ICAO

Doc 10088

Manual on Civil-Military Cooperation in Air Traffic Management

First Edition, 2020

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Approved by and published under the authority of the Secretary General

INTERNATIONAL CIVIL AVIATION ORGANIZATION

FOREWORD

The Preamble of the *Convention on International Civil Aviation* (Doc 7300, Chicago Convention) highlights that States, parties thereto, “agreed on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically”.

Article 3 of the Chicago Convention provides that it shall be applicable only to civil aircraft and shall not be applicable to state aircraft, which are used in military, customs and police services as per Article 3 b). However, Article 3 d) requires that “contracting States undertake, when issuing regulations for their state aircraft, that they will have due regard for the safety of navigation of civil aircraft”.

Therefore, there is a need for States to establish a framework for ensuring adequate collaboration, cooperation and coordination between civil and military aviation stakeholders, aiming to support States to fulfil their national requirements and meet their obligations as parties to the Chicago Convention. The focus of this manual is to provide guidance to States wishing to implement or improve civil-military cooperation for air traffic management, for safe and optimal use of the airspace by both parties. It is important to note, however, that most of this material would be equally relevant to the wider spectrum of state aircraft operations, as well as other airspace usage.

While the terms civil-military collaboration, cooperation and coordination may seem inter-changeable, these terms are used to differentiate between the various levels of efforts needed to support the State’s aviation policies and objectives. *Collaboration* entails the long-term (5 to 20 years) envisioning, planning and development of future global aviation systems and operations *Cooperation* is the more practicable effort towards developing mutually agreeable optimized solutions to strategic and pre-tactical issues and challenges in the nearer time horizon. *Coordination* refers to the real-time exchanges of information and joint tactical decisions at the operational level. The fundamental goal of collaboration, cooperation and coordination is to improve the safety and efficiency of all aviation operations.

Civil and military operations differ in nature and in purpose. While civil aviation supports global interaction and contributions to the global economy, military operations are conducted for national security or defence reasons. However, both types of operations take place in a single continuum of airspace and, therefore, civil aviation and military stakeholders need to cooperate to ensure their mutual safety. Successful cooperation is based on mutual trust, respect, transparency and understanding. Additionally, the direction of air traffic management (ATM) modernization towards developing greater information flows and operational flexibility creates a need to enhance civil-military cooperation and coordination.

Notwithstanding civilian requirements, militaries also need to use airspace effectively and efficiently while conducting their operations. To meet the increasing need for access to airspace by both types of actors, along with the growing need for operational flexibility, States are encouraged to foster better civil-military cooperation.

Guided by the *Global Air Navigation Plan* (Doc 9750), the evolution of the ATM system requires global, regional and national cooperation between civil and military aviation authorities. This cooperation would ensure the integration of State aviation needs and facilitate the required planning to support the effective implementation of the ATM evolution. Although current ATM research and development programme outcomes are not directly applicable to the military, their impact on military authorities and other agencies operating state aircraft will be operationally and financially relevant. Cooperation and coordination at all levels will enable the appropriate planning and evolution of military fleet, equipage and control systems, in view of increasing interoperability requirements.

Optimizing airspace for both civil and military operations results in nation-wide benefits. The flexible use of airspace (FUA) is a fundamental aspect in supporting the optimization process. It is recommended that civil and military experts jointly develop advice and guidance on the best practices for civil-military cooperation and coordination. The principle “as civil as

possible, as military as necessary" enhances interoperability, performance and military mission effectiveness, while providing performance benefits for the whole aviation community.

The need for this manual stems from the recognition that majority of States are facing challenges related to the management of the limited airspace available to fulfil the requirements for both civil and military activities, considering the current and foreseeable needs of aviation.

This manual provides information and guidance to relevant aviation authorities on the establishment of a framework for civil-military cooperation and coordination to enhance, optimize the management and use of the airspace, and to achieve and strengthen the trust between civil and military. This manual would also serve as reference for authorities and units responsible for establishing and implementing the processes and procedures that will facilitate civil-military collaboration, cooperation and coordination. This document supersedes *Civil-Military Cooperation in Air Traffic Management* (Cir. 330).

Future developments

In order to keep this manual relevant and accurate, suggestions for improvement in terms of format, content or presentation are welcome. Any such recommendation or suggestion will be examined and, if found suitable, will be included in regular updates to the manual. Regular revision will ensure that the manual remains both pertinent and accurate. These comments should be addressed to:

The Secretary General
International Civil Aviation Organization
999 Robert Bourassa Boulevard
Montréal, Quebec, Canada H3C 5H7
icaohq@icao.int

TABLE OF CONTENTS

Page

Page

GLOSSARY

ABBREVIATIONS/ACRONYMS

AAR	Air–to-air refuelling
ACAS	Airborne collision avoidance system
ACC	Area control centre
ADEP	Aerodrome of departure
ADES	Aerodrome of destination
ADIZ	Air defence identification zone
ADS-B	Automatic dependent surveillance - broadcast
ADS-C	Automatic dependent surveillance - contract
AFTN	Aeronautical fixed telecommunication network
AFUA	Advanced FUA
AIP	Aeronautical information publication
AIS	Aeronautical information service
AMC	Airspace management cell
AMHS	ATS message handling system
ANSP	Air navigation services provider
APV	Approach procedures with vertical guidance
ASM	Airspace management
ATC	Air traffic control
ATFM	Air traffic flow management
ATM	Air traffic management
ATN	Aeronautical telecommunication network
ATS	Air traffic services
ATSU	Air traffic services unit
AUP	Airspace use plan
BVLOS	Beyond visual line of sight
CAOM	Committee for Airspace Organization and Management
CBA	Cross-border area
CBP	Customs and border protection
CDM	Collaborative decision-making
CDR	Conditional routes
CIDIN	Common ICAO data interchange network
CMAB	High-level civil-military aviation cooperation policy board
CNS/ATM	Communications, navigation, and surveillance/air traffic management
CPDLC	Controller-pilot data link communications
DCB	Demand and capacity balancing
DMA	Dynamic mobile area
EASA	European Union Aviation Safety Agency (EASA)
EGPWS	Enhanced ground proximity warning systems
ENR	En route
FIR	Flight information region
FMP	Flow management position
FUA	Flexible use of airspace
GANP	Global air navigation plan
GBAS	Ground-based augmentation system

GNSS	Global navigation satellite system
IATA	International Air Transport Association
IFALPA	International Federation of Air Line Pilots' Associations
IFR	Instrument flight rules
ILS	Instrument landing system
IP	Internet protocol
ISR	Intelligence, surveillance and reconnaissance
KPA	Key performance area
KPI	Key performance indicator
LOA	Letter of agreement
MLS	Microwave landing system
MMR	Multi-modes receiver
MT	Mission trajectory
PANS	Procedures for air navigation services
PBN	Performance-based navigation
PSR	Primary surveillance radar
RF	Radio frequency
RPA	Remotely-piloted aircraft
RPAS	Remotely-piloted aircraft system
RVSM	Reduced vertical separation minima
SAR	Search and rescue
SARPs	Standards and Recommended Practices
SBAS	Satellite-based augmentation system
SMC	SAR mission coordinator
SMS	Safety management system
SSR	Secondary surveillance radar
SUA	Special use airspace
SUPPs	Regional supplementary procedures
SWIM	System-wide information management
SWOT	Strength, weakness, opportunity, threat
TACAN	Tactical air navigation system
TAWS	Terrain avoidance and warning system
ToR	Terms of reference
TRA	Temporary reserved area
UAS	Unmanned aircraft system
UIR	Upper flight information region
VFR	Visual flight rules
VHF	Very-high frequency
VIP	Very important person
VLOS	Visual line of sight
VOR	VHF omnidirectional radio range

GLOSSARY OF TERMS

Aeronautical information. Information resulting from the assembly, analysis and formatting of aeronautical data.

Aeronautical Information Publication (AIP). A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.

Aeronautical information service (AIS). A service established within the defined area of coverage responsible for the provision of aeronautical data and aeronautical information necessary for the safety, regularity and efficiency of air navigation.

Airspace management cell (AMC). A is a joint civil-military cell responsible for the day-to-day management and temporary allocation airspace.

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

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 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.

Air traffic management (ATM) performance. A measure of how well the ATM system satisfies the ATM community's expectations. In each of the KPAs, performance is measured at the level of individual performance objectives using performance indicators.

Air traffic management (ATM) security. 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

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 unit (ATSU). A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office

Appropriate military unit. A military unit planning and/or executing –any type of– aerial activities, providing –any type of– control to aircraft, and or/having –any form of– responsibility in an airspace. For example, an appropriate military unit can be a military unit providing ATS, a combat control unit, a fighter controller unit, a ground defence control unit, range control unit, a wing, an airbase, a special operation unit operating UAVs or RPAS.

Approved agency. A unit authorized by a State or AMC to request allocation of airspace to an AMC.

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

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

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

Danger area. An airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times.

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.

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.

Key performance area (KPA). KPAs are a way of categorizing performance subjects related to high-level ambitions and expectations.

Note.— The Manual on Global Performance of the Air Navigation System (Doc 9883) *has defined eleven KPAs: safety, security, environmental impact, cost effectiveness, capacity, flight efficiency, flexibility, predictability, access and equity, participation and collaboration, interoperability.*

Key performance indicator (KPI). The performance indicators used for the purpose of performance target setting.

Military mission effectiveness. Ability of the military to execute their operations and training (including the necessary exercises) in order to maintain their required operational skills to safeguard essential security or defence policy interests and achieve the political goals of their State.

NOTAM. A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

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.

Performance indicators. Current/past performance, expected future performance (estimated as part of forecasting and performance modelling), as well as actual progress in achieving performance objectives is quantitatively expressed by means of key performance indicators (sometimes called key performance indicators, or KPIs).

Performance management. The process of defining performance objectives, performance indicators and performance targets. Also includes performance monitoring and the identification of performance gaps.

Performance monitoring. The continuous process of collecting and analysing data to measure the actual outcome of a system versus the relevant (key) performance targets and performance plans using the (key) performance indicators.

Performance objective. Within key performance areas or focus areas, the intention to establish performance management is “activated” by defining one or more performance objectives. These define — in a qualitative and

focused way — a desired trend from today's performance (e.g. improvement). A distinction is made between generic objectives and instantiated objectives. Generic objectives specifically focus on what has to be achieved, but do not make statements about the when, where, by whom or how much. Instantiated objectives add the when, where, by whom and how much to the generic objectives.

Performance target. Performance targets are closely associated with performance indicators: they represent the values of performance indicators that need to be reached or exceeded to consider a performance objective as being fully achieved. A single performance objective can have one or more performance targets.

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

Prohibited area. An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is prohibited.

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 or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

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.

Note.— SUPPs 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 (Doc 7030) form part of the Air Navigation Plan developed by regional air navigation meetings to meet the needs of specific areas which are not covered by the worldwide provisions. They complement the statement of requirements for facilities and services contained in the Air Navigation Plan publications.

Remotely piloted aircraft (RPA). An unmanned aircraft which is piloted from a remote pilot station.

Remotely piloted aircraft system (RPAS). A remotely-piloted aircraft, its associated remote pilot station(s), the required C2 links and any other components as specified in the type design.

Restricted area. An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is restricted in accordance with certain specified conditions.

Segregated airspace. Airspace of specified dimensions allocated for exclusive use to a specific user(s), with operations that are not able to be safely integrated with other airspace users.

Special use airspace (SUA). In the context of this manual, SUA is a generic term used for airspace volumes designated for specific operations such as military training, exercises and operations of a nature such that require limitations on airspace access may be imposed on other aircraft not participating in those activities. These may include, but are not limited to: restricted, danger and prohibited areas or temporary reserved areas (TRA).

Standards and Recommended Practices (SARPs). *Standards* and *Recommended Practices* are adopted by the ICAO Council in accordance with Articles 54, 37 and 90 of the Chicago Convention and are defined as per below.

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 Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Safety template. Tool for the assessment and management of the risk associated with the operation of aerospace vehicles including aircraft, space launch vehicles, returning spacecraft, various forms of guided and unguided munitions or unmanned aircraft. A safety template is calculated for a particular set of mission conditions and would provide visual representation of the risk area and necessary buffers.

System-wide information management (SWIM). Standards, infrastructure and governance enabling the management of ATM-related information and its exchange between qualified parties via interoperable services.

Temporary reserved area (TRA). An airspace that is temporarily reserved and allocated for the specific use of a particular user during a determined period of time and through which other traffic may or may not be allowed to transit under air traffic control clearance.

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

REFERENCES

ICAO documents

Annex 2 — *Rules of the Air*
Annex 11 — *Air Traffic Services*
Annex 10 — *Aeronautical Telecommunications*
Annex 15 — *Aeronautical Information Services*
Annex 19 — *Safety Management*
Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444)
Procedures for Air Navigation Services — Aeronautical Information Management (PANS-AIM, Doc 10066)
Convention on International Civil Aviation, (Doc 7300)
Air Traffic Services Planning Manual (Doc 9426)
Manual Concerning Interception of Civil Aircraft (MICA) (Doc 9433)
Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations (Doc 9554)
Manual on Collaborative Air Traffic Flow Management (Doc 9971)
Global Air Navigation Plan (Doc 9750)
Global Air Traffic Management Operational Concept (Doc 9854)
Air Traffic Management Security Manual (Doc 9985)
Assembly Resolutions in Force (as of 4 October 2019) (Doc 10140)
Manual on System-Wide Information Management (SWIM) Concept (Doc 10039)
Safety Management Manual (SMM) (Doc 9859)

Chapter 1
A GLOBAL OPPORTUNITY

1.1 FRAMEWORK

1.1.1 Overview

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

1.1.1.2 The Chicago Convention establishes the privileges of and restrictions on all Member States and provides for the adoption of international Standards and Recommended Practices (SARPs) regulating international air transport. The Chicago Convention recognizes and accepts the principle that every State has complete and exclusive sovereignty over the airspace above its territory under Article 1, with Article 2 further clarifying that the territory of the State includes the land and the adjacent territorial waters.

1.1.2 Article 3 of the Chicago Convention

1.1.2.1 Article 3 a) of the Chicago 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 Chicago Convention, extracted below:

> *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 contracting States undertake, when issuing regulations for their state aircraft, that they will have due regard for the safety of navigation of civil aircraft.*

1.1.2.2 Pursuant to Article 3 d) of the Chicago Convention, ICAO urges States to consider the safety of navigation of civil aircraft when issuing regulations for their state aircraft. Regulations for state aircraft, and particularly military aircraft, established by States with the support of their military aviation authorities, must take into account the civil aviation dimension. States' publication of their national regulations will enhance the awareness of all stakeholders on how due regard for the safety of navigation of civil aircraft is applied by its state aircraft.

1.1.3 Resolution A40-4, Appendix I, Coordination and cooperation of civil and military air traffic

1.1.3.1 Appendix I of Resolution A40-4, adopted by the 40th Session of the ICAO Assembly *(Assembly Resolutions in Force (as of 4 October 2019)* (Doc 10140) refers), describes the principles which should guide the development of States' regulations and ICAO provisions and guidance in relation to civil-military coordination and cooperation:

> *Whereas* the airspace is a resource common to both civil and military aviation, and given that many air navigation facilities and services are provided and used by both civil and military aviation;
>
> *Whereas* the Preamble of the *Convention on International Civil Aviation* stipulates that signatories thereto had "agreed on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically";
>
> *Whereas* Article 3 a) of the Convention states that "This Convention shall be applicable only to civil aircraft, and shall not be applicable to state aircraft" and Article 3 d) requires that "contracting States undertake, when issuing regulations for their state aircraft, that they will have due regard for the safety of navigation of civil aircraft";
>
> *Recognizing* that growing civil air traffic and mission-oriented military air traffic would benefit greatly from a more flexible use of airspace used for military purposes and that satisfactory solutions to the problem of cooperative access to airspace have not evolved in all areas;
>
> *Whereas* the flexible use of airspace by both civil and military air traffic may be regarded as the ultimate goal, improvement in civil/military coordination and cooperation offers an immediate approach towards more effective airspace management; and
>
> *Recalling* that the ICAO Global ATM Operational Concept states that all airspace should be a usable resource, any restriction on the use of any particular volume of airspace should be considered transitory, and all airspace should be managed flexibly;
>
> *The Assembly resolves* that:
>
> 1. the common use by civil and military aviation of airspace and of certain facilities and services shall be arranged so as to ensure the safety, regularity and efficiency of civil aviation as well as to ensure the requirements of military air traffic are met;
>
> 2. the regulations and procedures established by Member States to govern the operation of their state aircraft over the high seas shall ensure that these operations do not compromise the safety, regularity and efficiency of international civil air traffic and that, to the extent practicable, these operations comply with the rules of the air in Annex 2;
>
> 3. the Secretary General shall provide guidance on best practices for civil/military coordination and cooperation;
>
> 4. Member States may include, when appropriate, representatives of military authorities in their delegations to ICAO meetings; and
>
> 5. ICAO serves as an international forum that plays a role in facilitating improved civil/military cooperation, collaboration and the sharing of best practices, and to provide the necessary follow-up activities

that build on the success of the Global Air Traffic Management Forum on Civil/Military Cooperation (2009) with the support of civil/military partners.

Associated practices

1. Member States should as necessary initiate or improve the coordination and cooperation between their civil and military air traffic services to implement the policy in Resolving Clause 1 above.

2. When establishing the regulations and procedures mentioned in Resolving Clause 2, the State concerned should coordinate the matter with all States responsible for the provision of air traffic services over the high seas in the area in question.

3. The Council should ensure that the matter of civil and military coordination and cooperation in the use of airspace is included, when appropriate, in the agenda of divisional and regional meetings, in accordance with Resolving Clauses 3, 4 and 5 above.

1.1.3.2 Increasingly, national and international military operations require complex coordination and planning processes to avoid unnecessary airspace segregation or restrictions, while maintaining the required level of safety. This is described in more detail in Chapters 3, 4 and 6. Although it is recognized that there may be exceptional circumstances and operational considerations that preclude either negotiation or notification, States are encouraged to consider the importance of such notifications in light of Article 3 d) of the Chicago Convention.

1.1.4 ICAO framework

1.1.4.1 Obligations of Member States under the Chicago Convention relevant to civil-military issues include:

a) to develop regulations governing aviation safety in compliance with Standards and Recommended Practices (SARPs) contained in the Annexes to the Chicago Convention (Article 37); and

b) to undertake, when issuing regulations for their state aircraft, that they will have due regard for the safety of navigation of civil aircraft (Article 3 d)).

1.1.4.2 Annex 2 — *Rules of the Air* includes provisions on the coordination with military authorities for State's territorial integrity and sovereignty, and air defence reasons. To facilitate this coordination with appropriate military units, a flight plan should be submitted for any flight:

a) within designated areas;

b) into designated areas; or

c) along designated routes;

when so required by the appropriate air traffic services (ATS) authority to facilitate coordination with appropriate military units in order to avoid the possible need for interception for the purpose of identification. Transparent and real-time data exchanges between civil ATS units and appropriate military units would facilitate this coordination.

1.1.4.3 Annex 11 — *Air Traffic Services* addresses the need for coordination with military authorities or units, depending on the degree and level to which state aircraft activities may affect civil operations or vice versa. To enable the safe and efficient coordination between civil and military stakeholders and facilitate the participation of military authorities

in civil safety risk assessment for activities potentially hazardous to civil aircraft, States should refer to the provisions in Chapter 2, 2.18 and 2.19.

1.1.4.4 The procedures found in the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444), and the Regional Supplementary Procedures (SUPPs, Doc 7030) together with the Standards in Annex 2, 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 require coordination with military authorities. Some miscellaneous procedures are detailed for the conduct of special military operations.

1.1.4.5 The purpose of the *Global Air Navigation Plan* (GANP, Doc 9750) is to guide States to achieve an integrated, harmonized and globally interoperable ATM system. A global system can be described as a worldwide system that achieves interoperability and seamlessness across regions for all phases of flight. The GANP includes technical, operational, economic, environmental, financial, legal and institutional elements and offers States practical guidance on implementation and funding strategies. Specifically, the GANP provides guidance on, and promotes the implementation of, the civil-military coordination measures and cooperation concepts embedded in the *Global Air Traffic Management Operational Concept* (Doc 9854). The concept defines seven components where the military and other state aircraft operators are recognized as part of the ATM community. Information management is the backbone linking these components together and is therefore critical for enhancing cooperation. The concept describes the services required to operate the global air traffic system in the future. It highlights the elements needed to increase user flexibility, maximize efficiencies and increase system capacity, while concurrently improving safety. The consideration of interoperability with civil aviation systems and operation of military systems is an integral part of these elements.

1.1.4.6 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 civil ATS and appropriate military units. It details the requirements to establish and maintain close cooperation with the military authorities responsible for activities that may affect civil aircraft operations.

1.1.4.7 The *Manual Concerning Interception of Civil Aircraft* (MICA, Doc 9433) consolidates all ICAO provisions and special recommendations relevant to the subject of interception of civil aircraft extracted from Annex 2, Annex 4 — *Aeronautical* Charts, Annex 6 — *Operation of Aircraft*, Annex 7 — *Aircraft Nationality and Registration Marks*, Annex 10 — *Aeronautical Telecommunications*, Volume I — *Radio Navigation Aids* and Volume II — *Communication Procedures including those with PANS status*, Annex 11, Annex 15 — *Aeronautical Information Services*, the *Procedures for Air Navigation Services — Aircraft Operations* (PANS-OPS, Doc 8168) Volume I and PANS-ATM.

1.1.4.8 The *Air Traffic Management Security Manual* (Doc 9985) complements the *Aviation Security Manual* (Doc 8973) and provides guidance on security issues specific to ATM in order to assist States and air navigation services providers (ANSPs) in implementing appropriate security provisions. In addition, the manual provides guidance to the ANSP on ATM security services provisions in support of national security and law enforcement requirements and offers guidance on protecting the ATM system infrastructure from threats and vulnerabilities.

1.1.49 The *ATS Planning Manual* (Doc 9426) provides guidance on airspace management to achieve the most effective exploitation of the airspace in accordance with the requirements of the various airspace users. In order to make maximum use of airspace, civil-military coordination must be achieved, with airspace being shared, either simultaneously or on a time-share basis, taking into account the different levels of aircraft equipage and the various air traffic control (ATC) components.

1.2 CIVIL-MILITARY COLLABORATION, COOPERATION AND COORDINATION

1.2.1 For many States, the aviation sector is a significant contributor to the economy, which requires a stable and secure environment. As such, the growth of civil aviation activities needs to be protected and encouraged, while

concurrently appropriating priority to military aerial activities for security and defence purposes. To best accommodate the needs of both civil and military stakeholders, States should adopt the perspective that airspace is a strategic resource to be collectively managed in support of achieving national objectives. This resource would be best managed through civil-military cooperation, supported by coordination, which would allow for civil aviation to flourish and allow both civil and military aviation to operate safely and efficiently.

1.2.2 Based on the experience of many States, the joint management of airspace in an equitable and dynamic manner has resulted in the efficient use of airspace, better responses to changing operational conditions (e.g. weather conditions, natural disasters), faster deployment of resources for contingency responses and enhanced safety for civil and military operations. This allows for efficient flight paths, resulting in lower fuel costs, reduced emissions and the availability of alternative routings to circumnavigate adverse weather conditions, resulting in obvious financial, environmental and safety benefits. Flexible access to airspace translates into quicker responses to developing situations, improving effectiveness and optimizing mission time of military aircraft. Cooperation to enhance systems (aircraft or ground) interoperability offers economies of scale, facilitates coordination and improves mutual understanding among stakeholders, which may promote a virtuous cycle of integration and improvement.

1.2.3 In addition to the positive impact of cooperation on airspace management on a day-to-day basis, it also allows for improved planning and execution of future technical and operational concepts. States should initiate cooperation and potentially collaboration, on aviation aspects such as the design and management of the airspace, technical requirements, interoperability and system-wide information collection and dissemination. This could be achieved through the establishment of effective civil-military cooperation and coordination processes to address present and future air transport demands for enhanced safety, national security and air navigation capacity and efficiency. A collaborative assessment of costs and benefits will allow States to meet the future demands of civil and military aviation with greater certainty. Consequently, States will likely be encouraged to consider common requirements for technology, capabilities, performance and procedures to meet future ATM demands. This would also ensure sustainability for both civil and military operations and potentially enhance military mission effectiveness.

1.2.4 State commitments to civil-military cooperation and collaboration are conducive to an internationally harmonized approach to aviation. The establishment of national and international agreements will benefit States and international civil aviation stakeholders alike.

1.2.5 Historically, agreements between civil and military authorities, and/or the appropriate civil and military air traffic services (ATS) authorities have focused on the needs of State defence, security, military readiness, emergency procedures and response requirements. However, procedures that support the efficient integration of civil and military aviation in day-to-day operations ensuring both flight-efficiency and mission effectiveness are consistent with the needs of both civil and military aviation.

1.2.6 Access to all airspace is a crucial requirement for state aircraft to perform their security and defence missions. Since the airspace is a single continuum, accommodating the requirements of all airspace users is dependent on the full cooperation of civil and military aviation authorities, relevant international and regional organizations, regional defence organizations, etc. In that context, civil-military cooperation becomes an opportunity to enhance the capacity, flexibility, efficiency, safety and security of the global aviation network.

1.2.7 The use of military assets to support humanitarian assistance has proven to be essential in certain circumstances, particularly in major natural disasters. Military units are often well placed and sometimes specifically mandated by their States to act as first responders. Bilateral and regional agreements on the use of external entities for disaster response are also being developed in some parts of the world. In this context, a solid approach to civil-military cooperation becomes an essential tool for the humanitarian community, both strategically and operationally. Civil-military cooperation is the essential link that enables the necessary dialogue and interaction between actors in humanitarian emergencies.

1.2.8 Civil-military collaboration is a strategic long-term (5 to 20 years) system-wide approach to achieving the

goals of the State, encompassing the development of the future air navigation system. When considering developments related to modernization at the global, regional or national level, collaboration is the process by which civil and military authorities jointly ensure that the requirements of both airspace users are considered. As stated in the GANP, “Civil-military collaboration is key to a seamless air navigation system, which is why military aviation authorities actively participate in the development of the GANP. By providing their operational requirements from the outset as new concepts and technical solutions are being developed, military airspace users ensure that their needs in terms of access to airspace, aircraft mobility, confidentiality and civil-military interoperability are taken into account. This helps to avoid potential adverse financial, security, efficiency and safety impacts and supports global interoperability”.

1.2.9 Civil-military cooperation is the joint effort, supported by political will, undertaken to provide optimum solutions for all stakeholders, based on consensus and mutual understanding, trust and established communications. It encompasses all the actions, structures, exchanges, processes, dialog and procedures at strategic phase and further actioned at pre-tactical phase that enable efficient air navigation and civil-military coordination. Cooperation involves the participation of a wide range of stakeholders, including civil and military aviation authorities, appropriate ATS authorities, civil ATS units and appropriate military units.

1.2.10 Effective civil-military coordination includes all the processes, procedures and actions conducted at the tactical phase (and sometimes at the pre-tactical phase) between operational actors (usually civil ATS units and appropriate military units) that enable safe and efficient air activities for all stakeholders. Coordination is normally an action initiated by one party, providing the other party(ies) with critical information, in order to agree on safe operational activities.

1.2.11 Establishing effective civil-military cooperation at the appropriate governmental levels is of utmost importance. Decision makers at the highest government levels should agree on a harmonized high-level policy for civil-military cooperation and coordination, including airspace design development, airspace access requirements, long and medium-term planning, standardization of procedures, regulation, and deployment of new procedures, including support for ATS and interoperability planning.

Note.— When defining this high-level policy, States should consider identifying the collaborative decision-making (CDM) responsibilities for civil and military aviation authorities (regulators), appropriate ATS authorities and appropriate military units, airspace managers, and airspace users. More details on the cooperation framework can be found in Chapter 3, and on CDM in Chapter 4, as well as in the Manual on Collaborative Air Traffic Flow Management (*Doc 9971*).

1.3. STRUCTURE OF THIS DOCUMENT

1.3.1 High-level considerations regarding civil-military cooperation are contained in **Chapter 1**.

1.3.2 **Chapter 2** presents details on state aircraft operations and related ATM considerations.

1.3.3 **Chapter 3** describes a civil-military cooperation framework while its high-level considerations are contained in this chapter. Before effective cooperation and coordination can be achieved, a series of steps, structures and processes should be implemented. **Chapter 3** also provides ample details on how to establish the necessary national structure and provides guidance on how to implement civil-military cooperation and coordination.

1.3.4 **Chapter 4** provides detailed guidance on the flexible use of airspace and the airspace organization and management in the context of civil-military cooperation and coordination.

1.3.5 Interoperability between civil and military is a key enabler to cooperation and coordination; **Chapter 5** provides guidance on how to improve interoperability of state aircraft and ground systems with the civil aviation systems.

1.3.6 While day-to-day routine operations are addressed in **Chapters 3, 4, 5 and 7**, civil and armed conflicts, natural disasters, and special activities calls on specific considerations which are highlighted in **Chapter 6**.

1.3.7 When considering a more advanced implementation of civil-military cooperation, a performance framework is a useful tool to measure the efficiency of the civil-military cooperation implementation with regard to airspace. **Chapter 7** provides basic elements to develop a performance measurement framework.

1.3.8 Consideration regarding ATM security in the framework of civil-military cooperation is provided in **Chapter 8**.

1.3.9 When considering the implementation of an air defence identification zone (ADIZ) State should consider the guidance provided in **Chapter 9**.

1.4 COMMUNICATION: A BASIC, YET OFTEN OVERLOOKED REQUIREMENT

1.4.1 Since effective communication is an essential foundation for better collaboration, cooperation and coordination, civil and military stakeholders should meet regularly to understand the needs, constraints and challenges relating to communications that each operator and service provider faces while operating within the airspace concerned. Good communication and mutual understanding will create a solid foundation upon which building cooperation can be enabled.

1.4.2 Military participation in civil aviation meetings will promote a better mutual understanding of civil and military needs. It is good practice to involve varying levels of military personnel at all stages of the civil-military cooperation and coordination processes. This enhances the interaction between civil and military stakeholders and ensures that civil-military airspace principles are understood by a wide range of personnel and that cooperation does not rely on specific individuals.

1.4.3 Establishing and enhancing effective lines of communication between military and civil aviation authorities provides mutual safety and efficiency benefits during times of normal operations. This supports mutual trust and understanding, which, along with open lines of communication, could be the critical factor that ensures the safety of civil aviation during situations requiring a military response.

1.5 STRUCTURES AND NEEDS

1.5.1 Different structures

1.5.1.1 Organizational structures vary for civil and military entities. While civil aviation structures are generally similar around the world, military operators may be organized differently and are usually regulated by national military authorities, or other national security authorities operating state aircraft. The established civil-military cooperation and coordination processes address the challenges arising from organizational differences and ensure the effective involvement of civil-military stakeholders at all levels of administration and for all phases of activities.

1.5.2 Varying needs

1.5.1.2 While civil aircraft aim to fly the optimum route at the most efficient flight level, military aircraft are mainly focused on executing operational requirements for both planned and contingency flights and therefore have different demands for airspace. When coordinating civil and military aviation activities, State authorities should take into consideration both types of needs.

1.5.1.3 State aircraft require access to sufficient airspace for training and the execution of the security, defence and law enforcement operations mandated by States and by international agreements. It is in this context, and that of Article 3 d) of the Convention that each State undertakes, when issuing regulations for state aircraft, that they will have due regard for the safety of navigation of civil aircraft. Armed forces may require large portions of airspace be reserved/restricted for training; however, such airspace may be made available to other users when military activities are not taking place. In some instances, coordination can allow joint usage by both civilian and military users.

Note.— Details on the expectations related to State aviation are available in Chapter 2.

1.6 AIRSPACE MANAGEMENT PRINCIPLES

Airspace management (ASM) is the process that allows the different needs of all airspace users to be met equitably. 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. In the context of civil-military cooperation, ASM should follow these guiding principles and strategies:

a) airspace is a common resource to be used by all stakeholders and allocated as a result of coordination;

b) all available airspace should be flexibly managed. Airspace boundaries should be adjusted to particular traffic flows and should not be constrained by national or facility boundaries;

c) dynamic flight trajectories should be accommodated and optimum operational solutions provided;

d) 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 to minimize the impact on operations;

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

f) airspace reservations should be planned in advance with requested changes accommodated dynamically whenever possible; and

g) allow for the possibility to accommodate short-notice unplanned requirements, while being cognisant that the complexity of operations may limit the degree of flexibility.

1.7 STRATEGIC, PRE-TACTICAL AND TACTICAL

1.7.1 When considering the various phases and levels of civil and military cooperation and coordination, the terms strategic, pre-tactical and tactical are used in various section of this document.

1.7.2 The term *strategic* represents the long-term, high-level planning and support to achieve the goals of civil-military collaboration and cooperation, including the development of a national airspace policy providing a framework for airspace management and utilization, and the development of harmonized procedures and mechanisms to be applied during pre-tactical and tactical phases.

1.7.3 The term *pre-tactical* refers to an intermediate preparatory planning phase or timeframe whereby the decisions and objectives made during the strategic phase, as well as the procedures agreed during that timeframe are

implemented, leveraging cooperation and collaborative decision making in order to meet the efficiency and safety objectives of the tactical phase.

1.7.4 The term *tactical* denotes the coordination mechanisms and exchanges between civil and military stakeholders, in real-time or within the immediate timeframe of the commencement of activities. It is the execution of actions for a narrow immediate objective.

1.8 EXPECTATIONS OF CIVIL AND MILITARY STAKEHOLDERS

1.8.1 There is a delicate balance to strike in order to meet the expectations of both civil and military aviation stakeholders. Competing demands for airspace are often a source of contention and should be managed collaboratively. In order to achieve this, civil and military users should make every effort to understand each other's operations.

1.8.2 The civil aviation community expects that States will ensure that their military airspace users define their operating airspace requirements based on operational requirements and responsibilities. It is also expected that state aircraft operators will use reserved airspace based on their actual needs, publish a reservation schedule and release any unused airspace with as much notice as possible.

1.8.3 While it is recognized that there may be times when airspace will be reserved or used upon short notice, civil aviation expects States to provide a framework for airspace reservation, covering topics such as the modalities of activation, notification and safety buffers that will be used to ensure adequate separations. Considering the role which civil aviation plays in a State's economy and development, States should be mindful of the costs associated with delays incurred by civil operators due to their military operations and of the importance that adequate notice is given to ANSPs to allow them to adapt their airspace utilization plans. In both instances, civil and military aviation authorities expect stakeholders to use the airspace efficiently, with an overall goal of ensuring the best use of the available airspace by all stakeholders.

1.9 SAFETY CONSIDERATIONS

1.9.1 Safety is a common priority for all aviators and aviation authorities, however, civil and military aviation authorities may adopt different approaches for its achievement. In some instances, military aviation authorities and operators plan and conduct their operations by assessing and mitigating risks using operational risk management methods to ensure safety. Civil aviation authorities and appropriate ATS authorities will apply the provisions contained in Annex 19 – *Safety Management*, also supported by the *Safety Management Manual* (SMM, Doc 9859) for safety investigations related to safety management systems (SMS) application. When appropriate, participation of military aviation authorities and/or appropriate military units in civil aviation SMS, and/or application of such system in the military environment, will enhance safety of the overall State aviation system.

1.9.2 Operating in compliance with international, regional and State civil aviation legislation where practicable is an effective means of complying with Article 3 d) of the Chicago Convention. However, the nature of defence and security missions can create unique situations that need special handling and considerations. As required by Article 3 d), States should ensure that regulations, procedures and safety management principles provide an adequate framework to ensure the safety of civil aviation when state aircraft must operate outside of civil rules. Furthermore, States should ensure that military authorities actively participate in the processes established by civil aviation authorities to coordinate activities potentially hazardous to civil aircraft as described Annex 11, 2.19. Additional guidance on this topic is provided in Doc 9554.

1.9.3 Accidents and serious incidents involving civil aviation are reported and investigated in accordance with Annex 13 – *Aircraft Accident and Incident Investigation*. Detailed guidance for the conduct of such investigations is

provided in the *Manual of Aircraft Accident and Incident Investigation* (Doc 9756), including for accidents and incidents involving both civil aircraft and state aircraft (which includes military aircraft).

1.10 LIAISON IN SUPPORT OF COOPERATION

1.10.1 Some States attach military personnel to civilian ATS units (ATSUs) where they are employed in operational and support positions. They may also be involved in research and development, including airspace planning. This type of arrangement supports consultation and cooperation in airspace planning and the development of new or revised procedures. Such an environment also fosters increased understanding and awareness of each other's needs, processes, procedures and aspirations.

1.10.2 Conversely, civil liaison personnel could be attached to appropriate military commands. These personnel should, as necessary:

a) present and interpret the effect and purpose of civil aviation policy, regulations and procedures as they affect military operations;

b) assist military personnel in the preparation, coordination and processing of arrangements for the movement of military traffic; and

c) assist in the resolution of problems which arise out of misunderstanding of military operations, civil procedures, systems limitations, and other matters of controversial nature in relation to operations.

Chapter 2

STATE AIRCRAFT OPERATIONS AND NATIONAL SECURITY AND DEFENCE CONSIDERATIONS

2.1 INTRODUCTION

2.1.1 Although the focus of this manual is on civil-military cooperation, this chapter will provide guidance on the wider range of state aircraft operations. State aviation operators in general and military aviation operators in particular, are required to respond as immediately as possible when security, defence or law enforcement situations arise. In many cases, State aviation assets are also expected to respond to situations in other States, in accordance with bilateral and/or multi-national agreements. A solid foundation of cooperation will ensure that State aviation operators have access to sufficient airspace to support the training and exercises required to maintain personnel readiness and proficiency. This cooperation will also assist States and their state aircraft to operate with due regard for the safety of civil aircraft, as required by Article 3 d) of the Chicago Convention.

2.1.2 State aviation authorities and operators may be expected to fulfil a wide range of roles. In pursuit of these tasks, States should require compliance with international, regional and State civil aviation regulations to the extent practicable. However, it is recognized that the nature of certain defence and security tasks can create situations that may need special handling and considerations. This chapter provides examples of roles that could be performed by state aircraft and the general expectations for handling such aircraft by an ANSP. Finally, explanations on basic operation principles, planning processes for military airspace users and the link between national security and airspace access requirements will be discussed.

2.2 EXAMPLES OF STATE AIRCRAFT ROLES

2.2.1 The diversity of roles which state aircraft fulfil means that the types of aircraft can vary considerably, ranging from highly agile military air defence fighter aircraft to wide-bodied cargo and passenger aircraft, down to small manned or unmanned aircraft. The following paragraphs describe some of the operations and roles state aircraft could have (this list is not exhaustive). In all cases below, where military requirements make it impossible to follow civil aviation regulations, States are reminded of their obligation, under Article 3 d) to the Chicago Convention, to ensure their military aircraft operate with due regard for the safety of civil aircraft.

2.2.2 *Aerial firefighting*. The use of aircraft to combat wildfires. The types of aircraft used include helicopters and multi-engine fixed-wing aircraft which deliver fire suppressants or firefighters who parachute into remote areas. This will often entail the establishment of a restricted area to ensure that civil aviation operations do not interfere with the firefighting operations. In addition, it will be necessary to accommodate aircraft transiting to and from the firefighting area, which are unlikely to conform to the usual traffic patterns in the airspace concerned. The firefighting operation itself cannot be safely integrated with civil aviation operations. However, it should be possible for aircraft transiting to and from the firefighting area to operate in compliance with civil aviation regulations and to be safely integrated with civil aviation operations.

2.2.3 *Aeromedical evacuation*. 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 could be conducted by military aircraft also in other environments. In most environments, it should be possible for these flights to comply with civil aviation regulations and to be safely integrated with civil aviation operations.

Certain medical situations may require slower climb or descent rates than might otherwise be expected from the type of aircraft.

2.2.4 *Airborne military operations*. The provision of air-delivered combat power to seize ground or installations through the airdrop or air-landing of land forces directly onto an objective. This activity is military-specific and involves helicopters or fixed-wing aircraft, possibly supported by air defence fighter aircraft and larger, multi-engine reconnaissance aircraft. This type of activity may take place in a known conflict zone or create an environment that is potentially hazardous for civil aviation. Due to the timing requirements of these operations, it may be impossible to provide forewarning to civil aviation authorities

2.2.5 *Airlift*. Aircraft enabling the movement and sustainment of forces anywhere in the world and across the entire range of operations. These operations can be conducted by military aircraft or by commercial transport aircraft that have been called into duty for a period of time. It should be possible for these types of flights to fulfil most of their tasks while operating in compliance with civil aviation regulations and to be safely integrated with civil aviation operations. In certain situations, such as an airdrop, adequate prior coordination should be affected to guarantee the safety of civil aircraft operations.

2.2.6 *Air power contribution to land and maritime operations*. 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 wide-ranging and can include helicopters, combat fighter/bomber jet aircraft, unmanned aircraft systems (UAS) and multi-engine wide-bodied aircraft, among others. In most cases, these types of operations cannot be safely integrated with civil aircraft operations.

2.2.7 *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. AAR requires sufficient airspace for aircraft to manoeuver in close proximity to the aircraft supplying the fuel. The aircraft supplying the fuel may remain between fixed locations, may travel in formation with the aircraft requiring fuel or may join aircraft in transit. In most cases, only minimal changes in aircraft attitude are possible during the refuelling process. Safe integration with civil aviation operations requires advance coordination between the military aviation authority and the ANSP to ensure adequate spacing is planned for and maintained between the AAR operation and non-participating aircraft, and to enable participating aircraft to enter and leave the airspace associated with the AAR operation.

2.2.8 *Counter-air*. The purpose of counter-air operations is to achieve a desired or necessary level of control of the airspace. Air policing, air defence and patrol missions are practiced and conducted with high priority to safeguard nations against threats. They are usually conducted on short notice, e.g. to intercept unidentified or suspicious aircraft. During crisis situations, counter-air operations may involve the use of a variety of integrated weapons systems and sensors to counter threats. Although the military requirements of these operations may make it impossible to provide forewarning to civil aviation authorities,

2.2.9 *Experimental/trials*. Acceptance testing for new aircraft, aerodynamics and systems research on aircraft. These activities range in variety and ATM requirements and in most cases, these types of operations cannot be safely integrated with civil aircraft operations.

2.2.10 *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. Depending on the flight patterns required to achieve mission objectives, it may be possible to safely integrate these operations with civil aircraft operations.

2.2.11 *Humanitarian assistance*. Providing personnel, equipment and supplies in response to natural disasters or other situations affecting a significant number of people or a large geographic area. This type of mission may also involve transporting people out of a disaster area. Although it should be possible for these types of flights to fulfil their tasks while operating in compliance with civil aviation regulations and to be safely integrated with civil aviation operations, particular

attention to civil-military coordination is required if these flights will operate in or near areas where military operations are taking place.

2.2.12 *Intelligence, surveillance and reconnaissance (ISR)*. The integration of capabilities from all military components and some non-military platforms, in order to provide awareness essential to the successful planning and conduct of operations, through the collection, processing, exploitation and dissemination of accurate and timely information. Air assets involve various manned and unmanned systems. Depending on the flight patterns required to achieve mission objectives, it may be possible to safely integrate these operations with civil aircraft operations. Although the security requirements of these operations may make it impossible to provide forewarning to civil aviation authorities.

2.2.13 *Maritime operations*. State aircraft may have a requirement to train and operate over the high seas. These flights, which vary in purpose, may originate from ships. The flight patterns required to achieve mission objectives mean that, in certain cases, these types of operations cannot be safely integrated with civil aircraft operations. Because it is not possible for airspace access to be denied for civil aircraft in high seas airspace, the military flights should operate with due regard for the safety of navigation of civil aircraft in accordance with Article 3 d) of the Chicago Convention.

2.2.14 *Meteorological support*. State aircraft may be employed by some States in support of data collection and research. The nature of the tasks predominantly utilizes multi-engine, fixed-wing aircraft fitted with unique on-board meteorological equipment, although UAS offer increasing utility. Depending on the flight patterns required to achieve mission objectives, it may be possible to safely integrate these operations with civil aircraft operations.

2.2.15 *Police/customs*. Air operations in support of police operations and customs and border protection (CBP) services. Aerial units can be 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. These operations are generally conducted through the use of helicopters; however, multi-engine fixed-wing aircraft are also used, allowing for higher and quieter surveillance with less visibility from the perspective of the suspect. In a similar manner, support to CBP services may utilize helicopters for surveillance operations; however, given the larger scale and distances involved with their operations, the use of multi-engine aircraft and UAS may be more efficient. Depending on the flight patterns required to achieve mission objectives, it may be possible to safely integrate these operations with civil aircraft operations.

2.2.16 *Search and rescue (SAR)*. A humanitarian activity with the primary objective of saving lives. In many States, 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-engine aircraft, which during actual SAR missions will require priority handling and unrestricted access to appropriate airspace. Depending on the flight patterns required to achieve mission objectives, it may be possible to safely integrate these operations with civil aircraft operations.

2.2.17 *Space operations*. States may sometimes wish to exploit space capabilities. Launches and recoveries of space vehicles may affect large volumes of airspace. In most cases, these operations cannot be safely integrated with civil aircraft operations.

Note.— See Appendix A for information on space launches and re-entry activities.

2.2.18 *Special air operations*. Specially organized military units manned by carefully selected individuals who are trained in unconventional applications of tactics against strategic and operational objectives. Special air operations are key enablers for special forces to conduct their operations. The nature of their tasks requires the element of surprise and covert handling. Depending on the flight patterns required to achieve mission objectives, it may be possible to safely integrate these operations with civil aircraft operations.

2.2.19 *Unmanned aircraft systems (UAS)*. UAS are an increasingly important air asset that offers flexibility and utility. Although originally operating in segregated airspace or within visual line of sight (VLOS), UAS are more frequently operating on missions outside of segregated airspace, including beyond visual line of sight (BVLOS). Depending on the

flight patterns required to achieve mission objectives, it may be possible to safely integrate these operations with civil aircraft operations. An example of such integration is the EU HALE Global Hawk flights performed outside of segregated airspace across the European skies.

2.2.20 *Very important person (VIP) aircraft.* It should be possible for these types of flights to fulfil their tasks while operating in compliance with civil aviation regulations and to be safely integrated with civil aviation operations. In some cases, however, the associated VIP status might require additional handling, separation and prioritization. Advance coordination between the military aviation authority and the ANSP will enable these requirements to be met without undue disruption to civil aviation operations.

2.3 STATE AIRCRAFT CONSTRAINTS

2.3.1 State aircraft can operate in a variety of contexts, with specific constraints. These constraints cover five general areas, which are further detailed below.

2.3.2 *Institutional constraints.* State aircraft operations are non-profit and either serve a function or carry out a requirement. Mandated to meet security and defence interests as demanded by governments, they require easy access to training areas near their respective bases.

2.3.3 *Financial constraints.* Aging fleets and budget constraints can hinder the implementation of new equipment on military aircraft, despite the growing need to evolve alongside new ATM initiatives.

2.3.4 *Operational constraints.* State aircraft operations related to defence and security threats give rise to unique situations that require special handling and consideration. For example, activities such as SAR, air policing/patrol, aerial firefighting and special air operations may demand the utmost priority and be unable to accommodate any delay or denied access to airspace. An additional operational limitation is imposed by Article 3 c) of the Chicago Convention, which prohibits the operation of state aircraft of one State over the sovereign territory of another State without authorization. This authorization may include restrictions on how and where such aircraft may operate. Accordingly, state aircraft may not be able to accept ATC clearances which change their flight-planned route and/or altitude while they are within the sovereign airspace of another State or would cause them to infringe on the sovereign airspace of another State where no authorisation has been given.

2.3.5 *Technical constraints*. Equipage of state aircraft is predominantly focused on the expected output and nature of the task. Physical space is not always available in such aircraft, because of limited space or conflict with mission essential systems and communications, navigation, and surveillance (CNS)/ATM equipment on board.

2.3.6 *Sensitive information constraints.* State aircraft conducting classified/sensitive operations may require special handling to preserve the integrity of the mission’s classified nature. For example, tactical aircraft conducting counter-air operations may not meet surveillance or communications requirements, but still require ATS support to safely avoid civil aviation.

2.4 MILITARY AIRCRAFT OPERATIONS

2.4.1 State aircraft usually conduct three types of missions: contingency/crisis operations, training/exercises or routine/steady state flights. Contingency/crisis operations wherein aircraft are engaged against assessed threats (i.e. suspected unlawful interference, sinking ship/aircraft, intruder alerts, pollution, etc.). In such cases, the appropriate State authority (i.e. military, police, civil protection, transport, coast guard, etc.) expects the deployed assets to achieve a defined objective, while abiding by specific procedures. During an operation, aircraft may request priority to perform their mission, despite its impact on civil air traffic capacity and efficiency. Using due regard for the safety of civil aircraft, in accordance with Article 3 d) of the Chicago Convention, military aircraft are likely to also utilize non-civil separation minima in the conduct of the operation.

2.4.2 For security and defence operations, the gradation of the threat may require different levels of ATS handling. Before activating an operation, an alert, early notification and/or information to the appropriate ATS authority and/or ATS unit should be provided where possible. This notice may vary according to the type of threat and the operational procedures of the State in question.

2.4.3 The objective of a training mission is to operate the flight as if it was a real operation. For military units participating in a training mission, the only difference between a training mission and a real operation would be the absence of a threat. Military training flights form the bulk of military daily operational schedules. Flight training may take various forms, including (but not limited to):

a) training flight;

b) tactical flight;

c) large-scale military exercise;

d) alert training; and

e) test flights.

2.4.4 Military forces must perform training missions and conduct exercises to remain operationally current and to preserve their readiness. An exercise is a situation where varying assets execute different tasks to react to a scenario and attain one or more objective(s). Exercises will use scenarios which are as close as possible to real operations. Frequently, exercises are used to assess the capabilities of a unit, State, or a group of States to meet operational expectations or a readiness status. Sometimes, an exercise may evolve mimicking the lack of predictability that would be associated with a real operation.

2.4.5 Large-scale military exercises require access to large volumes of airspace and therefore such exercises require appropriate planning and coordination to enable the timely reservation, in case of application of flexible use of airspace (FUA), and promulgation of temporary airspace restriction or reservation for the activity. When such exercises require segregation, airspace usage should be closely monitored to ensure that airspace is released for any other use as soon as possible.

2.4.6 Military air exercises should be carried out in accordance with letters of agreement (LOAs), or other appropriate and effective coordination arrangements, detailing comprehensive coordination and de-confliction of specific military activities in the identified airspace.

2.4.7 Unless special arrangements have been made with the appropriate ATS authority, operational ATS units should not be subjected to no-notice military training exercises. Military exercises or training flights should be coordinated in advance with the appropriate ATS units when they could affect civil aircraft operations. Letters of agreement are an

excellent means to contain notification and coordination procedures that ensure ATS units are prepared to handle military aircraft engaged in these types of training missions.

2.5 STATE REQUIREMENTS FOR AIRSPACE NOT NECESSARILY AVIATION RELATED

States may require access to airspace for specific operations; these operations are often not compatible with any other aviation activities. Non-aviation related operations can include, but is not limited to, surface/naval weapons firing, research, development and exercising of non-kinetic weaponry, jamming, weapons storage, ballistic launch and space re-entry activities. These activities will normally require the use of segregated airspace in order to ensure the safety of non-participating aircraft within the vicinity of these events.

2.6 PLANNING PROCESS

2.6.1 The planning of military training flights is somewhat different from that of civil air operations. Comparatively, military airspace scheduling requirements (dimensions and timings) may not be known until nearer to the operation date. While major exercises are usually planned months in advance, the specific airspace requirements may only be determined in the last few weeks or days. Civil and military airspace planners should continuously update their plans for restricted or reserved airspace and aim to finalize the dimension of the required airspace at an agreed upon time prior to the commencement of the exercise. The agreed timing should take into account the administrative and processing time required for the timely publication of the relevant information, ensuring adequate notice for other stakeholders and allowing the ATS authority to properly brief the ATS operational staff. Generally, the preparation for daily flight training starts two to three weeks in advance and is finalized one to five days before the operation.

2.6.2 The final planning and execution of training activity is mainly based on aircraft and pilot availability. On the day of operation, actual airspace needs will evolve alongside aircraft readiness and meteorological conditions. Unavailability of aircraft or unsuitable weather may require rescheduling flights and the associated airspace. The aim of a training flight is to qualify and maintain the pilot's proficiency and/or familiarity with tactical procedures. In terms of planning, this means that according to the concept of operations of each State, every type of pilot has specific qualifications objectives to achieve and duties required to stay operationally current. Therefore, considering possible rescheduled and additional activities for the completion of the training syllabus is an important aspect of planning. Also, as many civil ATS units plan system capacity based on expected traffic, military planners should ensure that the appropriate ATS units are advised whenever the magnitude of a training activity is expected to change significantly.

2.6.3 It is a good practice to agree to a "cut-off" time to establish a time limit on any request to modify the airspace reservations or restrictions in support of training exercises. This cut-off time provides some planning stability and facilitates planning activities for all parties. Where robust coordination and cooperation processes are in place, the cut-off time can be established nearer to the start time. In consideration of unplanned changes due to adverse weather or operational challenges, the process for the flexible use of airspace would allow for last-minute changes to airspace requirements to be better accommodated. During more complex or large-scale exercises, the air component may only be a supporting element to the main ground or naval forces. For such cases, considering the intertwined roles, it is a very complex endeavour to predict the exact airspace dimension required to fulfil these activities, due to the many moving pieces and fluid nature of such activities. Changes to scheduled activities should be expected, and to some extent, planned for.

2.6.4 State aviation authorities may be reluctant to limit the flexibility afforded to national security flights, or to limit training opportunities, readiness capability, realism of exercise and the assessment of operations, for the fear of being unable to meet the security objectives set out by the State. However, the guidelines provided in this document for both civil and military stakeholders should aid in finding optimal solutions while preserving national security.

2.6.5 Where the airspace planning process calls for the safeguarding of sensitive information relating to national interests, the State should make provisions to ensure that representatives of the civil ATS authority are appropriately cleared and authorized to receive sensitive information. Civil ATS units require sufficiently advanced notice and details to be prepared to support military training or operational objectives while developing plans to mitigate impacts to civil aviation.

2.7 NATIONAL SECURITY AND DEFENCE

2.7.1 National security and defence objectives

2.7.1.1 Each State defines its own national security and defence objectives which are then used to develop its security, defence, organizational and operational requirements. The airspace requirement and possible priorities afforded to state aircraft come as a direct consequence of these objectives. Such requirements also guide each State department and allows them to define their specific needs in terms of equipment, budget, personnel, and training, etc. When defined at the highest level of the State, the underlying authority supporting these requirements will be more clearly recognized by different departments within its government.

2.7.1.2 The importance of defence and security forces will vary from State to State and will determine the number of air assets devoted to each respective airspace requirement.

2.7.2 State aviation airspace requirements

2.7.2.1 State aviation airspace requirements are generally established by varying government branches as a function of national objectives. In general, airspace requirements are developed for two main considerations:

a) building and maintaining the readiness of State aviation capabilities; and

b) undertaking actual operations.

2.7.2.2 When establishing these requirements, State authorities should consider the impact on civil aircraft operations and other airspace users. The airspace requirements linked to maintaining readiness capability are usually a consequence of needs such as pilot training, readiness check, exercises, certification, etc.

2.7.3 Priorities

In order to satisfy national security and defence objectives and associated airspace requirements, States may need to define their priorities for airspace allocation. These priorities can help both civil and state aircraft operators undertake their operations both in terms of planning and execution when needed, they should therefore be clearly defined and communicated to all stakeholders.

Chapter 3

STRUCTURES AND IMPLEMENTATION

3.1 IDENTIFYING STATES' REQUIREMENTS

3.1.1 To achieve the intended benefits from civil and military cooperation and coordination, States should establish formal civil-military cooperation and coordination structures and processes. While the specific requirements may vary, the initial step prior to the implementation of such cooperation and coordination processes begins with identifying the needs of the various stakeholders and the objectives to be achieved. Civil and military stakeholders should assess their operational requirements to holistically determine the needs of the whole aviation community and the expected benefits from the coordination and cooperation processes. This analysis will, in turn, be closely linked to the concept of operation for civil-military cooperation, coordination, and airspace organization and management.

3.1.2 Factors to be considered during this analysis include, but are not limited to:

a) airspace structure and complexity;
b) efficiency of the airspace usage;
c) air navigation system performance issues;
d) types of civil and military air activities;
e) location of military training areas;
f) airspace and/or aerodrome capacity constrains;
g) location of military and civil aerodromes;
h) weather;
i) training requirements of the military;
j) access availability for both stakeholders;
k) air traffic flow management (ATFM) requirements;
l) pre-existing coordination mechanisms;
m) level of interoperability between civil and military systems;
n) airspace security considerations;
o) traffic flows and volume;
p) existing regulations (national, supranational, etc.);
q) existing CNS infrastructure; and
r) existing safety issues between civil and military.

3.1.3. Once the requirements are clear, stakeholders should perform a gap analysis against the existing baseline in terms of structures, cooperation and coordination mechanisms, airspace organization, management and policies, and thus determine the implementation requirements. The objective is to compare what is available to what is needed; and more specifically, what procedures are used against those needed.

3.2 STRUCTURE, PROCESSES AND FUNCTIONS

3.2.1 Overview

3.2.1.1 There is no “one-size fits all” operational structure framework for civil-military cooperation and coordination. States should carefully select and implement the elements suited for their national requirements, air activities and airspace organization and management objectives.

3.2.1.2 The following suggestions are steps for States to implement or enhance their civil-military cooperation and coordination structures, processes and functions in order to address the gaps identified in the analysis described above. It should be recognized that airspace structure, operational environment, national security requirements and overall ATM complexity will determine the necessary administrative structure, as well as the cooperation and coordination processes and functions. Effective civil-military cooperation, coordination and management of the airspace is an iterative process which must be on-going in order to achieve full maturity and deliver the full benefits (Figure 3-1 refers).

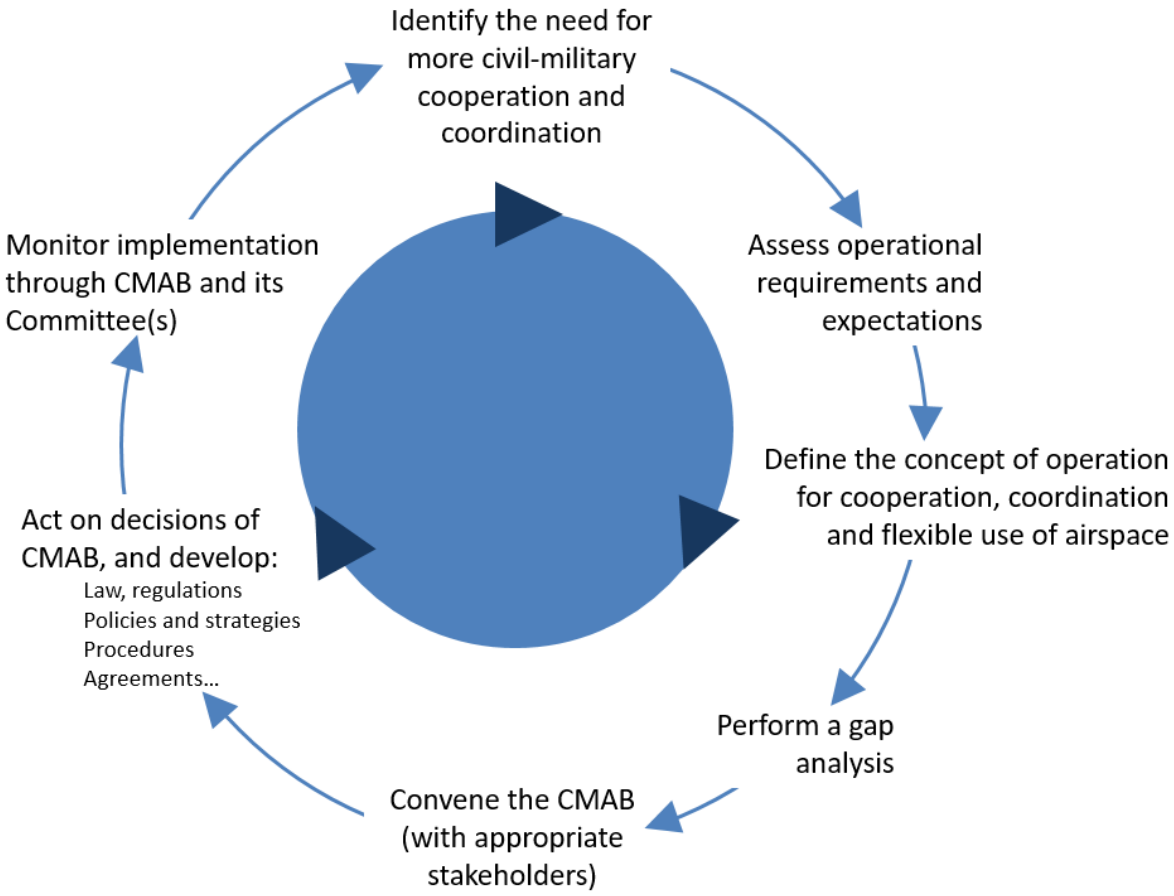

Figure 3-1. An example of an implementation and continuous improvement cycle

3.2.1.3 The State will need to consider its existing organizations to determine the exact structure necessary for its strategy, policies and processes to implement civil-military cooperation. The names of the various bodies as presented in this manual are for presentation purposes only. States should consider their own objectives and tasks when establishing the different bodies proposed in the application of this manual.

3.2.1.4 The following legal and regulatory frameworks should be established to develop the necessary supporting structures, processes and procedures:

a) formalize the high-level commitment of relevant stakeholders and authorities through official terms of reference, specifying the structure and responsibilities of a joint civil-military decision making body as described in 3.2.1.6 below (see Appendix E for a template);

b) develop a framework for a collaborative national airspace planning policy which considers the needs of all airspace users in supporting national economic, security, defence and law enforcement requirements;

c) develop framework agreements, and/or LOAs between civil and military authorities as necessary;

d) review the national legal framework to identify the elements of law or regulation to be amended as required to enable the implementation of cooperation, coordination and airspace management processes; and

e) develop a State airspace policy.

Note.— A State airspace policy is a key document that details the different cooperation and coordination processes and interactions applicable in the State, the responsibilities of different actors and processes, as well as the regulatory framework and priorities.

3.2.1.5 Formalizing the high-level commitment and cooperation structures of civil-military stakeholders may take a different form in each State. Joint declarations, decrees, acts, laws or regulations are a few examples. This formal commitment indicates the intent of the highest civil and military authorities of the State regarding civil-military cooperation and coordination. This intent should be expressed through the establishment of high-level polices, strategies, and formal supporting structures which empower all civil-military stakeholders (personnel, regulators, ANSPs, ATS unit supervisors, appropriate military units, etc.) to work collaboratively and effectively for the common national interest and benefits.

3.2.1.6 It is crucial that States create a joint civil-military decision-making body to oversee and direct the activities required to implement, maintain and constantly improve civil-military cooperation. For ease of reference, this manual refers to such a body as the high-level civil-military aviation cooperation policy board (CMAB). A CMAB would be composed of appropriate high-level representatives from both civil and military aviation authorities, as well as others deemed necessary, and would have the authority to plan and allocate airspace, determine the provision of air navigation services and oversee the operations of military aviation authorities. The CMAB would be responsible for ensuring that civil-military cooperation policies are facilitated and implemented at all levels of the respective authorities. A CMAB should monitor and coordinate civil and military aviation activities, provide policy direction, allocate resources, and ensure the State's high-level aviation policies and strategies are implemented.

3.2.1.7 To achieve the multitude of tasks within its mandate, it is recommended that a CMAB establish committees to study issues related to aviation, develop recommended courses of action, discuss and agree on policy and strategic considerations and present these recommendations and considerations to the CMAB. The CMAB should meet regularly to review the work of its committees and provide further direction as required. This process should be ongoing, maintained through regularly scheduled meetings and poised to respond to significant events affecting civil or military aviation-related activities. At minimum, the CMAB should consider the establishment of a Committee for Airspace Organization and Management (CAOM) (see 3.2.4.2). The establishment of other committees such as operations, CNS/interoperability and legal, should be based on the State's requirements. (see Appendix F for a ToR template for the CAOM)

3.2.1.8 A CMAB should represent all relevant stakeholders as members or observers. Considering the strategic, regulatory and airspace policy responsibilities envisioned for a CMAB, the structure may include the Director General of the Civil Aviation Authority and the equivalent military authority as key members of the body, potentially co-chairing the board. The military authority should appoint a senior representative with the appropriate authority with respect to military

airspace management, military airspace regulation, and who is accountable for air operation of all branches of the military services, and possibly other State aviation actors. To facilitate future development and implementation of cooperation and coordination, including all airspace management procedures, civil and military technical expertise should be made available through the participation of appropriate stakeholders.

3.2.1.9 Once fully established, a CMAB should provide a continuous role in monitoring the application of civil-military cooperation, coordination, airspace policy and the performance of the airspace management structures. A CMAB, and its committees, should monitor implementation and take corrective actions, as necessary, to address performance gaps and account for changing requirements (Figure 3-1 refers), as well as post-operation analysis (Figure 3-2 refers) to amend the structure, processes or procedures to address the mutually agreed objectives.

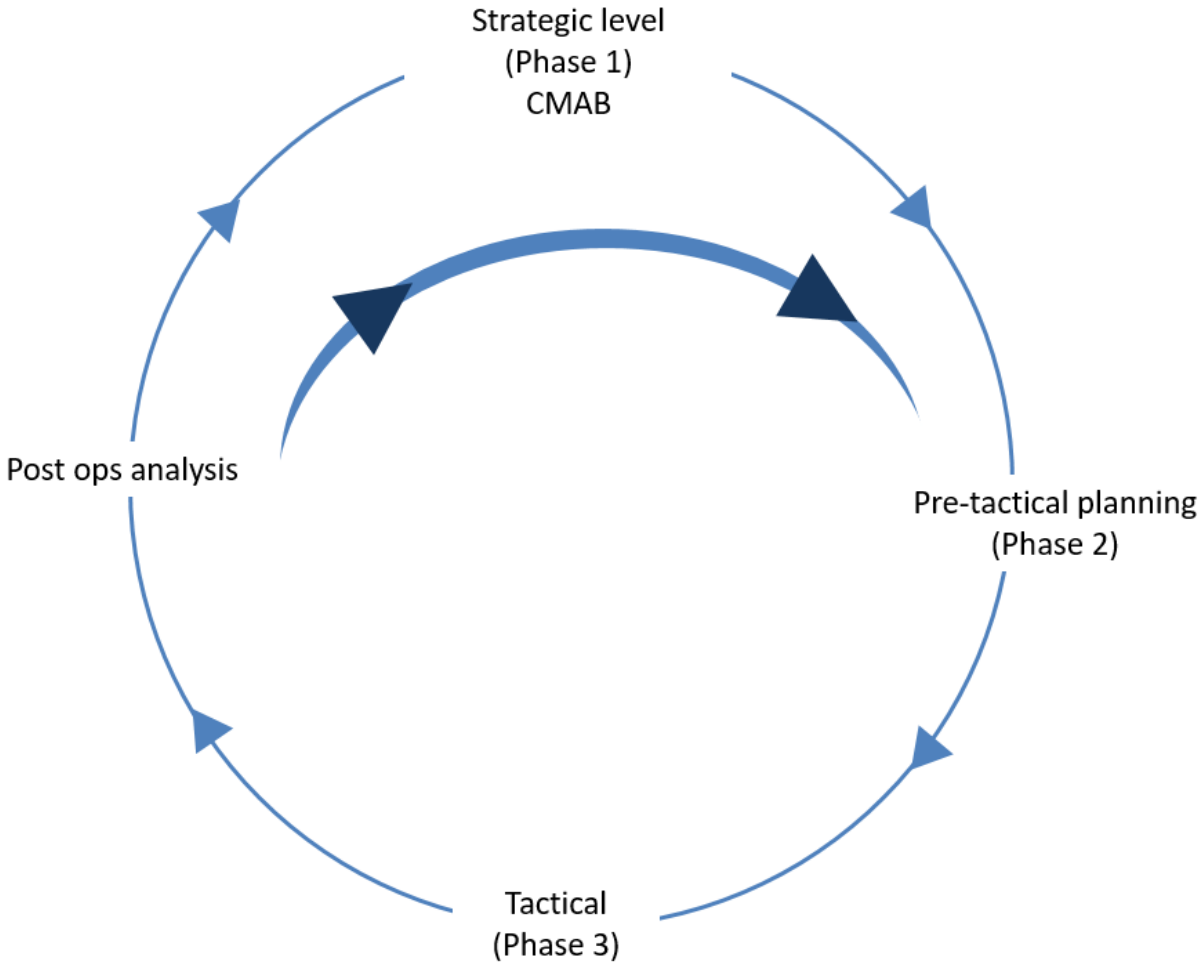

Figure 3-2. Continuous monitoring cycle

3.2.1.10 To be effective, a CMAB should have the following responsibilities:

a) review and update its terms of reference for effective governance and maintain its supervisory role in implementing civil-military cooperation and coordination across the State;

b) develop a national civil-military policy and strategic implementation plans to foster civil-military collaboration, cooperation and coordination in line with the State's high-level policies and strategies;

c) establish the necessary committees to implement the high level civil-military policies and strategies;

d) recommend necessary legislative amendments to the relevant authorities to ensure that national legal and regulatory framework supports the high-level policy and strategy for civil-military cooperation in aviation;

e) establish a CAOM (see 3.2.1.7 and 3.2.4.2) with associated procedures allowing for the safe, equitable and effective management of national airspace in accordance with agreed policies supported by adequate civil-military cooperation and coordination facilities;

f) establish the necessary strategies and policies to enable the development of appropriate operational procedures and LoA, to enable safe and efficient operations;

g) develop communication, negotiation and priority rules and procedures for civil-military cooperation and coordination;

h) task the appropriate ATS authorities and the appropriate military units to develop the necessary civil-military cooperation and coordination procedures;

i) establish a system and process for the review of airspace organization and management to meet the changing needs of the various stakeholders that foster joint airspace planning activities;

j) establish and monitor through the CAOM, the implementation of the procedures for airspace reservation or activities which require restriction, to increase predictability and timely access to restricted or reserved airspace whenever possible and maximize benefits and flexibility for all users;

k) promote collaborative airspace planning and the harmonization of procedures with neighbouring States;

o) enhance interoperability between civil and military ground systems and military aircraft to support the civil-military cooperation and coordination functions;

p) establish processes to ensure that safety risk assessments are conducted where appropriate;

l) create a consultative process based on consensus to achieve the goals set forth in the high-level airspace policy;

m) identify and facilitate the implementation of best practices as standardized procedures;

n) ensure that the airspace change processes and procedures developed are compatible with appropriate civil and military aviation safety procedures;

q) delegate the approval authority to the appropriate committee as deemed necessary;

r) request the appropriate committee to report back on implementation statuses and compliance to the procedures and process;

s) supervise and review the work of the committees; and

t) monitor and analyse compliance to the established procedures and processes, to further improve civil-military cooperation and coordination.

3.2.1.11 An agenda for the CMAB should be prepared and agreed upon among the different stakeholders. A list of agenda items is provided in Appendix D.

3.2.1.12 Since laws and regulations are often pre-requisites to enforce new concepts, responsibilities or procedures, a Legal Committee (if established by the CMAB) could perform a gap analysis to identify the necessary changes for a future structure enhancing cooperation, coordination and airspace management. It should leverage the earlier gap analysis (3.1.3 refers), and amend legislation, regulations or any other form of legal instrument to meet the requirements of civil-military cooperation and coordination, including implementation of FUA.

3.2.2 Improving tactical civil-military coordination

3.2.2.1 Measures to improve tactical coordination (coordination between ATS units and appropriate military units) should be undertaken to directly support aviation safety and efficiency. This will be achieved by identifying the different stakeholders, actors and authorities involved in tactical decisions, enabling communication means and establishing simple coordination procedures.

3.2.2.2 As a minimum, the following stakeholders should take part in improving tactical coordination:

a) all civil ATS units: the different sectors and the respective supervisors;

b) all appropriate military units: military units providing ATS, combat control centres, firing ranges, and the respective supervisors;

c) the airspace management cell (AMC), if implemented;

d) the regional or sub-regional ATFM centre; and

e) any stakeholder directly involved in the daily operation, including any authorities invested of tactical decision-making responsibilities, such as on-duty officers, officers having a delegated authority for the day-to-day flying activities or officer in charge, etc.

3.2.2.3 Existing coordination processes between civil and military units should be reviewed regularly. The periodicity of the review should be commonly agreed upon by civilian and military stakeholders. Inflexible arrangements or access request procedures may no longer be valid due to changes in organizational structures or operational processes. Direct coordination between operational supervisors, or even air traffic controllers, of civil ATS units and the appropriate military units has shown to enhance safety for civil and military activities and supports better deployment of resources during times of emergencies or contingencies (see Chapter 6). Updated coordination and operational procedures should be drafted, agreed among the stakeholders and implemented in the shortest possible timeframe.

3.2.2.4 The stakeholder list, contact information and initial coordination procedures should be formalized into an LoA whenever possible. It is recognized that drafting, agreeing and publishing LoAs may require some time, therefore stakeholders should envisage enabling coordination through informal arrangements until such LoAs are available.

3.2.2.5 Existing communication means, procedures and processes between civil ATS units and appropriate military units should be reviewed regularly. The periodicity of the review should be commonly agreed upon by civilian and military stakeholders. Lines of communication may be outdated due to organizational or structural changes. It may be required to update communication systems (including, if possible, increasing interoperability), which may improve the clarity or efficiency of communications. When establishing or reviewing communication means used for civil-military tactical

coordination, States should strive to establish direct communication capabilities between operational units. Direct communications between civil and military units allows for the timely resolution of specific traffic situations when military activities are conducted in proximity of civil traffic or vice versa.

3.2.2.6 In the interest of national security and to ensure the safety of civil aircraft, States may direct appropriate departments to establish secure communications interoperability between specified military units and civil ATS units. This interoperability will enable ATS units to react appropriately to sensitive military operations by either providing ATS support to military operations or keeping civil aviation clear of activities that are potentially hazardous to civil aviation.

3.2.3 Best practices

3.2.3.1 When first implementing a structured civil-military cooperation framework and coordination processes and functions, States should identify and prioritize easily achievable changes that will bring obvious and direct safety benefits. For example, developing and implementing coordination procedures between civil ATS units and appropriate military units, forming a high-level civil-military aviation cooperation policy board or initiating an airspace structure review.

3.2.3.2 A periodic review of permanently restricted military airspaces by both military and civil aviation authorities enhances the efficiency of civil aviation routes. Obsolete or infrequently utilized, restricted airspaces should be eliminated where not operationally essential. States should regularly review the existing airspace structure, and existing airspace restrictions such as prohibited, restricted and danger areas (see Chapter 4, 4.2).

3.2.3.4 There could be cases where the pattern of airspace utilization by a stakeholder may allow for more frequent use by others during specific time periods. For example, military airspaces may not have activities during festive seasons, such as summer holidays or during weekends when civil aviation may face increased traffic flows. An open discussion on these utilization patterns may result in better use of the airspace, possibly through the implementation of conditional routes (see Chapter 4, 4.5.2.1) where restrictions were not flexible to accommodate other use. Some States have implemented special agreements on certain Friday afternoons for civil ATS units to have priority in reserving some portion of the airspace for civilian use to deal with the increased traffic level.

3.2.3.6 The following best practices are common in States which have implemented effective civil-military cooperation and coordination:

a) military participation at relevant civil ATM, CNS and safety meetings to enhance strategic liaison and facilitate holistic planning;

b) the integration of civil and military CNS/ATM systems, including the joint procurement and sharing of ATS surveillance data, where possible;

c) the joint provision of civil-military navigation aids;

d) joint and common training conducted between civil ATS units and military units providing ATS in areas of common interest;

e) common rules, procedures and training programmes as far as practical;

f) legal agreements and specific provisions established between stakeholders within State and/or with other States;

g) participation of military aviation authorities in ICAO global and regional meetings through inclusion in State delegation.

3.2.4 Prerequisites to implement flexible use of airspace (FUA)

Note.— Detailed guidance on FUA implementation is provided in Chapter 4.

3.2.4.1 In the context of civil-military cooperation, FUA is an application of efficient airspace management based on civil-military coordination processes which are appropriate to the national needs. Establishing civil-military coordination entities for airspace organization and management is essential to implement FUA.

3.2.4.2 The CMAB should establish a CAOM to make strategic decisions on a State's airspace policy. The CAOM should organize and manage airspace and complete the necessary strategic planning work, taking into account national and international airspace users and ATS providers' requirements. The CAOM is normally composed of civil and military members as appropriate to meet the State's needs, and should be empowered to interact with both national decision making and operational levels.

3.2.4.3 The role of the CAOM is to reconcile civil and military operational needs without according preferential treatment to either. It ensures that airspace planning considers all users' interests and the State airspace policy. The main function of the CAOM is to continuously reassess national airspace, progressively establish new flexible airspace structures and introduce procedures for the allocation of these airspace structures on a daily basis. The CAOM should be fully supported at the State's political level to empower and enable it to fulfil the following main responsibilities:

a) ensure that a commonly agreed airspace policy is formulated (e.g. a national airspace charter);

b) establish an AMC (see 3.2.4.7) and associated procedures (see Chapter 4, 4.8);

Note.— An AMC is a pre-requisite to implement enhanced FUA as described in Chapter 4.

c) build trust, respect and confidence between regulators, airspace users and stakeholders using a consultative approach with the goal of consensus, especially in the development of flexible airspace structures and procedures;

d) consider both the civil and military aspects when planning for airspace classifications;

e) establish processes to achieve joint airspace planning activities as the norm, for the needs of both civil and military airspace users to be taken into account at the earliest planning phase;

f) to the extent possible, implement best practices and ensure that the airspace change processes and procedures are compatible with appropriate civil and military aviation safety procedures, including the review of airspace safety risk assessments where appropriate;

g) ensure that a safety risk assessment is conducted when planning for the establishment of new airspace structures or when changing or modifying airspace structures;

h) develop collaborative airspace planning and harmonization of airspace management procedures with neighbouring States, and work with these States to establish a cross-border area (CBA) as described in Chapter 4;

i) monitor compliance with FUA and other procedures, including validating national policies, priorities and achieving performance requirements by periodically reviewing airspace needs, organization and management.

j) ensure the ongoing re-assessment of national airspace and airspace organization (structure and procedures), with regard to effective application of the FUA concept, monitor the relevant national legislation and propose amendments as necessary (in coordination with the Legal Committee, if one has been established by the CMAB);

k) establish framework agreements between civil and military authorities to facilitate the application of the FUA concept as described in Chapter 4;

l) ensure that coordination processes between all phases of FUA are established and that civil and military terms and definitions applicable to the principles governing the FUA Concept are harmonized;

m) validate activities requiring airspace segregation and assess the level of risk for other airspace users;

n) ensure that agreed priority rules and negotiation procedures for airspace allocation at pre-tactical and tactical phases are clearly defined and implemented;

o) ensure the progressive design and establishment of new flexible airspace structures, including non-permanent structures as well as free route airspace, when so decided and where appropriate, according to the specific requirements;

p) ensure that the total volume of airspace restrictions or reservations are kept to the minimum necessary while ensuring safety and satisfying national operational requirements;

q) coordinate and plan major or specific events, such as large-scale military exercises, well in advance especially when additional segregated airspace is required;

r) establish a communications plan for civil and military stakeholders' coordination during the planning and execution of military operations;

s) initiate AIS publications, as required, to notify changes to airspace structures, classification, access or status; and

t) coordinate, as necessary, with other CMAB Committees (see 3.2.1.7).

3.2.4.4 In addressing the responsibilities listed above, the CAOM should consider:

a) *Safety*. An acceptable level of safety should be maintained for any airspace change and safety risk assessments should be carried out in accordance with the applicable ICAO provisions and State regulations. A safety risk assessment should be systematically conducted by each State before FUA implementation.

b) *Consultation.* Consultation with airspace users, service providers and other relevant bodies should be conducted to obtain consensus, wherever possible, before making changes in the planning or design of airspace arrangements.

c) *Cooperation.* Close cooperation should be maintained with national and international partners to ensure that national airspace planning and policies are consistent with national and international commitments and programmes.

d) *Environment.* The environmental impact of airspace design and planning should be taken into account, wherever possible, at the earliest possible stage when revising airspace procedures and arrangements.

3.2.4.5 Detailed cooperation and coordination procedures related to FUA should be documented in comprehensive LoAs between relevant civil and military authorities or units as appropriate. An appropriate manual detailing all cooperation and coordination procedures should be drafted and agreed upon by all stakeholders before being presented to the CAOM for endorsement. A suggested outline of an FUA manual is provided in Appendix G.

3.2.4.6 A detailed review of the current airspace structure should be conducted to reveal any gaps and existing issues, and identify solutions. This review will also unveil areas of overlapping needs which will require FUA to address the needs of all stakeholders. Not all airspace changes can be done in a short period of time, therefore, the stakeholders should prioritize the changes and establish a long-term plan of airspace re-design.

3.2.4.7 Before setting up the AMC, as part of the airspace management structure the following should be considered by the stakeholders involved in pre-tactical management of the airspace:

a) a clearly defined concept of operation and gap analysis are necessary to define the structure of the AMC;

b) the roles, responsibilities and objectives should be clearly defined;

c) the complexity with regards to the role AMC will be a function of the objectives, and the complexity of the airspace to be managed, therefore the AMC may take various forms in different implementations; and

d) the stakeholders involved in performing the pre-tactical airspace management in the future AMC should work together to define its structure, participants and processes.

3.2.4.8 When the precise roles, responsibilities and objectives of the pre-tactical cooperation and coordination team, and those of the AMC, have been agreed upon, its structure, participants and processes should be drafted. The following factors should be considered to define the structure, participants and processes:

a) define the stakeholders involved in the AMC and how their requests will be submitted to the AMC by stakeholders such as ANSPs, ATFM actors, military users (squadrons, planners, firing ranges, etc.), airspace planners, etc.;

b) decide the type of implementation:

1) physical joint cell manned by ANSP and military unit personnel;
2) a virtual AMC jointly working on the same system;
3) a correspondence-based AMC for very simple airspace; and
4) a military liaison officer in the civil area control centre (ACC), etc.;

c) identify the necessary tools to perform pre-tactical functions, ranging from email to spreadsheet, to more advanced airspace management tools;

d) list the processes to be documented;

e) review training requirements and scope;

f) review existing regulations and/or agreements, and determine if amendments are required prior to the commencement of operations;

g) determine the necessary safety risk assessments to be conducted;

h) clarify negotiation procedures, priority rules, and assign executive decision makers (some may be done within the AMC, others may require civil or military authorities outside of the AMC);

i) ensure that the AMC pre-tactical processes interlink with the ATFM function, when implemented;

j) assess the airspace structures to be implemented, if necessary, to facilitate the FUA application;

k) clarify and identify the flow of airspace information regarding airspace needs, negotiation, allocation, dissemination and publication of an airspace use plan (AUP) and its subsequent updates;

l) determine the AUP and updated airspace use plan (UUP) requirements and publication timings;

m) conduct post-operation analysis.

3.2.4.9 Once the details of the AMC have been agreed upon by the stakeholders, an AMC implementation plan should be prepared. AMC-related procedures, including the implementation plan, should be submitted to the CAOM for its consideration and approval. The implementation plan should detail training requirements.

3.2.4.10 The need for new airspace structures should be identified as part of the definition of the concept of operation and decided by the CAOM. Once the need for change has been approved by the CAOM, the stakeholders, when performing the airspace review, should analyse the appropriate structures to be implemented, determine the required processes to manage these airspace structures and identify the various links with other processes and functions, such as the pre-tactical phase or ATFM. All airspace changes should be supported by the appropriate safety risk assessment and safety mitigation measures. Implementation of new airspace structures, such as the ones presented in this chapter, will require a revision of the AMC processes, and possibly structure.

3.2.5 Examples

A variety of procedures, manuals, regulations and specifications have been developed by States to address their national or regional cooperation, coordination and FUA needs. Many of these are publicly available on the internet.

Chapter 4

AIRSPACE ORGANIZATION AND MANAGEMENT

4.1 GENERAL PRINCIPLES

4.1.1 The main airspace users are civil and military aircraft. Since airspace has become a scarce resource that should be used in a safe and efficient manner, its effective utilization is central to civil-military cooperation and coordination. The airspace requirements of all civil and military users should be accommodated on a fair and equitable basis while respecting State sovereignty, national and international security, defence and law enforcement obligations.

4.1.2 A component of ATM, airspace management is a process by which airspace options are selected and applied to meet the needs of all airspace users, as per the *Global Air Traffic Management Operational Concept* (Doc 9854). The ASM process and associated procedures between civil and military agencies are necessary to create an environment in which civil and military operations are conducted safely with an optimal utilization of the available airspace. 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.

4.1.3 Annex 11 — *Air Traffic Services,* Chapter 2 recommends States to establish procedures providing for a flexible use of airspace normally reserved for military or other special activities. The elements presented in this chapter are key for States to build their own flexible use of airspace procedures, when deemed necessary. The *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444), Chapter 3, provides details on the need to make provision for the flexible use of all airspace through the establishment of agreements and procedures.

4.1.4 Any changes to airspace structures and supporting procedures should be supported by safety risk assessments and the appropriate risk mitigation measures should be implemented. Guidance on safety risk management assessment is provided in the *Safety Management Manual (SMM)* (Doc 9859).

4.2 BASIC FUA

4.2.1 The goal of the FUA concept is to balance and, to the extent possible, meet the needs of both civil and military airspace users. As detailed in Chapter 2, some activities cannot be safely integrated with civil aviation operations. This implies a requirement to segregate airspace for exclusive military use to accommodate such activities. The central focus of the FUA concept is to ensure that military airspace users will have access to sufficient airspace to achieve their mission objectives without unduly impacting the safety and efficiency of civil aircraft operations. The FUA concept provides the ATM community with the potential to improve air traffic system performance. It allows the maximum use of airspace with appropriate coordination between civil and/or military users, enhancing airspace capacity and flight efficiency.

4.2.2 The basic principle of FUA is 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. Consequently, any necessary airspace restriction or reservation should be of a temporary nature. The FUA concept considers effective communication, cooperation and coordination necessary to ensure a safe, flexible, efficient and predictable use of airspace. To effectively implement FUA, States should embrace the following principles:

a) cooperation and coordination between civil and military authorities should be carried out at the strategic, pre-tactical and tactical phases to increase safety and airspace capacity and to improve the efficiency of aircraft operations;

b) ASM, ATFM and ATS should be established and interact in a consistent manner, including the establishment of necessary means to exchange information; and

c) the FUA concept should, when possible, be applied across national borders and/or the boundaries of flight information regions (FIRs), which requires international coordination.

4.2.3 It is common to establish prohibited, restricted and danger areas to contain military operations that could pose a hazard to civil aviation. States which have accepted the responsibility for providing ATS in high seas airspace are only permitted to establish danger areas in that airspace, because it is not permitted to prohibit access to high seas airspace. Establishment of prohibited, restricted and danger areas should involve cooperation between civil and military airspace planners to ensure the number, location and size for these areas will meet military operational requirements while minimizing potential impacts on optimal flight profiles for civil air traffic, to the extent possible. States should ensure that regular discussions and reviews take place between civil and military airspace planners to ensure that changes in civilian air traffic patterns and military requirements are accounted for. Effective cooperation at this implementation level will build trust and understanding among stakeholders while enabling efficient airspace planning as the foundation for FUA implementation.

4.2.4 The establishment and review of prohibited, restricted and danger areas should follow the following principles:

a) areas should only be established after due consideration of their effect on civil air traffic by subject matter experts representing both civil and military interests to ensure the area will be:

1) used for the purpose that it is established;

2) used regularly; and

3) of a size in line with the operational requirements;

b) the areas and associated processes and procedures should be regularly reviewed to ensure they are appropriate for the activities that are taking place. The review frequency should be determined by each State according to its needs, complexity and the pace of airspace evolution.

4.2.5 Over time, the type of prohibited, restricted or danger areas can become inconsistent with the actual usage. For example, the review process may reveal that a prohibited area is, in fact, not necessarily prohibited for all aircraft and should, therefore, be re-established as a restricted area. Some prohibited, restricted or danger areas may have been established to “unlimited” altitudes, but the review process may reveal that it is not actually required. The type and dimensions should be commensurate with the type of activity taking place in the airspace. Regular reviews will ensure this remains true. Some States have reduced their prohibited, restricted and danger areas by more than 30 per cent, through the simple analysis and review of the need for existing restrictions, resulting in improved operational flexibility and resilience for both civil and military aircraft operations.

4.2.6 The basic form of FUA could involve establishing time limits for when restricted or danger areas are active, enabling civil aircraft to freely access the airspace during the non-active times. For example, a restricted area may be utilized to contain military training, but such training may take place only during specific hours. In this case, the description of the area would specify the location, dimensions and the hours of operation.

4.2.7 Basic FUA implementation may involve having all or most restricted and danger areas designated as being active only upon notification. This level of implementation requires, at minimum, supporting procedures to ensure the ATS

authority is duly notified of activations. This enables ATS personnel to tactically respond to the change in airspace status. A more effective FUA implementation would include supporting procedures to encourage military airspace users to provide sufficient notice of their intent to activate these areas so that civil aircraft operators could be notified in time to plan their flights accordingly. Further effectiveness can be achieved by creating a process whereby the planned activation times can be reduced or cancelled to account for actual use on the day of operations.

4.2.8 FUA implementation in the civil-military cooperation context also requires coordinating and accommodating military operations that are not confined to already established prohibited, restricted and danger areas. At the basic level, this would involve coordinating the establishment of temporary restricted and danger areas to confine and segregate the planned military operations. Effective civil-military coordination is required to ensure that the location, dimensions and duration of these areas are sufficient for the achievement of military operational goals without unduly impacting the efficiency of civilian operations. Cooperative analysis could identify ways and means to integrate all or part of specific types of military operations with civil aircraft operations, thereby limiting the dimensions and duration of restricted and danger areas only to the airspace necessary to contain operations that are inherently potentially hazardous for civil aviation. For example, it could be possible for formation flights, training flights, air-to-air refuelling operations or aircraft transiting to and from areas of operation, to take place without the need to establish prohibited, restricted or danger areas.

4.2.9 To effectively implement basic FUA, States should:

a) establish an CAOM, under the CMAB, as described in Chapter 3, 3.2.1.7 and 3.2.4;

b) develop a framework for a collaborative national airspace planning process which considers the needs of all airspace users in supporting national security, defence and law enforcement;

c) establish communication, negotiation and priority rules and procedures for civil-military coordination;

d) establish and publish procedures for airspace reservation or activities which require airspace restrictions;

e) develop agreements between civil and military authorities to facilitate the coordination related to flexible use of airspace; and

f) establish a system to periodically review airspace needs, organization and management.

4.2.10 FUA is a concept that may be applied within the airspace of a single State, does not require cross-border or regional cooperation and can be implemented in the absence of an ATFM system. When considering an implementation plan, FUA can be implemented at different degrees of efficiency or complexity depending on the maturity of the State's ATM environment. However, full benefits of FUA implementation are only possible through implementing FUA at the tactical, pre-tactical and strategic phases, as described below.

4.3 PRINCIPLES FOR ENHANCED FUA

4.3.1 States should consider implementing enhanced FUA if civil and military operations are unduly constrained to provide at least seven days' advance notice for activations of airspace restrictions (as specified in the *Procedures for Air Navigation Services — Aeronautical Information Management* (PANS-AIM, Doc 10066) and if more flexibility is needed to cope with the operational requirements from civil and military partners. The full set of benefits, in terms of the efficient use of the airspace, is achieved by implementing enhanced FUA as described in this chapter.

4.3.2 A fundamental element for the enhanced implementation of FUA is the daily coordination process where all operational needs of civil and military partners are considered to define a consistent plan of the airspace usage for the

next day. Simplified, reliable and efficient means of notification (including electronically) are needed for this information to reach all the airspace users and interested parties in a timely manner.

4.3.3 The PANS-AIM provision referred above is complemented by a note indicating that, whenever possible, at least 24 hours' advance notice is desirable to permit timely completion of the notification process and to facilitate airspace utilization planning. Enhanced FUA implementation uses airspace reservations extensively which, associated with an efficient notification process, allows for a dynamic approach to airspace planning that supports full flexibility for airspace users to plan their operations based on current requirements, weather constraints and other operational factors.

4.3.4 With the enhanced implementation of FUA, the notification process takes the form of an airspace use plan (AUP) provided on the day before operation to inform airspace users about the airspace availability on the day of operation . Electronic means of communication allow for easily accessible and timely notifications. It is essential that States properly explain their notification process in their national AIP so that airspace users and stakeholders understand how to be fully and timely informed of the airspace status.

4.3.5 The objectives of an enhanced implementation of the FUA concept are consistent with the description of the general principles in 4.2.2 above and may be further described as:

a) the design and implementation of an optimal airspace configuration and associated procedures to accommodate civil and military airspace requirements;

b) an increase of flight efficiency by a reduction in distance, time and fuel using flexible trajectories where possible, thereby providing environmental benefits;

c) the establishment of an enhanced ATS route network and possibly the associated sectorization, providing for capacity increase;

d) a reduction of ATC workload;

e) a possible improvement in military mission effectiveness; and

f) more efficient ways to separate civil air traffic from other type of traffic where required.

4.3.6 The implementation of enhanced FUA increases the flexibility of airspace use and provides ATM with the potential to improve the air traffic system performance. It allows the maximum common use of airspace through coordination between civil and/or military users, enhancing airspace capacity and flight efficiency. Rather than relying solely on airspace restrictions, enhanced FUA allows military authorities to reserve airspace as and when required to fulfil their specific mission requirements.

4.3.7 An effective application of the enhanced FUA concept requires the establishment of a CAOM in each State (see Chapter 3, 3.2.1.7 and 3.2.4). The practical application of enhanced FUA relies on an AMC for the daily allocation and promulgation of the plan for using flexible airspace structures, the AUP, following procedures and priority rules validated by the CAOM. States should also establish adequate real-time civil-military coordination facilities and procedures, validated by the CAOM to cover the tactical management of airspace and flights on the day of operation (see Chapter 3, 3.2.2).

4.3.8 Enhanced FUA implementation is based on the following principles:

a) full CDM as described in 4.4 below;

b) cooperation and coordination between civil and military authorities should be carried out in a collaborative manner at the strategic, pre-tactical and tactical phases;

c) consistency between ASM, ATFM and ATS should be established and maintained at the strategic, pre-tactical and tactical phases;

d) airspace reservations should be of a temporary nature, applied only during limited periods of time and based on actual use of airspace and released as soon as the activity having caused its establishment ceases;

e) the daily allocation of flexible airspace structures and any necessary reservation of airspace is based on real usage within a specific time period and airspace volume; and

f) the FUA concept should whenever possible be applied across national borders and/or the boundaries of FIRs; this cooperation should cover all relevant legal, operational and technical issues.

Note. — See also Appendix B for more advanced FUA concepts.

4.4 COLLABORATIVE DECISION MAKING (CDM)

4.4.1 For all stakeholders to meet their requirements, civil and military stakeholders should work closely together within a framework of CDM as described in the *Manual on Collaborative Air Traffic Flow* Management (Doc 9971). CDM is a process focused on how to decide on a course of action articulated between two or more community members. Through this process, ATM community members share information and apply the decision-making approach and principles. The overall objective is to improve the performance of the ATM system as a whole while balancing the needs of individual ATM community members.

4.4.2 CDM benefits all participating parties through the negotiation of proposed options. The negotiation is concluded either at the moment when all participating parties agree, or when they are unable to accept further compromises due to defined priorities. The principles of CDM should be adopted by the civil and military authorities, appropriate civil ATS authorities and/or appropriate military units as a tool to support FUA.

4.4.3 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 respective operations. By enabling decision-making based on accurately shared information, CDM increases predictability in case of unforeseen events or disruption. Properly carried out, CDM also leads to optimum airspace utilization.

4.4.4 CDM should be applied to all layers of decision making from strategic planning through to real-time operations and post operational analysis. Civil and military authorities and stakeholders should establish pre-defined and agreed upon procedures and rules to ensure that collaborative decisions will be made expeditiously and equitably.

4.4.5 The State should ensure that a framework is established for the effective coordination between ATS, ASM and ATFM at the three FUA phases (strategic, pre-tactical and tactical) in a collaborative manner, and ensure the establishment of cooperation and coordination agreements defining clear and unambiguous operational procedures at pre-tactical and tactical phases.

Note.— ATFM is detailed in the Manual on Collaborative Air Traffic Flow Management *(Doc 9971)*

4.5 FUA AIRSPACE STRUCTURES

4.5.1 General considerations

4.5.1.1 Special use airspaces (SUAs) are airspace volumes designated for specific operations such as, military training, exercises and operations of a nature such that they require limitations on airspace access to be imposed on other aircraft not participating in those activities. These may include, but are not limited to, airspace reservations and/or airspace restrictions in the form of restricted or danger areas to ensure safety and proper notification of airspace users.

4.5.1.2 FUA needs to balance and, to the extent possible, meet the needs of civil and the military stakeholders. The notion of balance is even more important when establishing and operating a SUA, since the ultimate goal is to establish airspace blocks of optimized dimensions that are operated in a cooperative manner. Achieving this usually involves regular discussions between civil and military parties on a long-term basis that build on understanding and trust.

4.5.1.3 Reviewing SUAs is fundamental at the strategic stage of civil-military cooperation. An effective and regular airspace review provides the foundation upon which FUA is based. The SUAs review should follow the following principles:

a) SUAs should only be established after due consideration of its effect on civil air traffic by a national CAOM to ensure it will be:

1) used for the purpose that it is established;

2) used regularly;

3) sized in line with the operational requirements;

4) if applicable, operated in accordance with FUA principles; and

5) activated only when it is being utilized;

Note.— See 4.5.1.5 for the application of a safety buffer.

b) SUA and associated processes and procedures should be regularly reviewed to ensure the activities that affect the airspace, its size and the timing of such activity are accurately reflected by the SUA type, dimensions, activation notice and duration of activation. The review frequency should be determined by each State according to its needs, complexity and the pace of airspace evolution. In all cases it should be less than every five years.

4.5.1.5 Another area of inconsistency that could be identified through a regular review process involves the way in which SUAs are designed. For military training, a State should use safety templates to determine the volume of airspace needed to contain any aircraft and ordnance. Such templates usually rely on the setting of safety buffers that can either be inside or outside the SUA (or a combination of the two), to ensure the safety of non-participating traffic. Standardized buffers should be considered when defining vertical and horizontal limits of an area within a given State. Regular reviews of SUA usage should identify any discrepancies in the design of SUA and assist with their resolution.

4.5.1.6 *Moving beyond SUAs.* Regular and qualitative civil-military cooperation can lead to the execution of certain military operations, such as training and formation flights, within a civil controlled airspace without the use of SUAs, especially when civil ATC understands military operating parameters. In these circumstances, the military mission may be afforded the protection of a temporary block of airspace that would normally be utilized by civil aircraft but is exceptionally allocated to military users. Appropriate planning with civil authorities and airspace users enables the mission to be conducted while minimizing the impact on civil operations: a win-win situation enabled by civil-military cooperation.

4.5.1.7 *Uncontrolled airspace.* Uncontrolled airspace is an unknown traffic environment where aircraft operating in accordance with visual flight rules (VFR) may operate without establishing continuous two-way communications with the appropriate ATS unit. In order to guarantee the safety of all airspace users, the implementation of FUA structures is not advised in uncontrolled airspace, unless special requirements and procedures are put in place, including a clear and efficient notification process to ensure that all airspace users, including those not in contact with an ATSU, are aware of the airspace status.

4.5.2 Enhanced FUA airspace structures

Implementation of enhanced FUA should be based on flexible and adaptable airspace structures and procedures that are appropriate to the location, suited to temporary allocation and utilization. This manual explains the use of conditional routes (CDRs), temporary reserved areas (TRAs) and cross-border areas (CBAs). Restricted and danger areas may be declared suitable for FUA pre-tactical management and identified as such ("manageable") in the AIP. A SUA could be defined as "manageable" if its activation decision, in terms of airspace volume and time, is the outcome of a negotiation process at the AMC level. It is possible to implement dynamic FUA without using all of the structures described above, but only those deemed necessary.

4.5.2.1 Conditional routes

4.5.2.1.1 A CDR (Figure 4-2) is a non-permanent ATS route or portion thereof which can be planned and used under specified conditions. The properties of CDRs, including their categories, alignment, route designator and availability for flight planning are published in the national AIP. It remains a State responsibility to decide whether an AIS notification (such as NOTAM) is required as an additional publication. CDRs can be established at the FUA strategic phase:

a) through areas of potential temporary reservations (e.g. TRAs, manageable danger and restricted areas), with opening and closure conditions resulting from associated military activities; and/or

b) to address specific ATC conditions (e.g. traffic restrictions or ATC sectorization compatibility) with opening and closure conditions resulting from purely civil needs.

4.5.2.1.2 ATS providers should implement appropriate mitigation measures to ensure that flight plans are not accepted if they include unavailable CDRs.

4.5.2.1.3 According to their foreseen availability, flight planning possibilities and the expected level of activity in the associated airspace reservation, CDRs can be divided into the following categories:

— Category 1 CDRs (CDR1): Permanently plannable.

— Category 2 CDRs (CDR2): Non-permanently plannable.

4.5.2.1.4 Category 1 CDRs is available for flight planning during times published in the AIP.

4.5.2.1.5 When a CDR is expected to be available most of the time, it should be declared as permanently plannable for stated time periods and published as a Category 1 CDRs in AIPs. A Category 1 CDR can either be established on a 24-hour basis or for fixed time periods or at fixed flight level bands.

4.5.2.1.6 Unavailability of a Category 1 CDRs not affecting flight planning can be treated tactically when appropriate. In case of the notified unavailability of a Category 1 CDRs for flight planning, tactical utilization may be granted based on defined tactical coordination procedures between responsible ATS and/or controlling military units whenever applicable.

4.5.2.1.7 To achieve the expected dynamicity, Category 1 CDRs and Category 2 CDRs availability or non-availability is usually notified on day before the operation by the notification to relevant stakeholders of the airspace allocation on the day of operation through the airspace use plan. It remains a State responsibility to decide whether an AIS notification (e.g. NOTAM) is required as additional publication. If an additional AIS notification is published, States are responsible for ensuring consistency between relevant publications (e.g. NOTAM and airspace use plan/updated airspace use plan).

4.5.2.1.8 Category 2 CDRs may be available for flight planning. Flights may only be planned on a Category 2 CDR in accordance with conditions published daily in the airspace use plan and updated airspace use plan.

4.5.2.1.9 Category 2 CDRs form part of predefined routing scenarios depending on the allocation of associated SUA or for addressing specific ATM conditions. Category 2 CDRs availability can be requested to adjust traffic flow, when a capacity shortfall has been identified and after relevant factors have been considered by the ATS units concerned.

4.5.2.1.10 When not available according to the airspace use plan or updated airspace use plan, Category 2 CDRs may also be managed tactically, whenever conditions allow short-notice usage, subject to preventive coordination between responsible ATS and/or controlling military units.

4.5.2.1.11 Non-plannable tactically available routings should be made available at short notice when the pre-notified activity in a SUA has ceased, or for addressing specific ATC conditions. After coordinating with the ATS or controlling military unit(s) in charge of the SUA, the responsible controller may offer an aircraft a short-notice routing through the area by providing ATC instructions.

4.5.2.2 Temporary airspace allocation and reservation

4.5.2.2.1 The temporary airspace allocation process consists of the allocation of airspace of defined dimensions for a temporary reservation. In the dynamic FUA concept, all airspace reservations are subject to management and allocation during pre-tactical phase.

4.5.2.2.2 A TRA constitutes an example of airspace reservation that can be effectively managed flexibly and dynamically using FUA processes. A TRA (Figure 4-2) is 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 (or may not be) allowed to transit under ATC clearance. Whether the unit controlling the area can allow tactical crossing (or not) is based on its own decision and depends on the applicable agreements and dynamics of the ongoing activity. It remains a State responsibility to decide whether an AIS notification (such as NOTAM) is required as an additional publication to the AUP/UUP.

4.5.2.2.3 When the publication of a NOTAM is deemed necessary by a State, the NOTAM Code Group should include RA as its second and third letters to indicate an airspace reservation, followed by the appropriate fourth and fifth letters such as CA for activated (*Procedures for Air Navigation Services — ICAO Abbreviations and Codes* (PANS-ABC, Doc 8400) refers). Important information regarding the TRA, such as the TRA unique identifier, the coordinates - if not published in the AIP - as well as other conditions in application during the activation, should be provided in plain language in Item E) of the NOTAM (see details in PANS-AIM).

4.5.2.2.4 When established, manageable airspace (e.g. TRA, danger or restricted) should be published in the en route (ENR) section of the AIP with the time of possible activation which can be either a defined period or 24 hours a day.

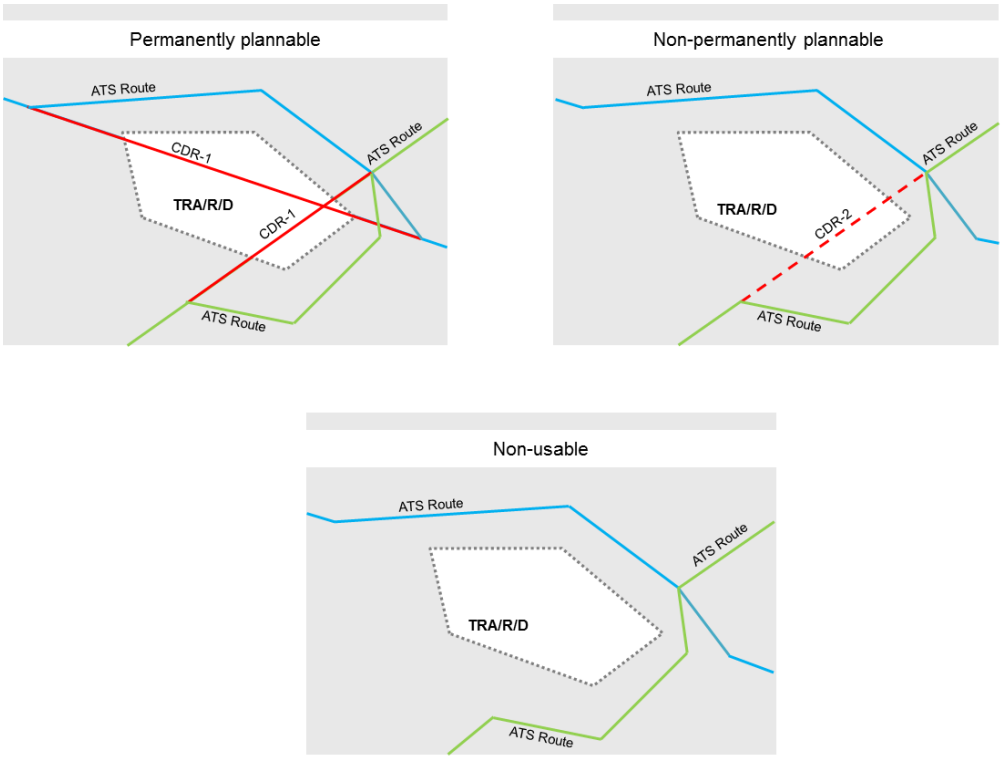

Figure 4-2. Example of options for flexible FUA structures

4.5.2.2.5 The temporary airspace allocation process gives States considerable flexibility in the use of airspace. Manageable airspace is established during the FUA strategic phase, allocated at the FUA pre-tactical phase in response to daily requests for specific periods, and activated during the FUA tactical phase for periods corresponding as closely as possible to the real time civil or military airspace users' requirement.

4.5.2.2.6 The AMC-manageable airspace reservations, like TRAs, may supplement, replace or modify, where possible, existing airspace structures such as danger or restricted areas in order to increase flexibility. However, in some situations, for example in airspace over the high seas (where only danger areas apply), or because of difficulty in the notification of airspace status to airspace users in ATS classes of airspace where flight planning is not required, States may have a continuing requirement to retain non-manageable danger and restricted areas. The remaining areas that are not suitable for FUA pre-tactical phase management remain unaltered from traditional utilization and are identified as such in the AIP.

4.5.2.3 Cross-border area

4.5.2.3.1 A cross-border area is a portion of airspace subject to reservation, established for specific operational requirements over international borders (Figure 4-3 refers). Cross-border areas are established to allow military training and other operational flights on both sides of an international border. Their use alleviates the constraints of national boundaries and enables the selection of a suitable location for both civil and military aviation. Use of such areas, combined with the potential use of conditional routes, improves the airspace structure and the designed ATS route network in regions located close to national borders. Political, legal, technical and operational agreements between the States concerned are required prior to the establishment of CBAs. Formal agreements must address issues of sovereignty, defence, legality, operations, the environment and SAR.

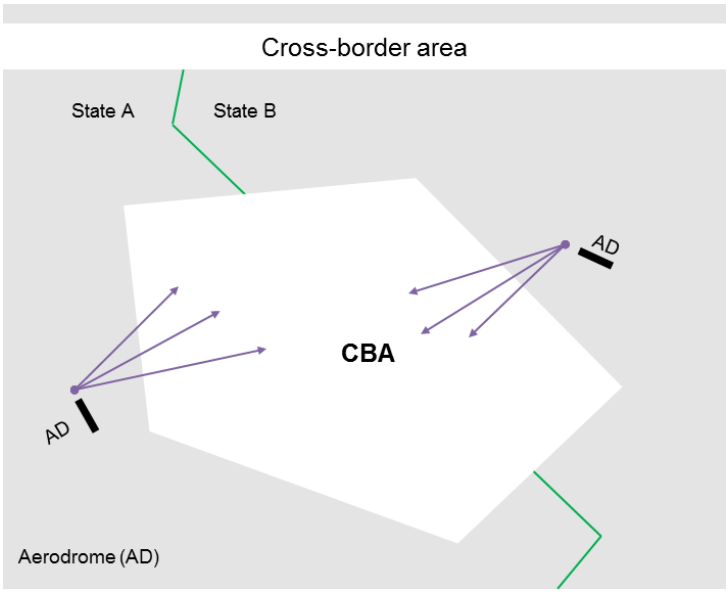

Figure 4-3. Cross-border area

4.5.2.3.2 The flexible management of cross-border area during the pre-tactical phase implies that the allocation of airspace is managed by one AMC only. This needs to be established by an agreement between the States concerned, which may decide to establish either one AMC (a "lead" AMC) to assume this role, or a joint AMC. Another option, although it is less optimal, is to retain two AMCs and define their respective responsibilities and associated processes through an agreement.

4.5.2.3.3 Cross-border activities should be supported by a common set of procedures to manage specific traffic situations and enhance real-time airspace management. They should be agreed among the civil ATS unit and the appropriate military units concerned.

4.6 FUA STRATEGIC PHASE

4.6.1 Governments should endorse the principle of civil-military cooperation and coordination at the State level by harmonizing policies regarding civil-military ATM cooperation and coordination. Cooperation should include coordinating airspace design and development, airspace access, standardizing procedures, regulation and supporting long and medium-term ATS planning. The policies should also define the CDM responsibilities for civil and military aviation authorities, in managing civilian use of military airspace, implementing procedures to apply airspace reservations or restrictions based on actual use, and release of airspace restrictions once activation is complete.

4.6.2 The civil aviation authorities of many States are already working with military authorities, using coordinated processes to manage civilian use of active military airspace. Jointly, civil and military authorities have developed procedures to apply airspace reservations or restrictions only during limited periods of time, based on actual use. Upon completion of the activation requiring reservations or restrictions, airspace is made available again to civil traffic.

4.6.3 The strategic phase consists of a joint civil and military process that will design and implement the national airspace policy. To achieve this, States should establish a joint national CAOM that is responsible for the design, implementation and oversight of a collaborative FUA.

4.6.4 For the strategic phase, there is no real differentiation in the description between a basic or enhanced implementation of FUA; the principles, tasks and responsibilities remain the same. The difference lies in the decisions taken under these principles and tasks, to the extent of collaborative planning and management.

4.6.5 The management of airspace implemented during the strategic phase should abide by the following guiding principles and strategies:

a) all available airspace should be managed flexibly, within the limits of the ATM system capability and complexity of operations, to support dynamic flight trajectories and provide optimum operational solutions. The required predictability for civil aviation needs to be balanced against the required flexibility of the military;

b) the effective implementation of a flexible process demands commitment from all stakeholders involved. Whenever possible, temporary access for civilian users into airspace normally used by the military or the accommodation of special military operations within airspace normally used by civil operations, should be allowed;

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

d) airspace use should be coordinated and monitored at strategic, pre-tactical and tactical phases to accommodate the conflicting requirements of all users and to minimize any constraints on operations; and

e) when portions of airspace are allocated for specific operations, such constraints should be planned in advance with the necessary changes made dynamically whenever possible, including accommodating short-notice unplanned requirements.

4.6.6 During the strategic phase, the following tasks need to be performed to ensure the overall application of the FUA concept:

a) design and establish airspace structures;

b) develop coordination procedures and airspace management procedures;

c) develop separation minima and operational rules in order to define responsibilities between civil and military control units when accommodating interactions between civil and military flights;

d) develop cross-border coordination if necessary, and

e) perform regular reviews of the national airspace structures, performance data and post-operations analysis reports as appropriate.

4.6.7 During the strategic phase, States determine the working structures for pre-tactical and tactical phases, and give them the authority required to carry out their tasks. States lay down the procedures to be followed at these tactical and pre-tactical phases and agree on priority rules and negotiation procedures for airspace allocation during the pre-tactical and tactical phases.

4.6.8 States should ensure that the national airspace policy and the coordination procedures for the joint civil-military airspace allocation and review process are defined taking into account:

a) the needs of all stakeholders and safety of all airspace users;

b) national security and defence needs;

c) civil aviation commercial and economical needs

d) environmental issues;

e) seasonal weather; and

f) ATM network effects.

4.6.9 States should ensure that civil-military cooperation and coordination is organized at each FUA phase to maximize operational benefits for all parties, which could vary based on expected objectives, functional output and airspace complexities.

4.6.10 States should ensure that specialists are appropriately trained and qualified. This can be done through personnel licensing, certification equivalence agreements or formal joint recognition of experience in particular specializations. Likewise, where system output and interoperability are relevant to both civil and military functions, ATM systems designs should have input from qualified civil and military specialists.

4.7 FUA PRE-TACTICAL PHASE

4.7.1 Pre-tactical FUA is a series of activities allowing for a better exchange of information and better coordination of airspace needs between the strategic and the tactical FUA phases. Such coordination may take the form of exchange of information supported or followed by formal publications like NOTAM. It may also be more advanced and include some CDM processes before a decision is made on airspace utilization.

4.7.2 Any kind of pre-tactical coordination is highly recommended to improve airspace efficiency, develop confidence building between the various categories of airspace users and refine airspace utilization planning as close as practicable to the day or period of operation. Such coordination implies the need to define procedures (at the FUA strategic phase), find the right balance between predictability and flexibility and consider the needs of all users and applicable operational conditions.

4.7.3 When NOTAMs are promulgated with applicable notice (e.g. seven days in advance), good practice is to have procedures in place to trigger the cancellation of such NOTAMs if the need for the airspace restriction has been cancelled, or if it will not be possible to make use of the airspace restriction as initially planned.

4.7.4 When an airspace restriction needs to be managed, the FUA concept recommends that, where possible, restricted and danger areas should be replaced or modified by more flexible arrangements (e.g. “manageable” restricted and danger, TRAs) which are part of the enhanced FUA implementation as described in 4.8. In this case, the AIP should identify the “manageable area” (with the entity responsible, e.g. AMC) as the area managed and allocated in the FUA pre-tactical phase. The remaining prohibited, restricted or danger areas that are not suitable for pre-tactical phase management may remain unaltered from conventional utilisation and should be identified as such in the AIP. Those States which have a continuing requirement to retain danger areas should, however, allocate and manage such areas.

4.8 ENHANCED FUA PRE-TACTICAL PHASE

4.8.1 States should ensure that appropriate civil-military ASM structures and processes are established and managed by a joint civil-military AMC. The outcome of this phase is the publication of the airspace use plan (AUP), which builds on the priorities established in the strategic phase and subsequent required aeronautical publications, such as NOTAMs, when applicable.

4.8.2 The AMC is responsible for the effective drafting and sharing of pre-tactical ASM data to develop a daily AUP. The AUPs should be promulgated and published on the day before the operation, ideally at the same time each day. Experience has shown that AUPs should be issued in the afternoon to minimize the chances of further changes, which will then result in one or more updated airspace use plans (UUPs) being issued. AUPs and UUPs should include, as a minimum, the following:

a) a header: unique identification for the sending unit, date and time of the promulgation, message type (AUP or UUP), validity period (e.g day of operations 06:00 UTC until the next day 06:00 UTC);

b) SUAs activation identification;

c) SUAs vertical dimension, start time and end time of the activation (UTC time);

d) CDRs availability, vertical dimension, start time and end time of the activation (UTC); and

e) the unit responsible for each activated SUA.

Optional information to be published in AUPs (or UUPs) could include the following:

a) information related to national events, such as major military exercise, major sport events, head of State visits, etc;

b) civil and/or military sector configurations;

c) capacity and flow forecast;

d) special or unusual air activity outside established SUA structures; and

e) remarks field with any other relevant information.

Note.— Examples of AUPs and UUPs can be found on the EUROCONTROL Network Management public portal[1].

4.8.3 Civil and military authorities should introduce the appropriate support systems, automated and interconnected where possible, for a timely communication of AUP and UUP to all relevant stakeholders.

4.8.4 States (or the established CAOM) should form an AMC with the authority to conduct the daily airspace management with the conditions and procedures agreed upon during the strategic phase and based on requests from airspace users. The AMC 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, and should be provided with adequate supporting systems for a timely and efficient FUA process (see 4.8.6 below).

[1] https://www.eurocontrol.int/portal/network-operations-portal

Note.— An AMC can also be a joint cell of two or more States.

4.8.5 The AMC is responsible for day-to-day pre-tactical airspace allocation and negotiation rules and protocols established by the national CAOM in accordance with airspace allocation priorities. It conducts pre-tactical airspace allocation and management operations to resolve conflicting airspace requests identified in the pre-tactical phase. The responsibilities of the AMC are to:

a) act as the national and, where appropriate, international day-to-day focal point for pre-tactical coordination;

b) collect and analyse all airspace requests which may require temporary airspace segregation, including airspace allocation decisions taken during the strategic phase with respect to major military exercises, air shows etc.;

Note.— Major/specific events planned well in advance, such as large-scale military exercises, which require additional airspace, are subject to strategic phase coordination; these activities are to be notified by AIS publication. However, depending on the State's ASM organization, additional coordination may take place at the level of the AMC in order to improve the efficiency of the airspace utilization.

c) analyse airspace structures availability and the traffic demand, anticipated ATC capacity problems and expected traffic delay due to ATC sectors congestion;

d) decide on allocating reserved/restricted areas and CBA, after completing the coordination, analysis, negotiation and resolution process, considering the ATFM plan for the day of operations;

e) make Category 2 CDRs available for flight planning in accordance with established procedures and decide on the unavailability of Category 1 CDRs in accordance with criteria established during the strategic phase;

f) promulgate the national AUP on the day before the operation to all concerned users. The AUPs should be published in an agreed format, as soon as possible and by an agreed published time (e.g. at 1800 hours local time), to cover the twenty-four hour period of the next day (e.g. between 0600 hours the next day to 0600 hours the day after);

g) collect and analyse updated information on the day of operation from approved agencies concerning the cancellation of reserved/restricted areas already published in the current daily airspace use plan;

h) promulgate, when necessary, UUPs containing additional reservations, or amendments or cancellations of reserved/restricted areas during the period of validity of the current airspace use plan; and

i) participate in a post-operation analysis of airspace allocation.

4.8.6 Units that represent users (e.g. squadrons, wings, ATS units/flow management positions) wishing to utilize airspace managed by the AMC, are identified as approved agencies and are authorized by the national authority concerned. Approved agencies can participate in the negotiation and coordination process of the AMC to use allocated SUA and other allocated airspace as appropriate.

4.8.7 Approved agencies are expected to:

a) prepare airspace use programmes regarding activities requested in a timely manner;

b) submit requests for airspace utilization to the AMC at least one day before the proposed activity;

c) ensure that, on the day of the activity, the airspace is used as allocated by the AMC; and

d) request, in a timely manner, adjustments to the airspace use plan, or cancel any airspace allocation no longer required. The information should be provided to the AMC for the promulgation of an UUP and transmitted to the relevant ACCs and users in accordance with national procedures.

4.8.8 States should ensure that the AMC is equipped with the supporting systems to assess airspace allocation requests, manage such allocation and communicate in due time, its availability to affected users, neighbouring AMCs, ATS units and other relevant partners and organizations.

4.8.9 Category 1 CDRs unavailability should be listed in the daily national AUP. The State decides whether an additional AIS notification (e.g. NOTAM) is required and is responsible to ensure that the information is consistent.

4.9 FUA TACTICAL PHASE

4.9.1 Tactical FUA should be carried out at the civil ATS level and with appropriate military units. This phase is the same for basic and enhanced FUA. Dedicated coordination procedures and communication between these units are necessary for the timely and mutual provision of airspace data. All affected users should be notified in a timely manner of the current status of the airspace.

4.9.2 In addition to routine tactical ATM inputs such as ATC tactical coordination or changes to the tactical airspace configuration, unforeseen events may require deviations from the initial airspace plan (i.e. meteorological conditions, national security incident alerts, SAR operations or natural disasters, etc.).

4.9.3 Tactical coordination allows States to adapt to real time changes. To ensure such changes do not adversely impact civil or military operations, a CDM framework is needed. It should operate along the following principles:

a) the appropriate definition, agreement and execution of coordination procedures between civil and military agencies to ensure the safety of civil and military flights;

b) the readiness of appropriate procedures and protocols to enable, on an ad-hoc basis, access to sovereign airspace by foreign state aircraft in unusual or unforeseen circumstances such as SAR activities, humanitarian events and/or natural disasters, unforeseen security and defence events etc.; and

c) the proper written agreements enabling coordination procedures and direct communication between appropriate civil and military units to safely resolve specific traffic situations.

4.9.4 When carrying out real time civil-military coordination States should ensure that:

a) coordination procedures (including the use of system support, between civil ATS and appropriate military units) facilitate the delivery of real-time activation, deactivation or reallocation of the airspace agreed upon during the pre-tactical phase;

b) the determination of these coordination procedures considers the potential impact on the network;

c) the procedures for the timely modification of the proposed pre-tactical airspace plan (the daily AUP as planned during the pre-tactical phase) among all affected civil ATS units and appropriate military units are established in written agreements;

d) all users are notified of any planned activity modifications in a timely and effective manner to facilitate safe, efficient and economic operations; and

e) the provision of data at the network level is framed to a national security and defence requirement.

4.9.5 Tactical coordination may be carried out at AMC level or, if the timing is too short, directly between ATS units and the appropriate military units. The role of each entity and their tactical coordination procedures should be defined during the strategic phase.

4.9.6 Dedicated coordination procedures and communication facilities should enable the timely sharing of tactical airspace data and all affected users should be notified of the current status of the airspace (see Chapter 3, 3.2.2).

4.9.7 SUAs that have been activated by NOTAMs and is no longer needed (e.g. mission cancelled), should be released in a timely manner and made available (notified) to other airspace users for their operations. If it was not released during the pre-tactical phase, it should occur during the tactical phase.

4.9.8 For an efficient FUA process, dynamic FUA, civil ATS units and appropriate military units require reliable means of communications and agreed upon procedures to enable safe and efficient real time coordination of SUAs management and of the flights operating in that airspace. This should allow for effective real-time activation, deactivation or reallocation of the airspace allocated during the pre-tactical phase.

4.9.9 Real time access to flight data, including the intentions of the controller, with or without system support, optimizes the use of airspace and reduces the need for airspace segregation. When civil and military controllers provide services in the same or adjacent airspace(s), direct communication between civil ATS units and appropriate military units should be available. This direct communication should be sufficiently reliable for the safe resolution of specific traffic situations, and should be used in accordance with procedures detailed in written agreements. Associated coordination actions, which include the prompt exchange of information relevant to the safe and expeditious conduct of both civil and military flights, can take place either in an active (as a result of the actions of a controller) or a passive mode (without any action by the controller, such as automatic data exchange). The capability to exchange relevant flight data between civil ATS units and appropriate military units is paramount.

4.10 FUA POST OPERATIONS ANALYSIS

4.10.1 ASM, and more particularly FUA, cannot achieve its expected benefits without post-operation analysis. After establishing the high-level airspace organization and management principles at the national level, its operations should be monitored and the results evaluated. States should consequently establish mechanisms to archive data on FUA activities and in particular the requests, allocation and actual use of airspace structures. Information on the impacted civil traffic should be archived as well as input to the analysis of the usage of released SUAs and for the strategic phase to review SUAs definitions in time and space.

4.10.2 Archived data may be aggregated to calculate performance indicators used to identify accrued benefits and, more importantly, possible areas for improvement. The results of such performance evaluations should be used to review the airspace structure and its procedures established during the strategic phase, for the organizations involved in civil military cooperation to thrive towards the most efficient airspace organization through constant improvements.

4.11 CROSS-BORDER AND CROSS-FIR BOUNDARY OPERATIONS

4.11.1 When deemed necessary, States should establish joint airspace policies to facilitate cross-border operations and cross-FIR boundary operations, addressing legal and institutional aspects such as sovereignty, liability, defence, environment, search and rescue and other issues of common interest.

4.11.2 When outlining the processes for cross-border operations and cross-FIR boundary operations, States should ensure the following:

a) the operational requirements for cross-border operations and cross-FIR boundary operations stemming from the assessment of national airspace structures and the ATS route network, are defined to encompass activities conducted by other States;

b) written bilateral or multilateral agreements are concluded to create a framework for cross-border operations and cross-FIR boundary operations. The agreements would address legal and institutional aspects while respecting sovereignty, defence, environment, search and rescue and other issues of common interest. These agreements should also encompass operational and technical aspects and activities conducted by other visiting States within an area established across international boundaries or entirely within their sovereign airspace; and

c) a joint concept of operations for cross-border operations and cross-FIR boundary activities is established and considers the impact to the ATM network and military mission effectiveness.

4.11.3 To ensure the effectiveness of cross-border operations and cross-FIR boundary activities, States should:

a) coordinate their FUA policy with neighbouring and visiting States to harmonize airspace management and use of airspace, while considering the impact on the ATM network;

b) conduct regular joint assessments and reviews of cross-border operations and cross-FIR boundary operations with neighbouring and relevant States;

c) create multinational civil-military coordination working arrangements to understand the airspace user needs and requirements of visiting States, harmonizing airspace structure as necessary. Such working arrangements should also be utilized on an ad hoc basis for large-scale exercises and/or major/specific events;

d) ensure that airspace structures on either side of national borders or FIR boundaries are coordinated and implemented to optimize the airspace for all users;

e) jointly define and approve a clear set of separation minima and coordination procedures to be applied between civil and military flights where cross-border/cross-FIR boundary operations have been agreed; and

f) where States have agreed on establishing cross-border operations across a shared border, they should appoint a lead AMC and ensure that the lead, joint or multi-national AMC has the responsibility for pre-tactical FUA pre-tactical phase on both sides of the international border.

4.11.4 Where a joint or multinational AMC is established, written agreements are concluded covering all relevant operational, technical, procedural and personnel issues. These can include (but are not limited to):

a) responsibilities and liabilities;

b) information exchange;

c) ATC procedures;

d) coordination and phraseology;

e) air defence notification and related control procedures;

f) other operational issues;

g) personnel issues including qualifications and training;

h) technical issues; and

i) contingency plans.

4.12 AIRSPACE OVER THE HIGH SEAS

4.12.1 States which have accepted the responsibility for the provision of ATS in airspace over the high seas recognize that aircraft cannot be denied access to this airspace, although operational restrictions might apply for air traffic control service reasons. States therefore should have airspace management procedures in place to facilitate this. Annex 11 — *Air Traffic Services*, provides for activities potentially hazardous to civil aircraft, whether over the territory of a State or over the high seas, to be coordinated with the appropriate air traffic services authorities. Furthermore, States establish procedures to enable the organization or unit conducting or identifying activities potentially hazardous to civil aircraft to contribute to the safety risk assessment in order to facilitate consideration of all relevant safety-significant factors. This coordination would be effected early enough to permit timely promulgation of information regarding the activities in accordance with *Procedures for Air Navigation Services — Aeronautical Information Management* (PANS-AIM, Doc 10066).

4.12.2 A State, having reasons to establish a danger area over the high seas, should consider the potential impact on the safety, regularity and efficiency of international civil air traffic and well as the more specific recommended practices contained in Annex 11. In this context, management of danger areas and the establishment of conditional routes and dynamic trajectory operations over the high seas can yield the same benefits as over sovereign airspace. These benefits include added airspace capacity and improvements in the efficiency and flexibility of aircraft operations.

4.12.3 States should ensure that information on the status of the airspace is widely made available through the appropriate aeronautical publication and, if established, an AMC should act as the focal point for all airspace use requests.

Chapter 5

CIVIL-MILITARY INTEROPERABILITY

5.1 INTRODUCTION

5.1.1 Interoperability between civil and military CNS/ATM infrastructure resources, systems and organizations, including those supporting civil and military ATM and air defence increases capacity in congested airspace, enhances safety levels, preserves the environment, raises flight efficiency and contributes to optimal ATS provision. This interoperability provides benefits for civil as well as military aviation and supports advanced concepts, including CDM (see in Chapter 1, *Note* under 1.2.11).

5.1.2 To overcome the difficulties caused by the mismatch of civil and military standards and certification, an alternative certification process based on the principles of performance equivalence [1] can utilize available military capabilities to comply with civil CNS/ATM requirements expressed as performance levels and attributes. Performance equivalence is one option for compliance. If it cannot be used, other options can be considered such as full compliance with civil requirements or other special measures such as specific procedures to be developed. For example, the increase of separation between civil and military aircraft, should the military aircraft be unable to comply with certain navigation performance.

5.1.3 Military authorities usually have stringent security requirements when they decide to exchange information with their civil counterparts. This impacts ground-ground and air-ground data exchanges. Security measures should be implemented when applicable to preserve the confidentiality, integrity and availability of sensitive data. Where a State deems it necessary for national interest, secure ground-ground communications may be established between military units and civil ATS units to enable the coordination within State established security requirements. In these cases, appropriate agreements should be in place to safeguard sensitive information.

5.1.4 Synergies in the acquisition, integration and modification of new systems that cater fully for civil as well as military requirements, should contribute to higher interoperability levels[2]. Civil-military coordination for research, planning, project management and procurement strategies should be performed when replacing legacy systems and when developing new technologies. The military can benefit from coordinating with the industry as these entities have significant experience in procurement processes.

5.1.5 Interoperability between civil and military systems should be done at the lowest possible cost for both civil and military stakeholders, but the respective systems implementation costs should also be weighed against the economic benefits they will yield or the positive budgetary outcome they could induce for the State (gained e.g. by the common use of CNS/ATM infrastructures, common procurement or by enabling more efficient civil and military flights). Military acquisition is a management process dealing with State investments in the technologies, programmes and product support needed to achieve national security and defence objectives. Roadmaps on Enhanced Civil-Military CNS Interoperability and Technology Convergence are openly available on the internet.

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[1] EUROCONTROL, EDA and the North Atlantic Treaty Organization describe Performance Equivalence as “the ability to meet the required functional attributes of CNS/ATM systems against the performance, safety, security and interoperability requirements of regulated airspace. This includes the measurable (e.g. metrics from regulations and standards) and non-measurable functional requirements (e.g. procedures or technical architecture), demonstrated through the evaluation of accuracy, integrity, continuity of function and availability.”

[2] https://www.eurocontrol.int/press-release/civil-military-atc-belgium-managed-using-single-atm-system

5.1.6 The limits of civil-military interoperability solutions are reached when it jeopardizes the ability of the armed forces to conduct military training and operational missions.

5.2 PROCEDURES AND/OR TECHNICAL INTEROPERABILITY

Where technical interoperability, i.e. relying on the ability to exchange information between equipment or systems, cannot be achieved, applying procedures can be an alternative option to achieve the required safety level and accommodate military aircraft in airspace where mixed (civil-military) operations are supported. An example of such operational procedures could be the handling of a non-reduced vertical separation minima (RVSM) approved flight in a designated RVSM airspace, where this flight would be separated by 2 000 ft from all other traffic.

5.3 REGULATIONS AND STANDARDIZATION

5.3.1 States should establish standing civil-military bodies consisting of aviation authorities, service providers and the military. These bodies would determine the required and desired civil-military procedural and technical interoperability as well as commonly used resources and their management, while ensuring that national defence and military mission requirements are not jeopardized. This determination should consider specific civil and military requirements including security. State regulations in this regard should be agreed to at this level. For example, some States such as Germany or the United Kingdom, have established Military Aviation Authorities to address the airworthiness and regulatory consideration of parts of their state aircraft operations.

5.3.2 The process and outcome of the state aircraft and/or military system certification[3] that originates from a competent military authority and emanating from the international standards published or referenced by ICAO, could serve as the basis for national and mutually agreed responsibility. Recent examples of certification by States have demonstrated the possibility for civil certification agencies to certify military systems, such certification will facilitate the aircraft operations in civil controlled airspace, e.g. the European Union Aviation Safety Agency (EASA) A400M certification.

5.3.3 Where possible, military authorities should use the internationally standardized systems specified in Annex 10 — *Aeronautical Telecommunications* and often further defined in the specifications from internationally recognized standard-developing organizations (such as RTCA, EUROCAE). States may publish national equipage mandates (or regional mandates, where legally applicable), including provisions on the interoperability between civil and military systems. When doing so, authorities should consider catering to particular requirements associated with military operations. Therefore, when developing national or regional mandates, the appropriate exemption procedures for state aircraft should be included. States should offer transition arrangements for retrofit or forward fit, and consider exemption or derogation schemes. For example, automatic dependent surveillance — broadcast (ADS-B) performance requirements mandates will permit ANSPs to provide a surveillance based ATS service in areas where surveillance is not traditionally available. As this technology reduces lateral separation standards, suitably equipped aircraft will benefit from more efficient flight routes and increased safety. However, non-ADS-B equipped state aircraft operating within ADS-B mandated airspace on exemptions or waivers will still require traditional non-surveillance separation standards. The combination of non-ADS-B and ADS-B aircraft prevent the latter from fully benefiting from the technology when operating along the same routes or trajectory. While it is recognized that ATS and military authorities should develop special procedures for the special handling of non-equipped aircraft during transitionary periods, State authorities should ensure military aircraft equipage schedules are established considering the impact on the air navigation system as a whole.

[3] Unlike in civil aviation, where ICAO develops SARPS for the consideration of its Member States, there is no global regulatory framework for state aircraft; neither for military CNS, ATM and AIM systems in general.

5.4 CNS/ATM/AERONAUTICAL INFORMATION MANAGEMENT (AIM) AND PROCEDURES

Note.— The following contains a list of civil and ICAO Standards and Recommended Practices (SARPs)-based systems relevant for military and state aircraft operators aiming for interoperability.

5.4.1 Communication systems

5.4.1.1 Ground-ground communications

5.4.1.1.1 Today, most military units rely on the ICAO aeronautical fixed telecommunication network (AFTN) or the common ICAO data interchange network (CIDIN) to receive aeronautical information, NOTAMs, meteorological data, etc. Military access to new ATS messaging handling system (AMHS) structures will become a civil-military interoperability requirement as soon as AFTN is gradually replaced by AMHS.

5.4.1.1.2 Networking based on the Internet Protocol (IP) is being introduced and access to its infrastructure will become a civil-military interoperability requirement. This will enable more advanced services including system-wide information management (SWIM). However, military use of the SWIM component of this infrastructure will depend, *inter alia*, on adequate security provisions.

5.4.1.1.3 Longer term requirements may imply the overall compliance of military systems with the following provisions:

a) aeronautical information and flight data;

b) data quality requirements; and

c) communication protocols (profiles).

The above would require suitable interfacing solutions to cover civil-military interoperability at the level of the technical infrastructure, also considering security.

5.4.1.1.4 To ensure operational coordination, especially in emergency situations, civil ATS, appropriate military units and their air defence units, should be connected by direct voice circuits or their digital equivalent. To improve safety as well as efficiency, voice should be complemented by an inter-centre electronic notification, coordination and transfer of messages according to the prevailing standards for civil aviation.

5.4.1.1.5 Due to evolving security requirements State and military authorities should consider enabling a direct secure voice coordination between appropriate military and civil ATS units. This requirement will vary from State to State but should consider the following factors:

a) the level of civil ATS support required for a specified type military operation;

b) the alignment of a State, civil ATS authority and military security requirements; and

c) the risk to civil aviation of not sharing information.

5.4.1.2 Air-ground

5.4.1.2.1 The availability of very-high frequency (VHF) on board military aircraft improves global airspace access. States may consider other interoperability solutions utilized by civil aviation.

5.4.1.2.2 For air-ground data communications, acquisition of data link capabilities for controller-pilot data link communications (CPDLC)[4] should facilitate more efficient use of the airspace that requires such capability. However, it is expected that many state aircraft will request exemptions from data link equipage requirements, due to mission requirements and challenges of forward fit.

Note.— Guidance on the use of air-ground capabilities is contained in the Global Operational Data Link (GOLD) Manual *(Doc 10037), and the* Performance-Based Communications and Surveillance Manual *(Doc 9869).*

5.4.2 Navigation systems

5.4.2.1 Performance-based navigation (PBN)

5.4.2.1.1 The PBN concept is defined in the *Performance-based Navigation (PBN) Manual* (Doc 9613). Military aircraft should gradually comply with PBN specifications where deemed necessary by the authorities.

5.4.2.1.2 PBN, including the use of satellite-based signals for en route and approaches, is gradually replacing traditional sensor-based navigation (typically supported by terrestrial navigation aids only).

5.4.2.1.3 When aircraft navigation systems do not meet PBN requirements, exemptions or special handling status by ATC may be required.

5.4.2.2 Global navigation satellite system (GNSS)

5.4.2.2.1 Future navigation requirements will increasingly rely mainly on GNSS, including augmentation services. However, there will remain a need to maintain some terrestrial navigation aids to support a reversionary conventional navigation environment in case of GNSS interference and outages, or to provide a conventional navigation environment for non-PBN-equipped users.

5.4.2.2.2 The availability of restricted signals capability of state aircraft should be considered in the performance equivalence process to support navigation in a mixed-mode environment by the military.

5.4.2.2.3 The long-term goal is to reach a high level of convergence between civil and military aeronautical navigation solutions. Military operational requirements with regard to positioning, navigation and timing may already exceed those imposed for civil navigation.

5.4.2.3 Navigation infrastructure rationalization

5.4.2.3.1 For civil aircraft, the ICAO strategy for rationalization of conventional radio navigation aids and evolution toward supporting performance-based navigation is summarized in Annex 10, Volume I, Attachment H.

5.4.2.3.2 Military aircraft are likely to operate in all weather conditions, day or night. They can fly at a low level, with or without the support of ground-based navigation aids, within civil-controlled airspace, at civil airfields and even when

[4] In accordance with the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444)

conducting military training in parallel with civil traffic.

5.4.2.3.3 This may require a residual number of VHF omnidirectional radio range (VOR) to be retained to support local operations in the vicinity of military aerodromes and to cope with limited airborne equipage. Retention of military en-route navigation aids (such as the tactical air navigation system (TACAN)) for military aircraft use, should be envisaged in the overall navigation scenarios until alternative consolidated navigational equipment is in place.

5.4.2.4 Instrument landing system (ILS)/microwave landing system (MLS)

5.4.2.4.1 The introduction of new civil systems and avionics will also yield benefits for the military in terms approach of and landing requirements.

5.4.2.4.2 Civil evolution in this domain includes the use of vertical guidance, based on approach procedures with vertical guidance (APV), to multiple runway ends to improve non precision approaches and/or to offer Category (Cat) 1 precision approaches. Ground-based augmentation systems (GBAS) have been standardized by ICAO to offer Cat II/III performance also. The ICAO strategy for introducing and applying non-visual aids to approach and landing is summarized in Annex 10, Volume I, Attachment B.

5.4.2.4.3 The evolution of civil systems should be considered by the military in relation to available airborne navigation resources. Multi-modes receiver (MMR) is widely available in military aircraft including ILS, MLS and differential satellite positioning system capabilities. The main driver of future military approach and landing concepts will require commonality with a civil system that will rely on a satellite-based GNSS infrastructure and use augmentation techniques (e.g. GNSS landing systems with combined SBAS/GBAS avionics).

5.4.2.5 Other considerations

5.4.2.5.1 States are encouraged to establish a formal process of coordination between all concerned civil and military organizations at the early stage of future avionics definition and development, to achieve maximum system interoperability[5] and to retain compatibility, where feasible, with legacy systems.

5.4.2.5.2 Where civil and military navigation infrastructures coexist and are compatible, the State should aim at coordinating their availability and reducing duplications to increase cost-efficiency. In addition, the joint acquisition of equipment and e.g. surveillance data sharing agreements should be considered in addition to common maintenance and/or training. The established national policy board may wish to oversee these actions.

5.4.3 Surveillance systems

5.4.3.1 Independent non-cooperative surveillance

5.4.3.1.1 Air defence units rely on extensive primary surveillance radar (PSR) coverage to detect non-cooperative targets. The provision of such data from independent non-cooperative surveillance systems such as PSR to the controller increases the situational awareness, safety and security of all stakeholders by adding a layer of surveillance and capability to ascertain the movement of civil aircraft when secondary surveillance radar (SSR) transponders are inoperable.

[5] if possible, in accordance with *Performance-based Navigation (PBN) Manual* (Doc 9613) or by State-created equivalent specifications.

5.4.3.1.2 Compared to independent non-cooperative surveillance systems, cooperative surveillance systems such as SSR and automatic dependent surveillance-broadcast (ADS-B) are vulnerable to malicious electronic attacks and unlawful interference.

5.4.3.2 Cooperative surveillance
(SSR, Mode S and automatic dependent surveillance-broadcast/contract (ADS-B/C))

5.4.3.2.1 SSR Mode S is the latest secondary surveillance radar used globally. It allows for the selective addressing of aircraft through the use of an aircraft (24-bit) address that uniquely identifies each aircraft and has a two-way data link between the ground station and aircraft, for the exchange of information.

5.4.3.2.2 A technique that combines the capabilities of the SSR Mode S system with those of ADS-B is the 1 090 MHz extended squitter (1 090 ES). This is accomplished by using an ES as the broadcast data link for transferring the aircraft-derived ADS report.

5.4.3.2.3 State aircraft should consider equipping Mode S and ADS-B OUT capabilities to conduct aerial operations where such infrastructure is used. However, not all state aircraft will be equipped in the short term, which calls for transitional measures to accommodate non-capable flights, since such transitional arrangements for non-Mode S equipped state aircraft have already been used. Mode S equipage should ensure the unambiguous and continuous individual identification of aircraft.

5.4.3.3 Other considerations

5.4.3.3.1 For safety net systems such as airborne collision avoidance systems (ACAS), ground proximity warning systems (GPWS)/terrain avoidance and warning system (TAWS), the militaries are expected to equip those avionics on a voluntary basis on some state aircraft, which are at least transport-type state aircraft flying regularly in typically civil airspace. Civil-military surveillance interoperability based on allowing for data sharing from those systems is encouraged.

5.4.3.3.2 In addition to safety benefits, the sharing of surveillance data reduces ground infrastructure, cost and radio frequency congestion. Surveillance data non-availability should be coordinated, for example when military sensors operate in special electronic counter-measure modes producing unverified data, or when maintenance is planned.

5.4.3.3.3 Civil and military surveillance systems share the same frequency spectrum. To avoid unnecessary radio frequency (RF) load and interference between surveillance systems used for similar applications, the frequency utilization used by such systems needs to be coordinated and de-conflicted by civil and military authorities. Especially since the frequencies 1 030 and 1 090 MHz support several surveillance systems such as SSR, ADS-B and ACAS, the need to limit RF load in the bands 1 030/1 090 MHz is recognized. A reduction of RF load would also be possible by strategic cooperation between civil and military authorities to ensure the rationalization of the overall surveillance infrastructure and by coordinating frequency utilization and reducing the extraction of on-board data with active interrogations.

5.4.3.3.4 Civil and military surveillance coverage often complement/duplicate each other, offering the possibility of integration of surveillance infrastructures wherever sharing of data has been enabled. Such rationalization is beneficial for several reasons:

a) the coordinated implementation of surveillance infrastructure would reduce the overall cost of surveillance;

b) greater redundancy with multiple systems;

c) reduction in the need for special air defence interrogator codes if civil flight identification data is available to the military; and

d) decreased cooperative infrastructure would reduce the RF load on the 1 030/1 090 MHz bands – improving data quality in dense traffic areas.

5.4.3.3.5 A reduction of RF load is also possible by using passive data acquisition to complement and reduce extracting on-board data with active interrogations.

5.4.3.3.6 Specific formats of extended squitters have been defined by ICAO[6] for interoperability between civil and military authorities, allowing civil authorities to detect military operations while securing the data.

5.4.4 ATM/air defence systems

The provision of common situational awareness, can be enhanced though the exchange of flight data, aeronautical information, meteorological information, surveillance data and airspace management data via the interconnection of civil and military ATM systems (flight data processing systems, surveillance data processing systems and human machine interface and other ATC systems), as well as appropriate air defence systems.

5.4.5 AIM systems

5.4.5.1 The harmonization and seamless exchange of AIM, MET and flight and flow data can benefit both civil and military operations, such as for civil airfields open to military aircraft operations. In terms of data modelling, the information that is relevant for all stakeholders needs to be fully harmonized. Existing international Standards applicable to aviation should be used.

5.4.5.2 States should ensure that the military stakeholders have access to and use AFTN/AMHS, or future IP-based networks. States should integrate civil and military aeronautical information service (AIS).

5.4.6 SWIM systems

In a transitional phase, SWIM may facilitate information exchanges with legacy systems. The close coordination of SWIM developments with military organizations is important and relevant requirements, associated with information exchange needs supporting ATM and air defence, should be covered by SWIM-related research, deployment and standardization. Military participation in SWIM governance structures is paramount. Military involvement in SWIM will ensure interoperability and financial savings, taking civil and military security (confidentiality, integrity and availability) issues into account.

5.4.7 Procedures

Harmonized procedures are achieved by applying common operational standards and procedures in conjunction with close civil-military coordination, using standardized terminologies and acronyms. ICAO SARPs should be applied whenever possible. When military units provide ATS to civil aviation, it is desirable that those services adhere to civil standards or at least offer a level of safety and harmonized procedures with civil systems that is equivalent to what is expected from similar civil service providers.

6 E.g. Downlink Format 19 for military data exchange (Annex 10, Volume IV) or data register F2 to substitute Mode 1 and Mode 2 transactions (*Technical Provisions for Mode S Services and Extended Squitter* (Doc 9871)).

5.5 THE ADVANTAGES OF MILITARY VOLUNTARY COMPLIANCE WITH CIVILIAN STANDARDS

5.5.1 Over the past decades, the evolution of technology has led to increased requirements on aircraft when operating in certain airspace (for example RVSM, ADS-B); the evolution towards trajectory-based operations will add to the increased requirements on aircraft. While military aircraft that cannot meet equipage or certification requirements have historically sought exemptions to operate in airspaces with such requirements, it is expected that granting exemptions will become more complex in the future as the number of requirements, and therefore necessary exemptions, may lead to the impossibility (or with high difficulty and impact on the system) to handle the non-compliant aircraft. Increased compliancy with civilian standards will facilitate access to airspace for military aircraft when specific requirements are imposed.

5.5.2 When considering retrofit/upgrades of their fleet or new aircraft acquisition, authorities should consider the following options to aim for technical compliance:

a) the certification of the appropriate modules of military systems taking into account/based on civil standards (for example the A330 MRTT and the A400M which were certified by EASA, installation of civil certified ACAS on board military transport aircraft);

b) the existence of military certificates that match, as a minimum, civil standards (for example the United States Department of Defence certification of some models of military Mode 5 Level 2 transponder that meet Annex 10, ADS-B provisions);

c) performance equivalence process when military certificates do not meet civil standards (EUROCONTROL, the European Defence Agency and the North Atlantic Treaty Organization, at the time of writing were developing such processes); and

d) the implementation of an acceptable alternative means of compliance based on tailored standards.

5.5.3 When only partial technical compliance can be achieved, exemptions and/or special handling are required to mitigate the gaps (such as increased separation minima). These mitigations should be applied in such a way that the impact on the overall system and airspace access for military aircraft is effectively scaled.

5.5.4 Where only partial operational compliance can be achieved, mitigation should be ensured through the agreement of exemptions, derogations or special handling procedures and coordination schemes that allow the safe and efficient conduct of missions outside segregated airspace.

5.5.5 When initiating a performance equivalence process related to military CNS capabilities, military authorities should consider the following:

a) military certificates and technical documentation should consider civil requirements and performance or appropriate acceptable means of compliance;

b) gaps in the available military certificates and technical documentation in relation to relevant civil requirements and performance or agreed acceptable means of compliance should be identified;

c) the accuracy, integrity, continuity of function and availability of military systems and data produced regarding the identified gaps should be evaluated, and the results documented; and

d) based on a) to c), determine and evaluate the performance equivalence before issuing the operational

approval.

Note.— When military authorities are unable to self-certify their military systems using performance equivalence, these authorities may seek support from other military or civil aviation authorities with the appropriate competences.

5.6 TREATMENT OF POTENTIAL OBSTACLES REGARDING THE INTEROPERABILITY OF MILITARY SYSTEMS

5.6.1 Potential obstacles

5.6.1.1 The following factors may still limit the ability of military authorities to adopt certain equipage improvements:

a) the civil nature of multiple CNS/ATM equipage requirements lacking military justification;

b) large military fleets with multiple military aircraft types and variants;

c) technical integration constraints;

d) differences in procurement cycles timelines and budgetary constraints;

e) lack of civil-military coordination during CNS/ATM equipage regulation drafting; and

f) lack of military CNS/ATM technical specifications and certification processes.

5.6.1.2 Budgetary and technical constraints, as well as legal processes may lead to a long procurement process. This process may be further influenced by the fluctuation of military budgets, which could influence the procurement outcome and achieving interoperability. This long process may deter industry players to develop a business case for civil-military interoperable solutions.

5.6.1.3 When faced with such obstacles, States may explore exemption or derogation. Generally, military legacy systems, including airframes, are designed for military purposes and not for civil aviation. States should consider these obstacles when planning to meet interoperability requirements and should apply sound obsolescence management practices. Certain legacy airframes may not be suitable for retrofitting to meet interoperability requirements; this can sometimes be due to a lack of available space within the aircraft or other integration limitations.

5.6.2 Proposed mitigations

5.6.2.1 The re-use or adaptation of available military capabilities, ground and airborne, can drastically reduce retrofit costs and technical impacts. An example of this approach is the United States Department of Defence certification of some models of military Mode 5 Level 2 transponder which meet Annex 10, ADS-B provisions.

5.6.2.2 The deployment of CNS/ATM improvements should be organized and planned using the following good practices:

a) keep track of civil CNS/ATM developments;

b) involve military in civil CNS/ATM standardization;

c) integrate military requirements in civil developments, where applicable;

d) grant equipage exemptions where justified and provide technical guidance;

e) consider interoperability opportunities and performance equivalence;

f) encourage technology convergence and infrastructure rationalization; and

g) ensure agile adaptation of capabilities.

5.7 SHARING DATA AND INFORMATION

Sensitive data and information could be exchanged between civil and military stakeholders on a need-to-know basis: non-disclosure should be agreed upon where necessary and systems should restrict the transmission of sensitive data via unsecure means. Interfaces should also be protected against cyber threats and arrangements should be made for the timely exchange of information, to establish and maintain safe and regular use of airspace (see 5.4.1.1.5 for planning considerations).

5.8 TRAINING, LICENSING AND JOINT PROVISION OF SERVICES

5.8.1 Training

The common application of Standards and equipment enables joint training and joint utilization of operational, administrative and technical personnel.

5.8.2 Joint provision of services

5.8.2.1 Providing air traffic services for civil and military flights from single units can be beneficial, provided that:

a) special treatment (for tactical or training purposes) beyond the abilities of the ATS unit is not required (in which case the appropriate military unit should be tasked);

b) military aircraft are equipped and aircrews are trained to the standards required for the airspace concerned and that ATS unit is capable of catering to military flights that require exemptions from civil procedures; and

c) a swift transfer to military entities, such as air defence, can be assured at all times.

5.8.2.2 The co-location of civil and military services using common infrastructure, can yield significant benefits, in terms of safety and cost-efficiency. It is, however, not always possible because of the specific nature of military flights and missions. Finally, it should be highlighted that temporary co-location is also an option to address civil and/or military contingencies.

Chapter 6

CIVIL AND ARMED CONFLICT, NATURAL DISASTERS, SPECIAL ACTIVITIES

6.1 INTRODUCTION

6.1.1 Airspace disruptions arising from events such as armed conflict, natural disasters or public health emergencies will generate an unpredictable demand for airspace that can cause major planning challenges. A fundamental aspect in reacting to disruptions is the development of contingency plans. These types of events may result in different demands for airspace. Civilian authorities should therefore develop concrete airspace proposals in advance, to ensure the promulgation of contingency airspace plans and routings. An impact assessment on commercial traffic should be included as part of any contingency planning.

6.1.2 Coordinating with airspace managers, ANSPs and regulators at an early stage and on the different requirements for airspace use is extremely important. A checklist including timelines to assist event planners with the coordination should be developed to reduce last minute changes to airspace needs. A special activity may cause unusual military traffic flows, with or without prior notification or coordination. During special activities or contingencies, increased coordination between civil and military authorities is required to allow for civil air traffic to continue operating to the maximum extent possible, while facilitating operational freedom for air operations.

6.1.3 Further guidance concerning coordination prior to or during these circumstances is contained in Annex 11, Attachment C — Material relating to Contingency Planning and the *Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft* Operations (Doc 9554). The *Risk Assessment Manual for Civil Aircraft Operations Over or Near Conflict Zones* (Doc 10084) provides guidance to States and operators for operation over or near conflict zones.

6.2 SPECIAL ACTIVITIES

Certain types of events, such as international sporting events, visits by heads of States, high profile meetings of government officials from other States, etc., create a heightened requirement for civil-military cooperation and coordination. Temporary airspace changes, including the establishment of temporary prohibited areas and/or specific security procedures, may be required to address security concerns. Civil and military stakeholders at national, or international, levels should jointly plan as soon as they become aware that a high-profile special event is likely to occur. The CMAB, the CAOM and the AMC, as applicable, should be part of the planning process, and as early as possible.

6.3 CIVIL AND ARMED CONFLICTS AND EXCEPTIONAL SITUATIONS

6.3.1 Civil and armed conflict are commonly classified into the following three categories:

a) intra-State: civil conflicts precipitated by deepening political discord, economic distress and growing inequalities, which in worst case scenarios can lead to the erosion of government legitimacy, a breakdown of law and order and escalating un-governability;

b) inter-State: conflicts over the status of disputed territories or any other reasons; or

c) trans-State: international terrorism, economic sabotage, or a cyber-attacks that may precipitate State paralysis, undermine national security and defence, or provoke international conflicts with sponsoring States;

6.3.2 The term “exceptional situation” is often used to refer to the broad spectrum of possible crises, ranging from a very limited regional disorder or humanitarian relief operation to large-scale crisis response operations involving the widespread mobilization and employment of military forces. A crisis could be instigated by a conflict, as described below, or be precipitated by natural disasters such as drastic climate change, floods, droughts, food and water shortages, pandemics, earthquakes, or volcanic eruptions. Responses to exceptional situations often involve multiple States mobilizing civil and military assets. Past events have highlighted a need to improve civil-military coordination to increase the effectiveness and timeliness of humanitarian responses (see Chapter 1, 1.2.7 and Chapter 2, 2.2.11).

Chapter 7

CIVIL-MILITARY COOPERATION PERFORMANCE MEASUREMENT FRAMEWORK

7.1 OPTIMIZING AIRSPACE PERFORMANCE

7.1.1 The *Manual on Global Performance of the Air Navigation System* (Doc 9883) describes a performance management process for a safe and cost-effective modernization of the air navigation system (Figure 7-1). Collaborative decision-making is key for a cost-effective modernization of the air navigation system and ensures that all concerned aviation stakeholders are involved and given the opportunity to influence decisions and reach defined performance objectives. This chapter presents a simplified approach for the implementation of a performance management process to increase trust between the civil and military communities and improve the performance of the ATM system as a whole, through the optimum use of the airspace.

7.1.2 This is a continuous process that can track and measure progress at regular intervals (daily, weekly, monthly or even annually depending on the metric). The periodicity should be determined to reflect the effect of corrective actions.

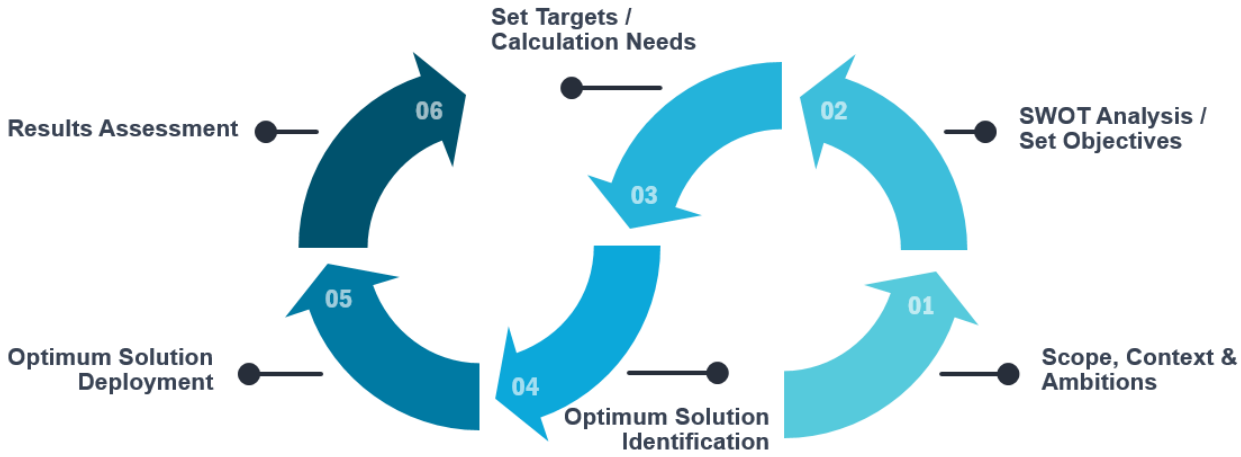

Figure 7-1. Six-steps performance management process

7.2 BENEFITS AND CHALLENGES OF APPLYING A PERFORMANCE MANAGEMENT PROCESS

7.2.1 The guidance in Doc 9883 is relevant to civil-military cooperation as it relates to setting performance objectives and targets, as well as monitoring, evaluating and forecasting system performance. A civil-military performance measurement framework not only contributes to the establishment of mutual trust between civil and military entities, it also ensures an acceptable level of flexibility and efficiency of civil and military operations. For instance, key performance indicators related to ASM promote transparency and the fair application of cooperation.

7.2.1.1 Challenges associated with cost and security due to data confidentiality associated with military performance, could arise from implementing a performance framework in the context of civil-military cooperation. In this case, mitigations measures might be required. For example, the costs associated with data collection and analysis could be balanced against the benefits resulting from accurate and effective assessment of the benefits of civil-military cooperation and subsequent systemic improvements accrued in the longer term.

7.2.2 Military mission effectiveness metrics should measure the impact of civil-military cooperation from the military operational requirement viewpoint. Some internal military metrics can provide useful indications on the performance of civil-military cooperation, specifically when considering issues related to the planning, reservation and release of airspace in a dynamic airspace management environment.

7.3 ESTABLISHING A PERFORMANCE MANAGEMENT PLAN

7.3.1 Stakeholders interested in the performance of civil-military cooperation include any civil or military entity, group or ATM community member who is affected by, or involved in, performance management at the national or sub-regional level such as:

a) civil and military regulatory authorities;

b) national supervisory authorities, which could involve the military;

c) ANPS, civil-military military units – which could involve military air defence; and

d) civil and military airspace users.

7.3.2 The civil-military cooperation performance framework should be commensurate with the complexity of the airspace where it would be applied. In other words, an airspace with a simple route network may require a basic performance assessment mechanism, while more complex airspace may require more elaborated performance frameworks.

7.3.3 The key performance areas (KPAs) defined in the *Global Air Traffic Management Operational Concept* (Doc 9854) provide categorized and performance-related high-level expectations and ambitions where civil and military ATM communities cooperate or where the military identifies specific performance requirements of the ATM system in order to carry out its security and defence tasks. Military performance requirements could be represented across all KPAs where civil and military stakeholders interact.

7.3.4 To set targets for civil-military cooperation, objectives that are specific, measurable, achievable, relevant and time-bound (SMART) should be developed and its indicators, defined. Indicators are the means to quantitatively express performance as well as actual progress in achieving performance objectives and can be:

— S*pecific*. The performance objective must be expressed in terms of the objects and events that represent air traffic and its operational environment.

— *Measurable*. It must be associated with one or more clearly defined performance indicators and it must be possible and affordable to establish the required data collection processes and to solve information disclosure issues;

7.3.5 Performance targets are closely associated with performance indicators; in that they represent the values of performance indicators that need to be reached or exceeded to consider a performance objective as having been fully achieved. They are:

— *Achievable*. Performance objectives can be challenging, but must realistically consider the public environment, timing and available resources. Above all, it must not be seen as means to exert undue leverage on either the civil or the military stakeholders.

— *Relevant*. Performance indicators should be defined where there is an opportunity to assess the civil-military cooperation related to realistic ATM improvement.

— *Time-bound*. The time available to achieve performance objectives is always limited. Therefore, targets should always be time-bounded. The performance objective must be achievable in a timely fashion to meet the air navigation community expectations.

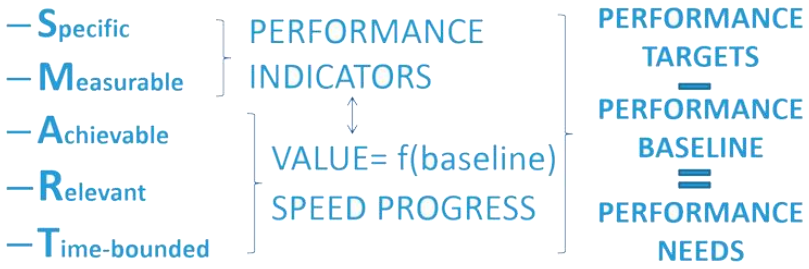

Figure 7-2. Performance targets and indicators.

Note 1.— The target and the time available to reach the target determine the required speed of progress for the performance objective. Care is to be taken to set target so that the required speed of progress is realistic.

Note 2 .— Appendix C provides examples of performance indicators.

7.4 USING METRICS TO SUPPORT THE FLEXIBLE USE OF AIRSPACE

7.4.1 The impact of civil-military cooperation while supporting the flexible use of airspace can be measured in terms of:

a) airspace capacity (FUA application, availability of airspace, efficient planning system, usage of released/available airspace even at short notice for civil or military needs); and

b) airspace efficiency (adherence to optimum airspace dimensions, economic impact of transit to and from a given area when possible to measure, impact of airspace location on training, effective use of allocated airspace).

7.4.2 In assessing the performance of cooperation in the context of dynamic airspace management, a global evaluation ,one that includes safety and other factors such as capacity, cost-effectiveness, the environment and military mission effectiveness, is needed. The latter is mainly affected by the following three parameters:

a) SUAs dimension: defined at the FUA strategic level for permanent structure to meet the operational requirements;

b) SUAs location: defined at the FUA strategic level for permanent structure; and

c) SUAs availability offered through the FUA and CDM process.

7.4.3 The national CAOM (See Chapter 4) can be an important element of the performance framework. In the specific context of the dynamic management of the airspace, it could:

a) establish joint civil-military processes for the periodic (at least yearly) assessment of airspace efficiency and effectiveness of procedures at all three levels;

b) ensure the definition and application of dynamic airspace management KPAs and key performance indicators (KPI) to monitor ATM performance against the needs of civil and military airspace users; and

c) assess the effectiveness of dynamic airspace management in terms of its impact on civil and military airspace users, ATM service provision and civil-military cooperation.

Chapter 8

ATM SECURITY

8.1 Civil-military cooperation allows States to better respond to international threats such as terrorism, counter unlawful interference and prevent the associated disruptions to civil aviation; a collaborative ATM security framework focusing on security policy, legislation and procedures, is needed. The requirements and obligations of each State with regards to security are detailed in Annex 17 — *Security — Safeguarding International Civil Aviation against Acts of Unlawful Interference.*

8.2 The *Air Traffic Management Security Manual* (Doc 9985) complements the *Aviation Security Manual* (Doc 8973) and provides guidance on security issues specific to ATM to assist States and ANSPs in implementing appropriate security provisions and in support of national security, law enforcement requirements. It also provides guidance on the protection of the ATM system infrastructure from threats and vulnerabilities.

8.3 ATM security is recognized as an essential component of the future ATM system in the *Global Air Traffic Management Operational Concept* (Doc 9854). This document outlines a role for ATM security beyond that of aviation security to meet national security requirements, assist in protecting against intentional and unintentional threats and provide the continuity of service during security threats and unusual circumstances. It also emphasizes aviation purposes to protect them from unlawful interference.

8.4 Cybersecurity is an aspect of security that poses considerable challenges to both civil and military aviation. During the 40th General Assembly, States resolved to, inter alia, encourage government/industry coordination with regard to aviation cybersecurity strategies, policies, and plans, as well as sharing of information to help identify critical vulnerabilities that need to be addressed; and to develop and participate in government/industry partnerships and mechanisms, nationally and internationally, for the systematic sharing of information on cyber threats, incidents, trends and mitigation efforts (Assembly Resolution A40-10, *Addressing Cybersecurity in Civil Aviation* resolving clauses e) and f)). Safeguarding the ATM system from security threats has become an issue of increasing concern. ANSPs have become more involved in supporting roles related to national security and law enforcement situations, including disaster prevention and recovery operations for situations that are not intentionally directed at the aviation system, but which could have profound, negative impacts on the aviation system if not managed effectively. These situations often require the use of ATM procedures such as temporary airspace/flight restrictions for security purposes. There are therefore two aspects of ATM security: protection against threats and vulnerabilities; and provision of ATM security services to support organizations and authorities engaged in aviation security, national security, defence, and law enforcement

8.5 One of the objectives of ATM security is to reduce the response time to security threats that affect flights (aircraft, passengers and crew) or the ATM system itself. Another objective is the safeguarding of the airspace from unauthorized use, intrusion, illegal activities or any other violation. This, along with the protection of the ATM system itself, requires that ANSPs provide ATM security services that enable military, law enforcement and aviation security authorities to carry out their roles and responsibilities within the ATM system.

8.6 Improving ATM security standards relies on the combination of organization, means, regulations and procedures established to protect the ATM system. Security measures, when adopted by all parts of the ATM system, foster security awareness in both civil and military areas, improve the necessary dissemination of information, and will ensure that all security requirements are met for communications, navigation and surveillance domains and for the ATM infrastructure.

8.7 Civil-military cooperation will be a powerful enabler of ATM security and assist in providing early protection against threats, attacks and acts of unlawful interference, preventing and mitigating incidents while improving the ability to respond to acts of unlawful interference.

Chapter 9

AIR DEFENCE IDENTIFICATION ZONES (ADIZs)

> ***Air defence identification zone (ADIZ).*** Special designated airspace of defined dimensions within which aircraft are required to comply with special identification and/or reporting procedures additional to those related to the provision of air traffic services.
> (Annex 15 — *Aeronautical Information Services).*

9.1 The promulgation of ADIZs by a small number of States appears to have been driven by an apparent need for an additional air defence response to potential airborne threats during periods of heightened geopolitical tension. Constrained by the level of technology related to aircraft tracking, identification and communications of the era, it has been used as a preventive measure to allow for early identification of aircraft to minimise a security risk. The first ADIZ was established in the 1950s, and there are currently less than 20 active ADIZs globally. Information pertaining to ADIZ procedures can usually be found in AIPs. There is no publicly available consolidated list of ADIZs.

9.2 Compliance with flight plan filing and reporting requirements for an ADIZ are intended to facilitate the identification process, thereby minimising unnecessary, and potentially hazardous interceptions.

> *Annex 2, 3.8.1 Interception of civil aircraft shall be governed by appropriate regulations and administrative directives issued by Contracting States in compliance with the Convention on International Civil Aviation, and in particular Article 3(d) under which Contracting States undertake, when issuing regulations for their state aircraft, to have due regard for the safety of navigation of civil aircraft. Accordingly, in drafting appropriate regulations and administrative directives due regard shall be had to the provisions of Appendix 1, Section 2 and Appendix 2, Section 1.*

9.3 The only other mention of ADIZ in ICAO documentation requires that States publish the details of their ADIZ in their aeronautical information publication (AIP) and aeronautical charts (Annex 4 — *Aeronautical Charts* and Annex 15 — *Aeronautical Information Services*). There are no other ICAO Standards or procedures related to the establishment or operation of an ADIZ.

9.4 Most of the current ADIZs are permanent and were established many years ago. Therefore, to ensure that the procedures do not unnecessarily impose additional workload on flight crew from meeting their normal obligations with respect to flight operations and air traffic services, the associated procedures and its dimensions should be regularly reviewed. The procedures should also be reviewed to ensure that they do not conflict with existing ATS-related procedures. Finally, States with established ADIZs should ideally review if continued promulgation remains necessary and, if so, consider limiting the procedures to requiring the submission of a flight plan with details of the relevant ADIZ entry point, entry time, and the radio communication channels to be used to contact the relevant ATS unit.

> ADIZ should be established with clearly defined, intuitive airspace dimensions, allowing the flight crew to easily ascertain the position of the aircraft relative to its boundary. This would allow pilots to meet any communications requirements accurately and in a timely manner.

9.5 Nearly all States avoid the need for the establishment of an ADIZ. Usually, the objectives of an ADIZ can be otherwise achieved through means more aligned with existing international standards and procedures. By ensuring civil-military cooperation and coordination between adjacent ATS authorities, States can effectively fulfil their national security requirements without any undue burden upon flight crews and operators. Under such circumstances, an ADIZ need not be promulgated where aircraft are identified by an ATS unit and information is duly passed to the military authorities.

> Identification procedures can be made more robust with coordination between civil and military units, and the availability of direct communications between the two. Arrangements can be made for sharing of ATS surveillance and flight plan data with military units.
>
> *Annex 2, 3.3.1.2 A flight plan shall be submitted prior to operating:*
> *…*
> *d) any flight within or into designated areas, or along designated routes, when so required by the appropriate ATS authority to facilitate coordination with appropriate military units or with air traffic services units in adjacent States in order to avoid the possible need for interception for the purpose of identification;*

9.6 ADIZ procedures and communication requirements should not conflict with any ATS or flight operations procedures, or the rules applying to any other ADIZ in the area. It is recognized that this may prove challenging for airspace under the authority of adjacent States' ATS authority, unless the scope of the ADIZ procedures are kept very limited. The following considerations should be taken in account when establishing the procedures for an ADIZ:

a) ADIZ procedures should be drafted in clear, simple and concise language, and applicable only to aircraft intending to operate into, within or from sovereign airspace;

b) flight planning procedures related to each ADIZ should be limited to the relevant ADIZ entry point and entry time listed;

c) pilots should communicate with the relevant ATS units only. Most aircraft are not equipped for radio communications outside of the established spectrum used for civil aviation and are limited to the number of communication channels that can be selected simultaneously;

d) the aircraft inflight emergency communication channel should not be used as an ADIZ procedure channel; it is reserved for emergency use only;

e) ADIZ procedures pertaining to abnormal operations and emergencies occurring within ADIZ airspace, such as radio communications failure, weather deviation, or equipment failures, should be included;

f) ensure all relevant contact information, frequencies etc. are clearly promulgated in the AIP; and

g) States should ensure that pilots are trained in the correct application of ADIZ procedures that apply.

> **!** Unclear, complicated, or inadequate ADIZ procedures can result in a safety risk. Resultant non-compliance, potentially unintended, will necessitate a response from the ADIZ authority, which may prove unnecessary.

9.7 The following text is provided as a template for promulgating information in the AIP, and any other publication deemed necessary, when establishing an ADIZ:

(name) AIR DEFENCE IDENTIFICATION ZONE (ADIZ)

(geographical/vertical description of the area).
The purpose of the *(name)* ADIZ is aircraft identification of flights entering or operating within the ADIZ.

Pilots shall ensure that when submitting the flight plan, the ADIZ entry point and estimated time of entry is included in field 18 of the ICAO flight plan form.

Pilots operating VFR flights are required to file a flight plan prior to entry into, or departure from within the ADIZ.

Aircraft departing from location inside ADIZ shall contact the ATS unit concerned, on departure for identification purposes.

For inbound flights *(distance in nautical miles, if necessary)* prior to entering the ADIZ, pilots are required to set the aircraft transponder to the assigned discrete code and contact the ATS unit concerned. Pilots are to report again when reaching the entry point as listed in the flight plan, and time of entry should be within plus or minus 5 minutes of the time reported.

Pilots unable to meet the reporting times as previously filed must update their flight plan with the ATS unit concerned prior to entering the ADIZ.

A list of respective ATS units and the associated radio frequencies can be found at *(specific reference or AIP section)*.

In case of communications failure, pilots should comply with the published radio communication failure procedures in *(AIP section)*

Compliance with these procedures reduces the likelihood of interception for the purposes of aircraft identification.

Appendix A

EXAMPLE OF BALLISTIC LAUNCHES AND SPACE RE--ENTRY PROCEDURES

The following procedures are contained in the ICAO Asia/Pacific Seamless ANS Plan for States in the ICAO Asia and Pacific Regions conducting ballistic launches or space re-entry activities within high seas airspace. To minimize disruption to other airspace users, all States should ensure the following:

a) the development of written coordination agreements between the State civil aviation authority and the launch/re-entry agency concerned;

b) strategic coordination is conducted between the State civil aviation authority and any States affected by the launch/re-entry activity at least fourteen days prior to the proposed activity, providing notice of at least:

   i) three days for the defined launch window; and

   ii) twenty-four hours for the actual planned launch timing;

c) consideration of affected airspace users and ANSPs is established after consultation, so that the size of the airspace is minimized and the launch window is optimized for the least possible disruption to other users; and

d) communication is established with affected ANSPs to provide accurate and timely information on the launch/re-entry activity to manage tactical responses (for example, emergencies and activity completion).

Appendix B

ADVANCED FUA (AFUA) – THE EUROPEAN EXAMPLE

1. CONCEPT

1.1 Advanced flexible use of airspace (AFUA concept) aims to further enhance the ASM/ATFM/ATS cooperative planning. The concept builds on enhanced CDM and the optimization of airspace configurations, using new types of airspace structures.

1.2 The AFUA concept is designed to achieve performance at national, and regional levels with extended multi-national cooperation, but it should not affect the sovereign responsibility of national authorities regarding final decisions on airspace allocation. The AFUA concept may be summarized as the cohesive coordination of the common airspace resources (up to network level), through a proactive partnership between all ATM actors. The concept ensures that both civil and military needs are addressed, that airspace utilization is optimized and that performance objectives are achieved.

1.3 The AFUA concept is not new or fundamentally different from the FUA concept, as it builds on it with advanced tools and procedures to make FUA more dynamic and efficient to support an ASM performance approach.

1.4 *Dynamic trajectory operations*. FUA in airspace using dynamic trajectory operations will differ from that using fixed ATS routes; aircraft operators will no longer be given information on route availability, but will still need to know about airspace availability. For the transit period of a given flight through such airspace, airspace users will need to know the activity of all pertinent airspace affected by civil-military activities to select a flight path avoiding these operations. This may include routing via published or ad hoc intermediate points to ensure adequate separation from active airspace reservations.

2. OBJECTIVES

The objectives of the AFUA concept are to achieve:

a) the systematic application of cooperative mechanisms among all civil and military partners at the local, sub-regional and network levels through interactive ASM/ATFM/ATS management during all three phases (strategic, pre-tactical and tactical) as required, with the aim to:

   i) optimize resources versus airspace demand;

   ii) minimize possible adverse effects on network operations caused by national borders and/or the sub-regional constraints; and

   iii) minimize adverse effects on network operations that local decisions on airspace status may have, through the application of continuous impact assessment of local or sub-regional airspace status change;

b) a seamless and synchronized transition, both geographically and time-wise, from one operational environment to another (e.g. between dynamic trajectory operations and standard ATS routes);

c) continuous, seamless and reiterative planning, allocation and utilization of different airspace configurations resulting from any airspace change in any time period initiated by both pre-tactical and tactical phases (not limited to the current pre-tactical phase timeframe);

d) evolution from the current system of regulating the network to precise demand and capacity balancing (DCB) through cooperative airspace planning and usage, including proactive management of all airspace structures activation and shifting air traffic flows as appropriate;

e) collection of available FUA and ATFM information made available to all parties, at various planning stages, through network services;

f) contribution to the achievement of the performance targets in safety, capacity, environment and flight efficiency and mission effectiveness.

3. ENABLERS

The AFUA concept is derived from the building blocks below, which may be implemented to achieve the above-mentioned objectives.

— Extensive CDM will enhance FUA. The AFUA procedures include the description of how the performance objectives, the airspace allocation and mission effectiveness are considered within CDM. Improved vertical and horizontal CDM processes are used with horizontal CDM covering all partners in the gate to gate concept (involving airports, ATFM, military missions planning, ACC and military unit's supervisors etc.) and the vertical CDM process applied between the network, sub-regional and local levels.

— An extensive use of airspace configurations, which are the predefined and coordinated organization of ATS routes and dynamic trajectory operations airspace of the area route network and terminal routes (evolving towards business and mission trajectories) and their associated airspace structures (including temporary airspace reservations, variable profile areas[1] (see Figures B-1 and B-2) or dynamic mobile areas (DMA) (see section 4) and ATC sectorization.

— Management by airspace blocks availability, dynamic trajectory operations and free routing.

— Continuous, seamless and reiterative planning resulting in a continuous/rolling network airspace use plan known as rolling process, allowing airspace users to benefit from changes to airspace structures.

— An extensive region-wide and cross-border shared use of reserved areas, in a bi-lateral or multi-lateral context, is a direct consequence of the implementation of sub-regional reinforced cooperation.

— Better exchange of data to ensure common situational awareness at any time, based on the deployment of local FUA support systems and their interfaces with enhanced network systems by business-to-

[1] A flexible composition of defined modular portions of airspace to fulfil military needs, restricting airspace utilization for other airspace users only by the necessary minima.

business and common agreed standards, and also sharing all relevant civil and military information, including relevant military/state aircraft flight plans.

— A more accurate and comprehensive performance monitoring and evaluation at network and local levels.

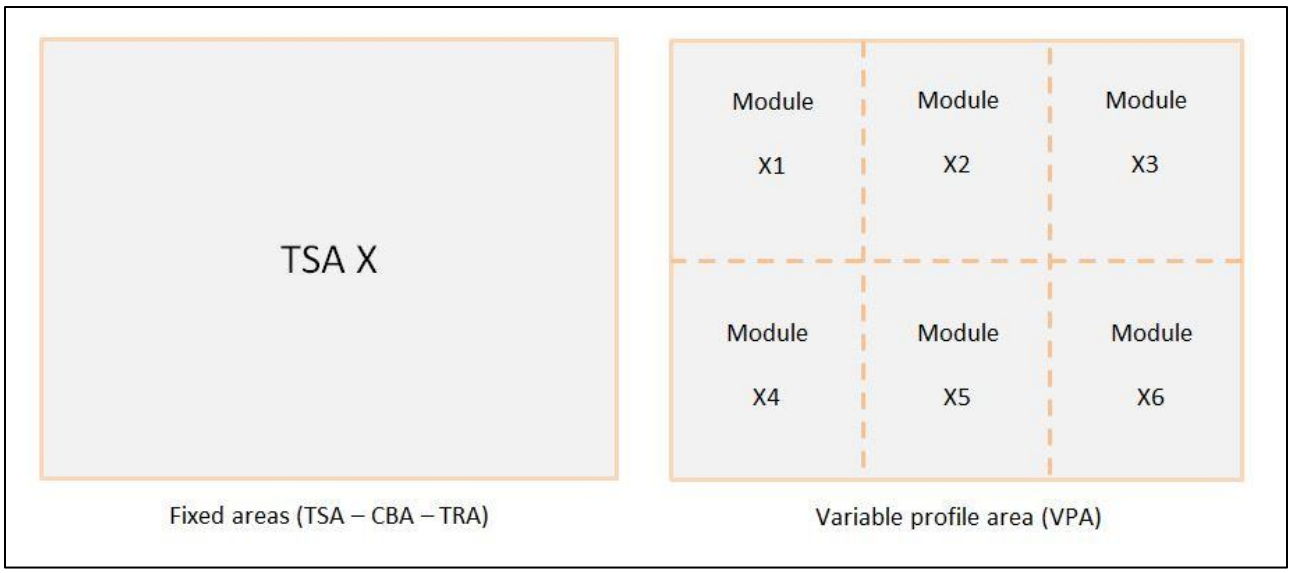

Figure B-1. Variable profile area (VPA)

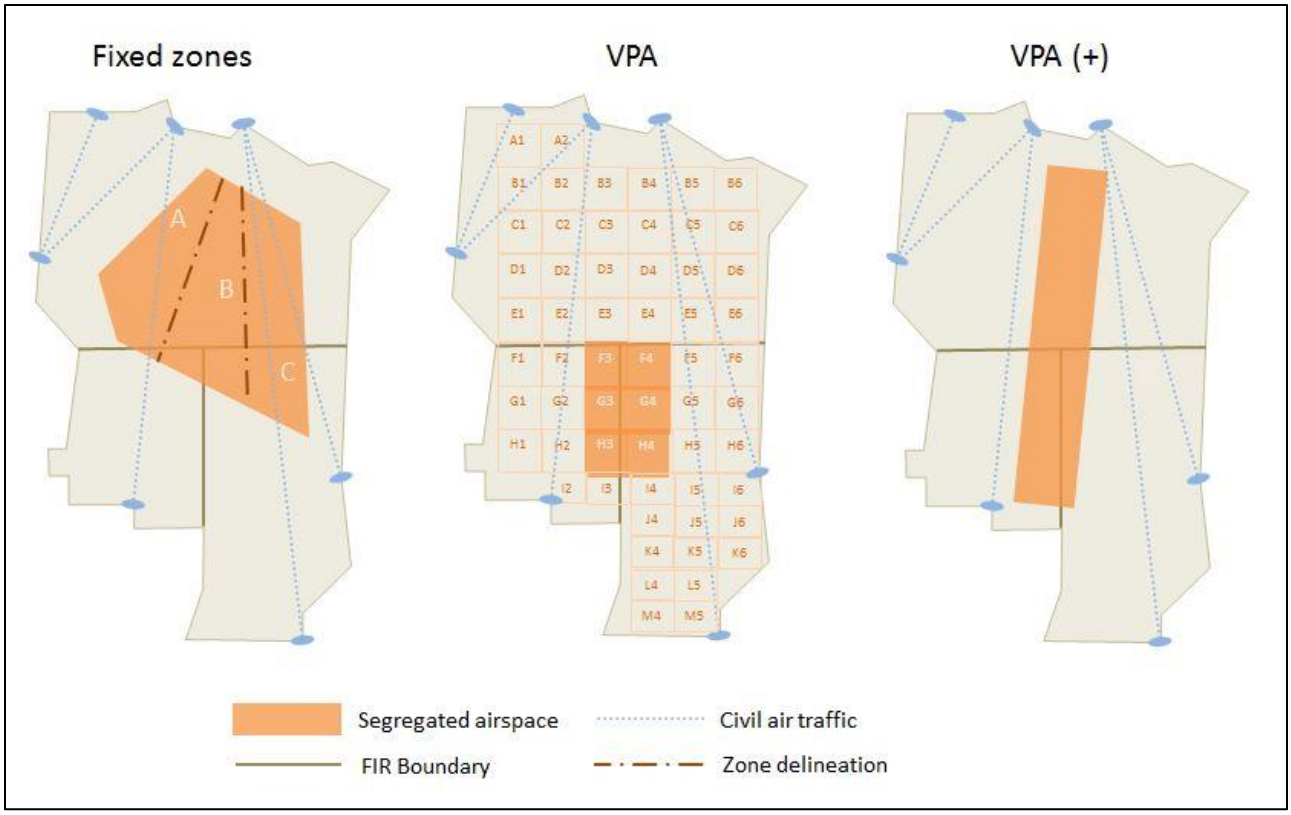

Figure B-2. Evolution from fixed zones to VPA and future enhanced VPA

4. DYNAMIC MOBILE AREAS

4.1 DMAs are more adapted to military needs as they provide enhanced flexibility in terms of airspace structure. DMAs are defined volume of airspace along a mission trajectory (MT) defined in 4-dimensions and used as a reference for the flight. This helps minimizing the impact on the civil traffic flow.

4.2 Type 1 DMAs are areas defined (lateral and vertical dimensions) and allocated (time frame of activation) to meet the needs of the airspace user. The optimum location of the DMA is decided on a case by case basis. The AMC will allocate a DMA at a specific location for a given mission so as to minimise the impact on the expected civil traffic, while ensuring that the transit time between the DMA and the aerodrome of origin remains acceptable. (See Figure B-3).

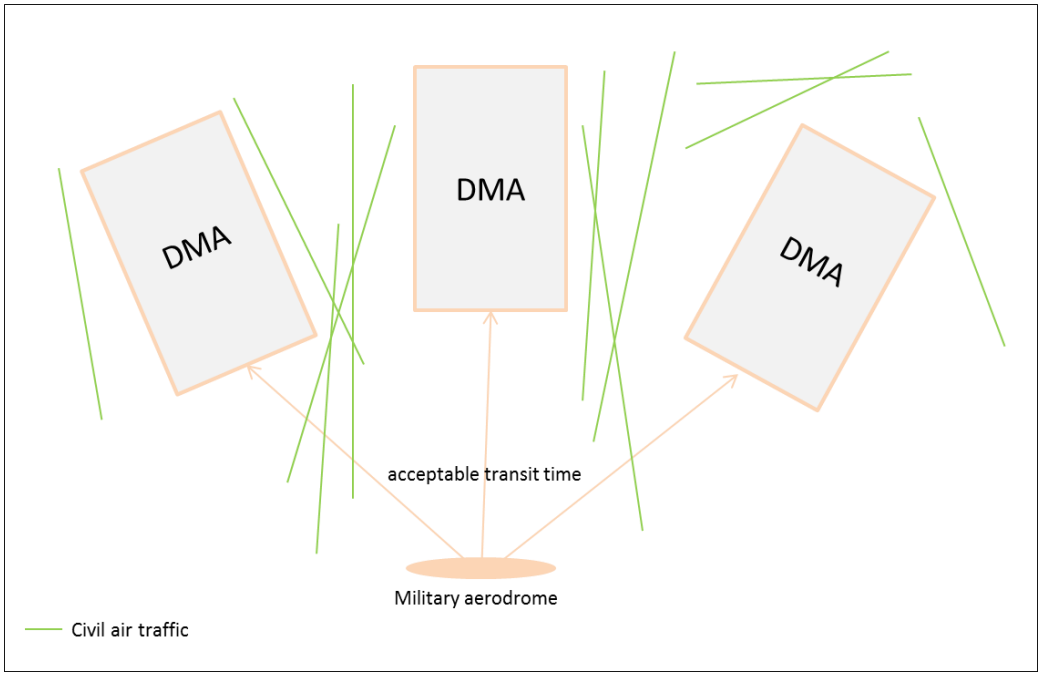

Figure B-3. Dynamic mobile area Type 1

4.3 Type 2 DMAs are areas defined with lateral and vertical dimensions and time frame allocation in line with the needs of the airspace user. The difference with type 1 mobile areas is that the location of the area will change as the mission happens, to follow the path of the mission trajectory. Military missions often include several tasks at different locations and different flight levels (e.g. air-to-air refuelling, combat exercise, etc.). It is not always possible to allocate a single area that encompasses all these tasks as it would segregate important portion of airspace and that would impact dramatically the civil traffic flows. Type 2 DMAs consist of several smaller areas defined along the mission trajectory, that limit the impact on the civil traffic flows and secure the allocation of the airspace for the military. (See Figure B-4)

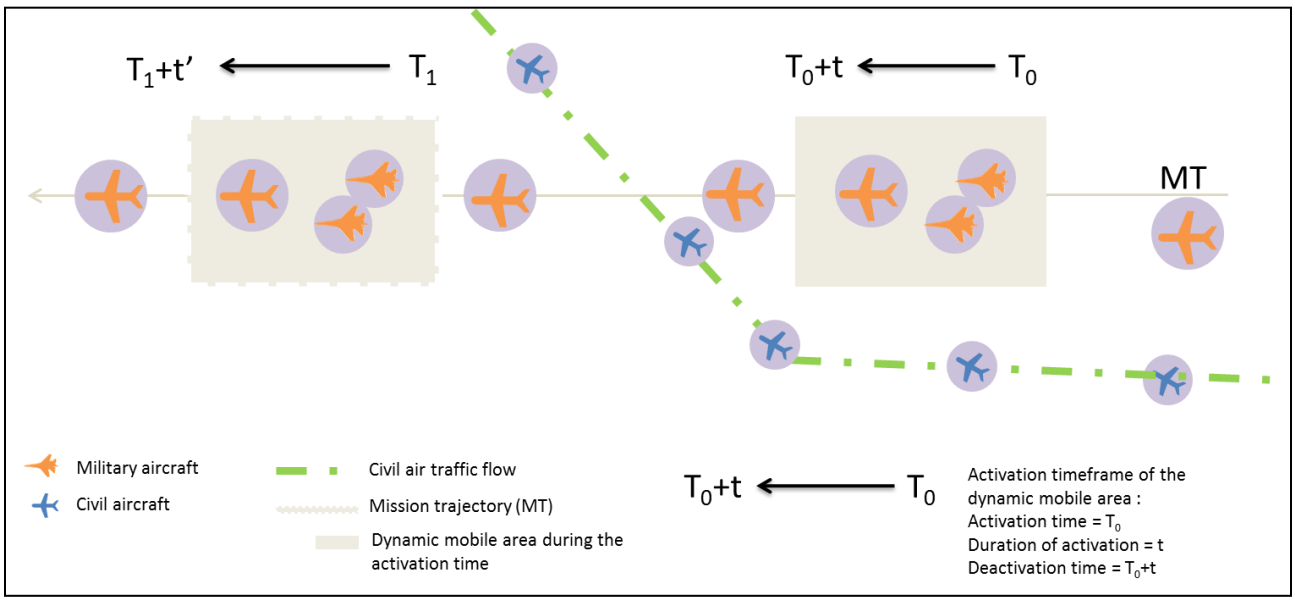

Figure B-4. Dynamic mobile areas Type 2

4.3 Type 3 DMAs are areas defined with lateral and vertical dimensions around moving activities that require appropriate separation from other airspace users' trajectories. Type 3 DMAs are therefore *bubbles* moving with the military aircraft to separate the military flight from the rest of the traffic. This type of DMA not only minimizes airspace segregation but is also beneficial to the military airspace user, by increasing flexibility. (See Figure 9-B-5)

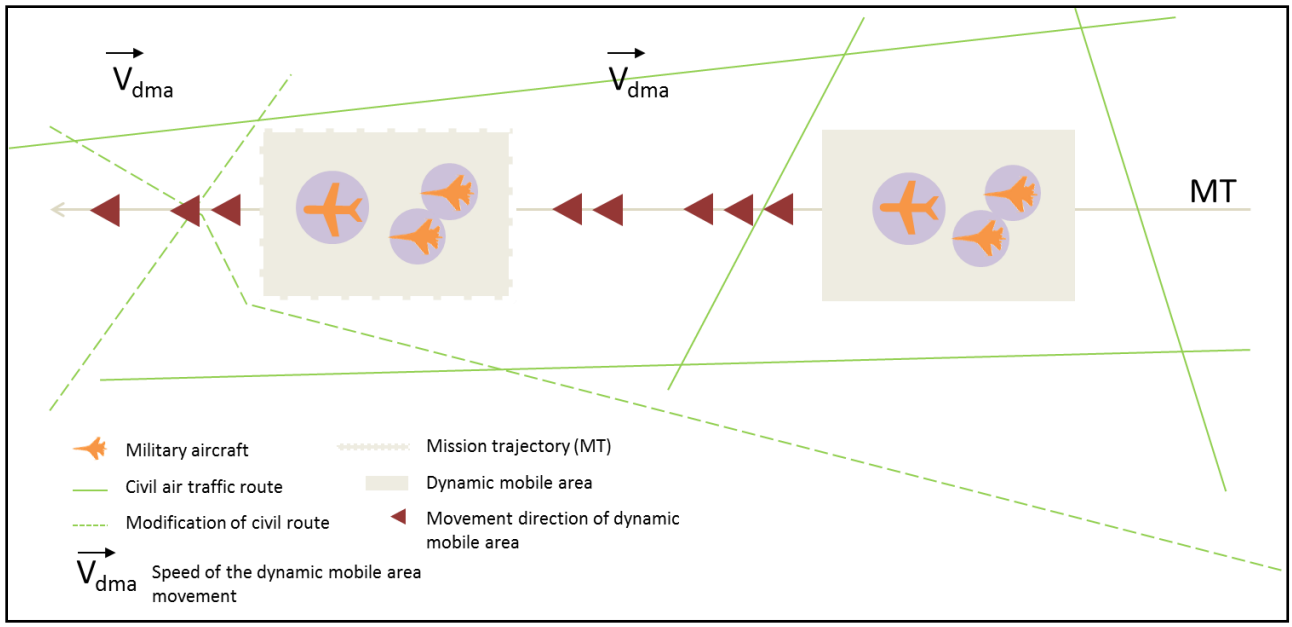

Figure B-5. Dynamic mobile area type 3

Appendix C

PERFORMANCE INDICATOR EXAMPLES

The following performance indicators (PIs) are provided as examples which may be used as best practices to support:

a) high-level policy decision-making;

b) negotiations between civil and military partners for airspace design;

c) performance plan drafting and monitoring;

d) impact assessment of new airspace designs;

e) efficiency and optimization assessment of common airspace management (ASM) processes; and

f) ASM impact assessment on military mission effectiveness.

Note 1.— Many PIs have been developed by many countries, some of these are available on specialized website. However only those simple enough and globally meaningful have been selected to be enclosed in this document as PI examples.

Note 2.— The following meanings are given to the acronyms used in the examples below.

AIC	Aircraft interested in a CDR
AUC	Actual use of the CDR
PI	Performance indicator
RAAUM	Rate of actual airspace use by the military
RAIC	Rate of aircraft interested in using a CDR
RAUC	Rate of actual use of the CDR

1. RATE OF ACTUAL AIRSPACE USE BY THE MILITARY (RAUUM)

Formula: RAAUM = time used/time allocated

Metrics: 1) *Time used.* The time used for training event in SUAs. States should agree on how to define the start and end moment that determine the “time used”.

2) *Time allocated.* The time allocated (or published) for training in SUAs.

The RAAUM PI should be as close as possible to 100 per cent.

2. RATE OF AIRCRAFT INTERESTED IN USING A CDR (RAIC)

Formula: Simple use:

AIC = number of flights which flight planned on the released CDR

Advanced use:

RAIC = number of flights which flight planned on the released CDR/number of flights which COULD have planned on the released CDR

Metrics:

1) *Number of flights which flight planned on the released CDR.* Number of civil flights, which filled a flight plan through the released CDR (or released airspace) once it was made available.

2) *Number of flights which COULD have planned on the released CDR*. Traffic demand through that CDR during the time the CDR was released for civil traffic. It should be extracted from the total traffic based on aerodrome of departure (ADEP)/aerodrome of destination (ADES) (or entry/exit points) which is served by that CDR.

RAIC PI should be as close as possible to 100 per cent.

3. RATE OF ACTUAL USE OF THE CDR (RAUC)

Formula: Simple use:

AUC = number of flights which used (flew) on the released CDR

Advanced use:

RAUC = number of flights which used (flew) on the released CDR/number of flights which COULD have planned on the available CDR

Metrics:

1. *Number of flights which used (flew) on the released CDR*. Number of civil flights which actually flew through the released CDR (or released airspace) once it was made available.

2. *Number of flights which COULD have planned on the available CDR.* Traffic demand through that CDR during the time the CDR was released for civil traffic. It should be extracted from the total traffic based on ADEP/ADES (or entry/exit points) which is served by that CDR.

RUAC PI should be as close as possible to 100 per cent.

Appendix D

INDICATIVE AGENDA FOR FIRST CMAB MEETING

An agenda for the first CMAB meeting should be agreed upon among the different stakeholders. When developing the agenda, the following items should be considered:

a) agree on the need to establish civil-military cooperation and coordination processes, and the implementation of airspace organization and management;

b) establish the CMAB – proposed structure, list of participants and draft terms of reference (ToRs);

c) establish the Committee Airspace Organization and Management (CAOM), and the other necessary committee(s) and or sub-committee(s), as necessary, including proposed list of participants and draft ToR;

d) legal considerations;

e) the initial actions to establish implementation:

1) develop an action plan to enhance tactical coordination between ATS units and appropriate military units in the near-term, and its subsequent implementation;

2) formalize the high-level commitment from all parties to enhance civil-military cooperation and coordination;

3) develop State airspace policy;

4) task the CAOM to review the current airspace structure and establish proposals for its evolution in line with the new cooperation framework;

5) task the CAOM to develop the necessary flexible use of airspace structure, as well as LoAs, FUA procedures and documentation;

6) develop or task the appropriate committee and sub-committee to develop, the legal and regulatory framework to enable all three civil-military cooperation and coordination levels; and

7) any other business.

Appendix E

TERMS OF REFERENCE HIGH-LEVEL CIVIL-MILITARY AVIATION COOPERATION POLICY BOARD (CMAB) – MODEL TEMPLATE

Note.— The ToR provided below should be adjusted according to national requirements; some elements may be missing while others may be superfluous.

1. **Composition**

— *Chair of the Board.* The Board shall elect co-chairpersons and their vice-chairpersons (one from the civil aviation authority and one from the military authority each) for a cycle of three meetings, unless otherwise re-elected.

— *Members*. Representatives of the civil aviation authority, military authorities, appropriate ANSPs and military unit(s) and involved members from ministries and authorities which have an impact on aviation operations.

— *Observers* could be invited on an ad hoc basis

The participants list is as follow:

Name	Title/Function	Organization	Status in CMAB

2. **The CMAB overall approach and responsibilities are to:**

a) review and update its terms of reference for effective governance and maintain its supervisory role in implementing civil-military cooperation and coordination across the State;

b) develop a national civil-military policy and strategic implementation plans to foster civil-military collaboration, cooperation and coordination in line with the State's high-level policies and strategies;

c) establish the necessary committees to implement the high level civil-military policies and strategies;

d) recommend legislative amendments to the relevant authorities to ensure that the national legal and regulatory framework supports the high-level policy and strategy for civil-military cooperation in aviation;

e) establish a CAOM for the safe, equitable and effective management of national airspace in accordance with agreed policies and supported by adequate civil-military cooperation and coordination facilities;

f) establish the necessary strategies and policies to enable the development of appropriate operational procedures and LoA , to enable safe and efficient operations;

g) develop communication, negotiation and priority rules and procedures for civil-military cooperation and coordination;

h) task the appropriate ATS authorities and the appropriate military units to develop the necessary civil-military cooperation and coordination procedures;

i) establish a system and process for the review of airspace organization and management to meet the changing needs of the various stakeholders that foster joint airspace planning activities;

j) establish and monitor, through the CAOM, the implementation of the procedures for airspace reservation or activities which require restriction, to increase predictability and timely access to restricted or reserved airspace whenever possible to maximize benefits and flexibility for all users;

k) promote collaborative airspace planning and the harmonization of procedures with neighbouring States;

l) create a consultative process based on consensus to achieve the goals set forth in the high-level airspace policy;

m) identify and facilitate the implementation of best practices as standardised procedures;

n) ensure that the airspace change processes and procedures developed are compatible with appropriate civil and military aviation safety procedures;

o) enhance interoperability between civil and military ground systems, and military aircraft to support the civil-military cooperation and coordination functions;

p) establish processes to ensure that safety risk assessments are conducted where appropriate;

q) delegate the approval authority to the appropriate committee as deemed necessary;

r) request the appropriate committee to report back on implementation statuses and compliance to the procedures and process;

s) supervise and review the work of the committees; and

t) monitor and analyse compliance to the established procedures and processes, to further improve civil-military cooperation and coordination.

3. **The CMAB actions are governed by the following considerations:**

a) *Safety*. An acceptable level of safety should be maintained for any airspace change and safety risk assessments should be carried out in accordance with the applicable ICAO provisions and State regulations. A safety risk assessment should be systematically conducted by each State before FUA implementation.

b) *Consultation.* Consultation with airspace users, service providers and other relevant bodies should be conducted to obtain consensus, wherever possible, before making changes in the planning or design of airspace arrangements.

c) *Cooperation.* Close cooperation should be maintained with national and international partners to ensure that national airspace planning and policies are consistent with national and international commitments and programmes.

d) *Environment.* The environmental impact of airspace design and planning should be taken into account, wherever possible, at the earliest possible stage when revising airspace procedures and arrangements.

Appendix F

TERMS OF REFERENCE FOR COMMITTEE FOR AIRSPACE AND ORGANIZATION AND MANAGEMENT (CAOM) – MODEL TEMPLATE

Note.— The ToR provided below should be adjusted according to national requirements; some elements may be missing while others may be superfluous

1. Composition

— *Chairperson.* The Committee shall elect co-chairpersons and their vice-chairpersons (one from the civil aviation authority and one from the military authority each) for a cycle of three meetings, unless otherwise re-elected.

— *Members*. Representatives of the civil aviation authority, military authorities, appropriate ANSPs and appropriate military unit(s).

— *Observers* could be invited on an ad hoc basis.

The participant list is as follows:

Name	Title/Function	Organization	Status in CAOM

2. **The CAOM overall approach and responsibilities are to:**

a) ensure that a commonly agreed airspace policy is formulated (e.g. a national airspace charter);

b) establish an AMC and associated procedures;

c) build trust, respect and confidence between regulators, airspace users and stakeholders using a consultative approach with the goal of consensus, especially in the development of flexible airspace structures and procedures;

d) consider both the civil and military aspects when planning for airspace classifications;

e) establish processes to achieve joint airspace planning activities as the norm, for the needs of both civil and military airspace users to be taken into account at the earliest planning phase;

f) to the extent possible, implement best practices and ensure that the airspace change processes and procedures are compatible with appropriate civil and military aviation safety procedures, including the review of airspace safety risk assessments where appropriate;

g) ensure that a safety risk assessment is conducted when planning for the establishment of new airspace structures or when changing or modifying airspace structures;

h) develop collaborative airspace planning and harmonization of airspace management procedures with neighbouring States, and work with these States to establish a cross-border area (CBA) as described in Chapter 4;

i) monitor compliance with FUA and other procedures, including validating national policies, priorities and achieving performance requirements by periodically reviewing airspace needs, organization and management.

j) ensure the ongoing re-assessment of national airspace and airspace organization (structure and procedures), with regard to effective application of the FUA concept, monitor the relevant national legislation and propose amendments as necessary (in coordination with the Legal Committee, if one has been established by the CMAB);

k) establish framework agreements between civil and military authorities to facilitate the application of the FUA concept;

l) ensure that coordination processes between all phases of FUA are established and that civil and military terms and definitions applicable to the principles governing the FUA Concept are harmonized;

m) validate activities requiring airspace segregation and assess the level of risk for other airspace users;

n) ensure that agreed priority rules and negotiation procedures for airspace allocation at pre-tactical and tactical phases are clearly defined and implemented;

o) ensure the progressive design and establishment of new flexible airspace structures, including non-permanent structures as well as free route airspace, when so decided and where appropriate, according to the specific requirements;

p) ensure that the total volume of airspace restrictions or reservations are kept to the minimum necessary while ensuring safety and satisfying national operational requirements;

q) coordinate and plan major or specific events, such as large-scale military exercises, well in advance of the day of operation, especially when it requires additional segregated airspace;

r) establish a communications plan for civil and military stakeholders coordination during the planning and execution of military operations;

s) initiate an AIS publication, as required, to notify changes to airspace structures, classification, access or status; and

t) coordinate, as necessary, with other CMAB Committees.

2. **The CAOM will respect the following principles:**

a) all available airspace should be managed flexibly, within the limits of the ATM system capability and complexity of operations, to support dynamic flight trajectories and provide optimum operational solutions. The required predictability for civil aviation needs to be balanced against the required flexibility of the military;

b) the effective implementation of a flexible process demands commitment from all stakeholders involved. Whenever possible, temporary access for civilian users into airspace normally used by the military or the accommodation of special military operations within airspace normally used by civil operations, should be allowed;

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

d) airspace use should be coordinated and monitored at strategic, pre-tactical and tactical phases to accommodate the conflicting requirements of all users and to minimize any constraints on operations; and

e) when portions of airspace are allocated for specific operations, such constraints should be planned in advance with the necessary changes made dynamically whenever possible, including accommodating short-notice unplanned requirements

3. **The CAOM actions related to FUA are governed by the following considerations:**

a) *Safety*. An acceptable level of safety should be maintained for any airspace change and safety risk assessments should be carried out in accordance with the applicable ICAO provisions and State regulations. A safety risk assessment should be systematically conducted by each State before FUA implementation.

b) *Consultation.* Consultation with airspace users, service providers and other relevant bodies should be conducted to obtain consensus, wherever possible, before making changes in the planning or design of airspace arrangements.

c) *Cooperation.* Close cooperation should be maintained with national and international partners to ensure that national airspace planning and policies are consistent with national and international commitments and programmes.

d) *Environment.* The environmental impact of airspace design and planning should be taken into account, wherever possible, at the earliest possible stage when revising airspace procedures and arrangements.

Appendix G

FLEXIBLE USE OF AIRSPACE

SAMPLE MANUAL

Record of Amendments and Corrigenda

AMENDMENTS			
Num.	Effective date	Date recorded	Recorded by

CORRIGENDA			
Num.	Effective date	Date recorded	Recorded by

INTRODUCTION

1. Objective

1.1 The Flexible Use of Airspace (FUA) Manual (henceforth referred to as 'manual') for (*State XYZ*) has been prepared by (*Insert any of…* CAA/ANSP/DGCA/AIR FORCE/NAVY/ARMY/…etc.,) It provides comprehensive guidelines for matters pertaining to implementing ASM/FUA in (State XYZ) in a harmonized fashion.

1.2 The FUA Manual considers the guidance of the International Civil Aviation Organization in this regard, (*Insert any of…ICAO Doc 10088, ICAO Doc 9750…etc.*). FUA shall be facilitated through both strategic cooperation, pre-tactical cooperation and tactical coordination to enable dynamic interaction, thus allowing the implementation of optimal flight paths, reducing operating costs of airspace users while protecting the environment, whilst paying due heed to security considerations and providing for military operational requirements.

2. Scope

The FUA Manual – (*State XYZ*) has been developed to be used in the (*Insert the name of FIR/FIRs*) taking into account the operational improvements and airspace optimization initiatives in the short and medium term, and particularly in accordance with ATS route network optimization in the region. This manual will apply to all civil and military use of flexible airspace structures.

3. National background

(Note.— Text is only indicative and may be expanded based on the State's analysis of civil military cooperation and flexible use of airspace.)

3.1 Military aviation places a lot of emphasis on a secure national airspace. Civil-military cooperation is leveraging effective real time coordination.

3.2 The goal of civil-military cooperation and coordination should be based on a dialogue between civilian and military authorities, with a clear understanding that supporting the civil air navigation infrastructure is consistent with the military mission to defend the nation's interests. The objective is to make better use of airspace using mechanisms such as the exchange of flight plan and surveillance data.

3.3 An identified gap in the current system is a lack of policy and procedures for FUA, which hampers airspace design and management by not allowing the application of an optimal airspace structure and the use of optimum flight paths. The limitations identified include the existence of permanently reserved airspace, primarily for military purposes, which although justified from a national security point of view, pose constraints on airspace planning, which prevents direct flights between airports of origin - destination and/or city pairs. The endeavour, made using FUA principles, should permit civil flights through such areas, when not being utilized by the military.

3.4 Improved civil-military coordination and cooperation strengthens airspace safety, allows for a more efficient air traffic services (ATS) route structure, reducing miles flown and fuel consumption and, consequently, CO_2 emissions into the atmosphere, and increases airspace capacity.

3.5 It also increases the availability of additional airspaces for military usage, on a day to day basis, where the requirements cannot be met in the existing reserved airspaces should also be considered.

4. Basic airspace management principles and strategies

4.1 States should include the following principles in compliance with ICAO:

a) all available airspace should be managed in a flexible manner, whenever feasible;

b) airspace management processes should incorporate dynamic flight paths and provide optimal operational solutions;

c) when conditions require segregation, based on different types of operations and/or aircraft, the size, shape and time zones of said airspace should be determined to minimize impact on operations;

d) the use of airspace should be coordinated and monitored to accommodate the conflicting requirements of all users and minimize any constrains 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) the complexity of operations may limit the degree of flexibility.

4.2 Cooperation and coordination between civil and military authorities shall be organized at strategic, pre-tactical and tactical levels aimed at increasing airspace safety and capacity and improving the efficiency and flexibility of air operations.

4.3 Consistency among airspace management, air traffic management, air traffic flow management (ATFM), and ATS should be established and maintained at the three airspace management levels (strategic, tactical and pre-tactical).

4.4 Airspace reservation for exclusive or specific use of certain user categories shall be temporarily applied only during limited periods of time depending on actual use and it shall be disregarded as the activity that motivated it ceases to be, and it shall follow the procedures set forth in ICAO documents and Annexes.

4.5 Air traffic service units and users will make the best possible use of available airspace.

4.6 Coordination and collaborative decision making by ATS and ATFM units, and effective application of the FUA concept should be consistent and permanent during the strategic, pre-tactical and tactical phases of airspace management.

4.7 Adequate resources should be allocated for an effective implementation of the FUA concept, taking into account both civil and military needs.

4.8 Security of national airspace shall be paramount and will not be compromised at any stage.

5. FUA Manual – Structure and content

5.1 The FUA Manual considers the national security situation, the national background on civil-military cooperation and the current and future requirements as well as the best practices and the principles of FUA enshrined in various ICAO Annexes and documents.

5.2 The manual is organized as follows:

Chapter 1. Definitions.

*Chapter 2***.** Details of FUA implementation in (*State XYZ*) and the strategic level embodies the three levels of flexible use of airspace (Level 1, 2 & 3, flexible airspace structure, particular application of FUA concept, priority rules, transition to the FUA concept.

*Chapter 3***.** Procedures for airspace change proposals, joint design of airspace at the strategic level, allocation of airspace at the strategic level, (***ATS-ASM-ATFM relationship * Subject to the*

*implementation of ATFM**).***

Chapter 4. Procedures pertaining to Level 2 (pre-tactical management), details of airspace management cells (AMCs), allocation and notification process, based on airspace requests.

*Chapter 5***.** Procedures involved in publication, promulgation and dissemination of FUA information including AIP, airspace use plan, updated airspace use plan etc.

*Chapter 6***.** Details of air defence requirements, cooperation between civil and military unit providing ATS in case of air defence violations, interception of civil aircraft etc.

*Chapter 7***.** Processes and procedures at Level 3 (tactical management).

*Chapter 8***.** Details on civil-military cooperation and the interoperability of their systems.

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Table of Contents

FUA Manual Template

Chapter 1. Definitions

Chapter 2. General

2.1 Implementation of FUA

2.1.1 High level recommendations, master plans, national law on LUA, State adoption of FUA and establishment of a national level CAOM.

(name of national CAOM) — Establishment and terms of reference

2.1.2 The Composition of the *(name of national CAOM)* is as follows:

2.1.3 xxx

	Designation/Organization	Status
1		Chairman
2		Member
3		Member
4		Member
5		Member
6		Member/ Convener
7		Member

2.2 Major functions and responsibilities of CAOM

2.2.1 The *(Name of national CAOM)* is vested with the responsibility of implementation of flexible use of airspace (FUA).

2.2.2 The *(Name of national CAOM)* is responsible for the formulation of National Airspace Policy and carries out necessary strategic planning work, taking into account national and international airspace requirement.

2.2.3 The body also shall develop policy guidelines and procedures for airspace allocation for FUA 1, FUA 2, FUA 3 levels.

(Name of national CAOM) Terms of reference

(Consider inserting the TORs as deemed suitable. The following list is offered as a reference.)

a) continuous assessment/re-assessment of National airspace usage requirements of various stakeholders and Route structures.

b) establishment of flexible use of airspace (FUA) structures and the introduction of procedures for the allocation of these airspace structures.

c) to improve safe and effective regulation and Management of airspace and its supporting infrastructure.

d) to designate military Special Use Airspace (SUA), and to review the continuing use, dimensions and activation timing at regular intervals not exceeding five years.

e) to improve coordination for implementation and harmonization of Civil and Military ATC Systems with common features and applications.

f) standardize CNS/ATM infrastructure where it supports a civil/military interface.

g) to establish, as necessary, appropriate committees/sub-committees/advisory bodies at appropriate levels for implementation or taking suitable decisions for implementation of FUA.

h) any other issue vital to FUA.

2.3 Three Levels

2.3.1. The FUA Concept is based on three Levels of ASM which have been identified as:

a) strategic ASM - Level 1;

b) pre-tactical ASM - Level 2; and

c) tactical ASM - Level 3.

2.3.2 The three levels correspond with civil-military ATM cooperation and coordination tasks. Each level is related directly to, and impacts the others.

Level 1 – Strategic management

2.3.3 Strategic FUA at Level 1 consists of a joint civil and military process within a *(Name of national CAOM)*, which formulates the national airspace policy and carries out the necessary strategic planning work, taking into account national and international airspace users' requirements, within the framework of national security requirements.

2.3.4 In order to maintain a flexible airspace organization, there ought to be a continual assessment of the national airspace and route structures. At strategic level, the working structures for Levels 2 and 3, should be determined and authority required to carry out their tasks, should be given to them. The procedures to be followed at these pre-tactical and tactical levels and the priority rules and negotiation procedures for airspace allocation at Levels 2 and 3 should be determined by the *(Name of national CAOM)*.

Level 2 – Pre-tactical management

2.3.5 Pre-tactical - Level 2 consists of the day-to-day management and temporary allocation of airspace through AMCs.

2.3.6 The airspace management cell (AMC) has the authority to conduct ASM within the framework of the State's airspace structures, priority rules and negotiation procedures as laid down by the National CAOM. The AMC collects and analyzes airspace requests. After coordination, the ATS authority promulgates the airspace allocation.

2.3.7 The airspace allocation information, consolidated into a AUP or UUP, published daily on the ANSP's dedicated portal and provided to aircraft operators (AOs) for flight planning purposes.

Level 3 - Real time use of airspace

2.3.8 Tactical - Level 3 consists of the real time activation, deactivation or real time reallocation of the airspace allocated at the pre-tactical level, and the resolution of specific airspace challenges between civil and military units.

2.3.9 Real time access to all necessary flight data, including controllers' intentions, with or without system support, permits the optimized use of airspace and reduces the need to segregate airspace.

2.4 Flexible airspace structures and procedures

2.4.1 xx

2.5 Conditional routes

A Conditional Route (CDR) is a non-permanent ATS route or a portion thereof which can be planned and/or used under certain specified conditions only. CDRs permit the definition of more direct and alternative routes by complementing and linking to the existing ATS route network.

2.6 Transition to the FUA concept

A State adopting the FUA concept is committed to reassess current national airspace and route structures with the aim of implementing a flexible airspace organization.

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Chapter 3: Level 1

3.1 Airspace change process

xxx

3.2 Joint design of airspace

3.2.1 *The typical cycle of activities can be mainly classified as planning, design, validation and implementation. Best practices include joint design of airspace as a means of minimizing delays in the sometimes long process of airspace change proposals.*

3.2.2 On completion of the planning stage of an airspace change proposal, it may augur well to include a joint evaluation of the airspace design by airspace experts from the ANSP headquarters, area control centres, and military airspace experts from their headquarters, command headquarters and affected military nits. A joint design effort will minimize the delays in validation and implementation, since the considerations of both civil and military stakeholders has been obtained and recorded and the design suitably reiterated.

3.3 Long-term planning of airspace at the strategic level

3.3.1 *Major events planned well in advance, such as large-scale military exercises, rocket launches etc., which require additional segregated airspace are subject to strategic level coordination. Subsequently, these activities will be notified by AIS publication.*

3.3.2 Through the appropriate considerations by the CAOM, military authorities or units which are involved in such well-planned special use airspace shall bring their requirements to the ANSP in adherence to prescribed lead times, as per norms laid down from time to time by the ANSP and as coordinated with stakeholders.

3.4 General

3.4.1 *As an integral part of ATM, ASM personnel should work in close cooperation with both ATS and ATFM personnel.*

3.4.2 An airspace structure reorganized to increase accessibility is essential to increasing the capacity of the ATS system and reducing delays.

3.4.3 In order to achieve an improvement in airspace use, the link between FUA and ATFM is harmonized at all the three Levels including compatibility between ATS, FUA and ATFM procedures and timetables.

3.5 FUA/ATFM relationship at the strategic level - Level 1

3.5.1 *Both ASM and ATFM have a planning phase. At the strategic level, this consists of a periodical review of the use of airspace using traffic statistics and forecasts.*

3.5.2 In this phase, ATFM identifies choke points, sector capacity and demand imbalances. This national periodical review process, involving both airspace and route planners, ACCs/FMUs/FMPs and the airspace management cell, should keep pace with the development of improved navigation capabilities, advanced ATC techniques and changes in user requirements.

3.5.3 A national airspace review, including the review of CDRs, can assist in airspace planning, to establish solutions to identified bottlenecks for the longer term.

3.5.4 The ANSP may consider the preparation and publication of a route availability document (RAD) which enables increased capacity by defining route restrictions via an organized system of major traffic flows and, at the same time, allowing aircraft operators flight planning flexibility. The RAD is therefore based primarily on permanent ATS routes and Category 1 CDRs and includes route restrictions as published in the national AIPs, LoAs, NOTAMs and AIP Supplements. The RAD includes a number of permanent routing suggestions to assist AOs in the preparation of their flight plans; these suggestions are advisory and not mandatory.

3.6 FUA/ATFM Relationship at the pre-tactical level - Level 2

3.6.1 *In the pre-tactical ATFM phase, the ATFM centre highlights areas of insufficient ATC capacity. Routing scenarios have to be considered to solve capacity shortfalls in coordination with AMCs/ACCs/FMUs/FMPs concerned.*

3.6.2 User requirements necessitating segregated airspace form the basis for requests and allocation of relevant SUA.

3.7 ATC/ASM/ATFM relationship at tactical level - Level 3

If a reduction in the activation time of a relevant SUA is agreed between units, the subsequent release of airspace enables ACCs to open certain CDRs and reroute traffic flows at short notice. Similarly, ATS units and/or controlling military units are able to use relevant SUAs at short notice taking into account the general ATFM plan. To enlarge or combine relevant SUAs ACCs may be able to allocate, at short notice, some flight levels of an ATS route segment for temporary use.

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Chapter 4: Pre-tactical management of the airspace

4.1 Level 2 – Pre-tactical management

4.1.1. Pre-Tactical FUA at pre-tactical level consists of the day-to-day management and temporary allocation of airspace through the AMC.

4.1.2 An AMC established with adequate representation from the ANSP/DGCA and military authority/unit(s) shall conduct the pre-tactical level function.

4.1.3 The AMC shall have the authority to manage the airspace within the framework of airspace structures, priority rules and negotiation procedures as laid down in the FUA Manual approved by the *(Name of national CAOM]*.

4.1.4 The AMC shall have adequate authority to enable it to efficiently resolve conflicting airspace requests and minimize the necessity for referral to higher authority.

4.1.5 The AMC shall strictly adhere to the policies formulated by the *(Name of national CAOM)*, and engage in collaborative decision making (CDM), within the framework of FUA and within the powers vested in it.

4.2 Organizational structure of the AMC

The AMC may be comprised of an ANSP nominee, representatives from the Air Force, Army and Navy, and a representative from the State regulatory body.

4.3 Allocation and notification process – General provisions

4.3.1 Agencies responsible for airspace activities should submit their requests for the allocation of airspace or – FUA airspace structures to the AMC, in adherence to the agreed conditions laid down in the SOP/LoA for the SUA activation and deactivation.

4.3.2 After the AMC has received, evaluated and de-conflicted the airspace requests, it will convey the allocation plan through a notification of the airspace allocation published in the AUP, .

4.4 Airspace requests

The requests for airspace use could be presented as a block of airspace required during a specified period of time with the possibility of moving the request in terms of time and flight levels.

4.5 CDR requests

4.5.1 Requests for CDRs are normally based on capacity needs identified in the pre-tactical phase.

4.5.2 Include here State procedures for managing CDR requests.

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Chapter 5: FUA Information Management

5.1 Publication of ASM information

5.1.1 An important task at the national, strategic level is to publish in AIPs the status of airspace structures and ATS routes under its jurisdiction.

5.1.2 Another task consists of the coordination of major events planned well in advance, such as large-scale military exercises or air shows, which may require additional segregated airspace.

5.2 Publication of CDR routes, their availability and conditions

Provide information on how CDRs are described in the AIP, including the timing and means of activation or availability.

5.3 Airspace use plan

The effective application of the FUA Concept requires that pre-tactical level airspace allocation decisions are promulgated daily in an efficient, timely and accurate manner by the AMC by means of an AUP message.

5.4 Updated airspace use plan (UUP)

5.4.1 After the airspace management cell has completed the allocation process, the modification of the airspace allocation might be necessary in order to take advantage of the cancellation of any previously reserved airspace structure. This may also be necessary in cases of sudden unexpected requirements of the military to close certain routes/portions of routes, activate additional SUAs and/or increase timings of already activated SUAs. Changes to the airspace allocation will be effected by the Airspace Management Cell through updated airspace use plans.

5.4.2 Updated airspace use plans will replace the current airspace use plans and previous updated airspace use plans according to the validity time described in the procedure.

5.3 Pre-tactical level Timetable

5.3.1 The application of the procedures described below will continue to allow the tactical management of CDRs and SUA according to the current procedures.

5.3.2 Outside the airspace use plan and updated airspace use plan process the changes will continue to be treated at the tactical level and will be processed at the ATC unit level, informing the users via voice or data link. Notification to pertinent adjacent ATC units will also be provided unit-to-unit.

5.3.3 Include here a description of how pre-tactical level plans, decisions and advisories are managed.

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Chapter 6: Air defence requirements

6.1 Air Defence Identification Zones (ADIZ)

(Insert text on ADIZ)

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Chapter 7: Level 3

Tactical Management Functions (Level 3)

7.1 General

7.1.1 Tactical Level 3 consists of the real-time activation, deactivation or real time reallocation of the airspace allocated at pre-tactical level and the resolution of specific airspace problems and/or traffic situations between civil ATS units and military units providing ATS, controllers and/or controlling military units as appropriate.

7.1.2 The real time access to all necessary flight data, including controller's intentions, ***with or without system support***, permits the optimized use of airspace and reduces the need to segregate airspace.

7.1.3 Adequate real time coordination facilities and procedures are required to fully exploit the FUA concept at Levels 1 and 2. Flexibility in the use of airspace is enhanced by real-time civil/military coordination capability.

7.2 Coordination procedures for ATS routes and airspace transit

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7.3 Transfer of control responsibility

A responsibility for transfer of control should be described in the LoA.

7.4 System support functions

At the tactical level the main requirement is to provide system support to create a traffic environment in which the FUA Concept can be applied efficiently, i.e. an environment in which the need to segregate traffic is reduced to a strict minimum. This can be achieved by:

a) the provision of airspace use data;

b) the exchange of flight data, as appropriate, between civil and military units;

c) the provision of system support for airspace transit.

7.5 Airspace use data function

7.5.1 The Airspace use data function should provide, in real time, information to all parties concerned on the current use of airspace, in addition to AUP/UUP information.

7.5.2 The supporting systems should assure common, secure and consolidated information exchange of the current airspace status.

7.5.3 At tactical level airspace management, information should be available to controllers on activation, deactivation, short-term cancellation or amendments to reservations and reallocation of the airspace structures.

7.5.4 The supporting systems should provide the real time airspace status on an airspace status display and should be capable of interfacing with ATC automated systems.

7.6 Basic flight plan information function

7.6.1 The Basic flight plan data information function concerns the automatic exchange between civil and military control units of necessary flight plan data.

7.6.2 This function will permit the creation of associated tracks/labels in both civil and military units for the display and identification of air traffic.

7.6.3 As a minimum, to permit the correlation of radar data with flight plan data, the aircraft identification or call sign, the SSR Mode and code for each flight concerned in the coordination process shall be passed from civil to military units, and when required, from military to civil units.

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Appendix: Acronyms and abbreviations

ACC	Area control centre
AD	Aerodrome
ADC	Air defence clearance
ADIZ	Air defence identification zone
ADS-B	Automatic dependent surveillance broadcast
AIP	Aeronautical information publication
AIS	Aeronautical information service
AMC	Airspace management cell (AMC)
ANSP	Air navigation Services provider
AO	Aircraft operator/airline operating agencies
ASM	Airspace management
ATC	Air traffic control
ATFM	Air traffic flow management
ATM	Air traffic management
ATS	Air traffic services
ATZ	Aerodrome traffic zone
CBA	Cross-border area
CDM	Collaborative decision making
CDR	Conditional route
CNS/ATM	Communication, navigation and surveillance/air traffic management
CTA	Control area
CTR	Control zone
CWP	Controller work position
DGCA	Director general of civil aviation
e-AIP	electronic AIP
ENR	En route
EOBT	Estimated off block time
ETD	Estimated time of departure
FDPS	Flight data processing system
FIC	Flight information centre
FIR	Flight information region
FMU/FMP	Flow management unit/flow management
Position FPL	Flight plan
FTP	File transfer protocol
FUA	Flexible use of airspace
GNSS	Global Navigation Satellite System
GPI	Global plan initiatives
HMI	Human machine interface
ICAO	International Civil Aviation Organization
IFR	Instrument flight rules
LoA	Letter of agreement
MOU	Memorandum of agreement
PANS	Procedures for Air Navigation Services
PBN	Performance-based navigation
PSR	Primary surveillance radar
RAD	Route availability document
RPA	Remotely piloted aircraft
RRP	Rerouting proposals

RTF	Radio telephony frequency
SAR	Search and rescue
SARPS	Standards and Recommended Practices
SIDS	Standard instrument departures
SMS	Safety management systems
SOP	Standard operating procedures
SSR	Secondary surveillance radar
STARS	Standard arrival routes
SUA	Special use airspace
SUPPS	Regional Supplementary Procedures
TMA	Terminal control area
TMU	Traffic management unit
TRA	Temporary reserved areas
UACC	Upper area control centres
UAS	Unmanned aircraft system
VFR	Visual flight rules
WGS	World Geodetic System

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