provision and sharing of radar data and the ability for State aircraft to coexist with GAT traffic within Mode S airspace have been identified as the most critical aspects of civil/military interoperability in the surveillance domain.

10. For completeness, the Roadmap describes a number of other systems or requirements such as the airborne collision avoidance system (ACAS), reduced vertical separation minimum (RVSM) and FM immunity from FM radio broadcast. Future flight management systems (FMS) are recognized as an outstanding evolution that can also influence the proposed objectives of civil/military CNS/ATM system interoperability. These areas are also identified in the Roadmap.

11. The process used to develop the Civil/Military CNS/ATM Interoperability Roadmap was to assess the current European CNS strategies and the existing military systems, used within the ATM context, to derive an appropriate migration path towards required interoperability levels or integration.

12. Today’s paradigm, where exemptions are often required to accommodate non-equipped State aircraft within GAT controlled airspace, needs to be changed, targeting the final application of common technologies and full

convergence of military and civil standards. Common technologies should lead to the development and application of common rules and required performances (airworthiness) for both civil and military flight operations within jointly used airspace.

13. The Eurocontrol Civil/Military CNS/ATM Interoperability Roadmap can be obtained from:

http://www.eurocontrol.int/mil/gallery/content/public/milgallery/documents/CM%20CNS%20RM%201_0.pdf

— END —

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