United Arab Emirates

الهيئة العامة للطيران المدني
GENERAL CIVIL AVIATION AUTHORITY

GUIDANCE MATERIAL

GM No. 02

Civil Military Coordination Plan

Version 1.0

FOREWORD

1. The General Civil Aviation Authority (hereinafter "Authority") has recently conducted a review of CAR PART VIII Subpart 4 as part of a routine Regulation review. The review has concluded that the provisions of Subpart 4 related to coordination between Civil and Military ATS need to be expanded and that GCAA provide guidance on this subject. Guidance material is thus provided in the form of the UAE Civil Military coordination guidance document.

2. This issue is based on NPA 05-2014 and the associated Comments Response Document CRD.

HIGHLIGHTED CHANGE

Effective Date	Brief Description
September 2014 Version 1-0	First Edition

TABLE OF CONTENT

DEFINITIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Special Use Airspace. A collective term for Danger, Restricted or Prohibited Areas.

State aircraft. Aircraft used in military, customs and police services.

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

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

ACRONYMS AND ABBREVIATIONS

ANSP	Air navigation service provider
ASM	Airspace management
ATC	Air traffic control
ATFM	Air traffic flow management
ATM	Air traffic management
ATS	Air traffic services
CDM	Collaborative decision-making
CNS/ATM	Communications, navigation, and surveillance /air traffic management
FIR	Flight information region
FUA	Flexible use of airspace
GNSS	Global navigation satellite system
LOA	Letter of Agreement
NOTAM	Notice to airmen
PANS	Procedures for air navigation services
PBN	Performance-based navigation
TRA	Temporary reserved area
TSA	Temporary segregated area

1. CIVIL / MILITARY COLLABORATION PLAN

This plan is designed to facilitate the requirements of the UAE Airspace Policy with respect to Civil/Military Cooperation. The plan requires the adoption of the ICAO Aviation System Block Upgrade (ASBU) modules related to civil/military cooperation and the adherence to the time-lines incorporated in the various related modules. The Civil/military cooperation ASBU modules can be found in Appendix 1 to the plan.

It details the UAE position on enhancing civil/military collaboration and cooperation which should result in benefits to airspace management and air traffic management (ATM) system operations. Civil/military coordination has been shown in other parts of the world to:

a) attain higher levels of safety;

b) increase airspace capacity;

c) enhance national security; and

d) increase operational efficiencies through:

   1) the interoperability of civil and military aircraft;

   2) a reduction in distances flown;

   3) the establishment of optimal flight profiles; and

   4) a reduction in fuel consumption and carbon emissions.

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

1.1. ICAO REQUIREMENTS

Article 3 of the ICAO Convention on International Civil Aviation, particularly paragraph 3(d), requires States to safeguard navigation of civil aircraft when setting rules for their State aircraft. However State aircraft are specifically exempt from compliance with articles of the Convention.
Appendix O from Resolution 37-15 of the 37th Assembly of ICAO contains, inter alia, the following statement:

> *"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."*
> "*Contracting 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*"

In order for international aviation to operate as a safe and harmonious system, States have, through the acceptance of the ICAO Conventions, Annexes and Documents, agreed to collaborate on a common

regulatory infrastructure and have agreed on the air traffic services provided within each State's airspace, as well as access to and use of UAE managed airspace.

ICAO also requires, through Annex 11 and the Global Air Navigation Plan, Doc 9750, for ATS Authorities to establish and maintain close cooperation with military authorities, and in PANS-ATM, gives guidance to help achieve this.

In 2009, ICAO recommended that civil and military experts should jointly develop advice and guidance on the best practices for civil/military cooperation and acknowledged that successful cooperation required collaboration that is based on communication, education, a shared relationship and trust.

The UAE is developing an ATM Strategic Plan, the draft of which contains the following statements:

6.2.1 Airspace Organization and Management: "This concept establishes airspace structures to support the various stakeholders' requirements for access and level of service. The concept requires airspace to be considered a National asset, the management of which will be dynamic and flexible with any reservations being of a temporary nature allowing full access when that requirement no longer exists." and

9.1 Civil/Military Cooperation Strategy: "Airspace is recognised as a National asset which should, except in times of National emergency, be available to all users in an organized and equitable manner.

Both civil and military aviation sectors are essential to National stability and economic wellbeing. However, both usually cannot operate simultaneously within the same block of airspace, thus requiring the establishment of boundaries and segregation. The UAE is therefore faced with the challenge of managing limited airspace in a way that safeguards both civil and military aviation requirements.

1.2. AVIATION SYSTEM BLOCK UPGRADE (ASBU)

ICAO recently introduced the ASBU concept detailing a series of improvements to the aviation system, timelines and "performance areas" involved. Several of these performance areas require improvements to civil military coordination.

The upgrades are sorted into four periods, Block 0 by 2018, Block 1 by 2023, Block 2 by 2028 and Block 3 2028 and beyond.

This plan requires adherence to those performance areas related to civil military coordination which refer to optimizing capacity and flexible flights and efficient flight paths through a series of modules including:

- Free-Route Operations (FRTO) spanning Blocks 0, 1 and 3.
- Continuous Descent Operations (CDO) spanning Blocks 0, 1 and 2.
- Continuous Climb Operations (CCO) in Block 0.

Detailed requirements of the above Civil Military coordination related ASBUs is found in ***Appendix 1*** at the back of this plan.

1.3. BENEFITS OF ESTABLISHING A CIVIL MILITARY COORDINATION STRUCTURE

When effective civil/military coordination takes place, airspace is no longer designated as purely civil or military airspace. This National asset is considered one asset which is allocated according to the demands of the day. This results in:

a. More efficient civil aviation through the optimization of use of the limited airspace resource within the UAE FIR
b. Enhanced ATS through better sectorisation and an increase in capacity.
c. Reduction in the segregation of civil and military operations
d. Improved civil aviation economics through more direct routing and access to optimum flight levels

One area where interoperability, in the form of military adherence to civil regulations, can provide immediate benefits is the equipage of military transport aircraft to operate in compliance with civil airspace requirements whenever they operate in unsegregated airspace.

2. CIVIL / MILITARY INTEROPERABILITY

2.1 INTRODUCTION

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

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

This plan recommends a three tier airspace management structure consisting of a Strategic level, a Pre-tactical level and a Tactical level.

2.2 STRATEGIC AND/OR POLITICAL INTEROPERABILITY

The strategic level reviews the UAE National airspace policy incorporating National civil aviation requirements, National military requirements, the needs of airspace users and ANSPs. This level establishes both permanent and temporary pre-determined airspace structures.

The strategic level determines the prioritization of the ASBU requirements related to civil military coordination. See Appendix 1 for a breakdown of the relevant ASBU modules.

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

Finding a common ground can be difficult to achieve. National considerations with respect to defence on one hand and accessibility for National growth on the other hand, are potential deterrents to affordable interoperability. It is therefore in everyone's interest to cooperate and invest in order to achieve the highest level of interoperability and cooperation.

2.3 OPERATIONAL AND TECHNICAL INTEROPERABILITY

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

The day to day allocation of airspace according to user requirements takes place at the pre-tactical level. This level is where operational management of airspace within the structures developed by the strategic level occurs. Airspace structures determined at this level are disseminated to interested airspace stakeholders.

The tactical level is where the activation, de-activation and reallocation of airspace allocated at the pre-tactical tier takes place in a real-time scenario. Airspace problems are resolved at this level to ensure a safe separation of both military operations, within sufficient airspace reserved for military purposes, and civil operations within adjacent airspace.

2.4 REGULATION AND STANDARDIZATION

Full access for State transport aircraft to the airways structure is enhanced by agreement between the GCAA Regulator and the UAE military authorities as to which CAR's the military will comply with, as a matter of course, except in times of national emergency.

Where military ground communications and surveillance systems are integrated into a civil CNS/ATM network, or when military units provide air navigation services to civil aviation or when carriage requirements are imposed on airspace users there is a requirement for standardization of system interoperability, therefore the GCAA and service providers implementing regulations or designing procedures should consider and minimize the impact of such actions on military users and systems (ground or airborne).

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

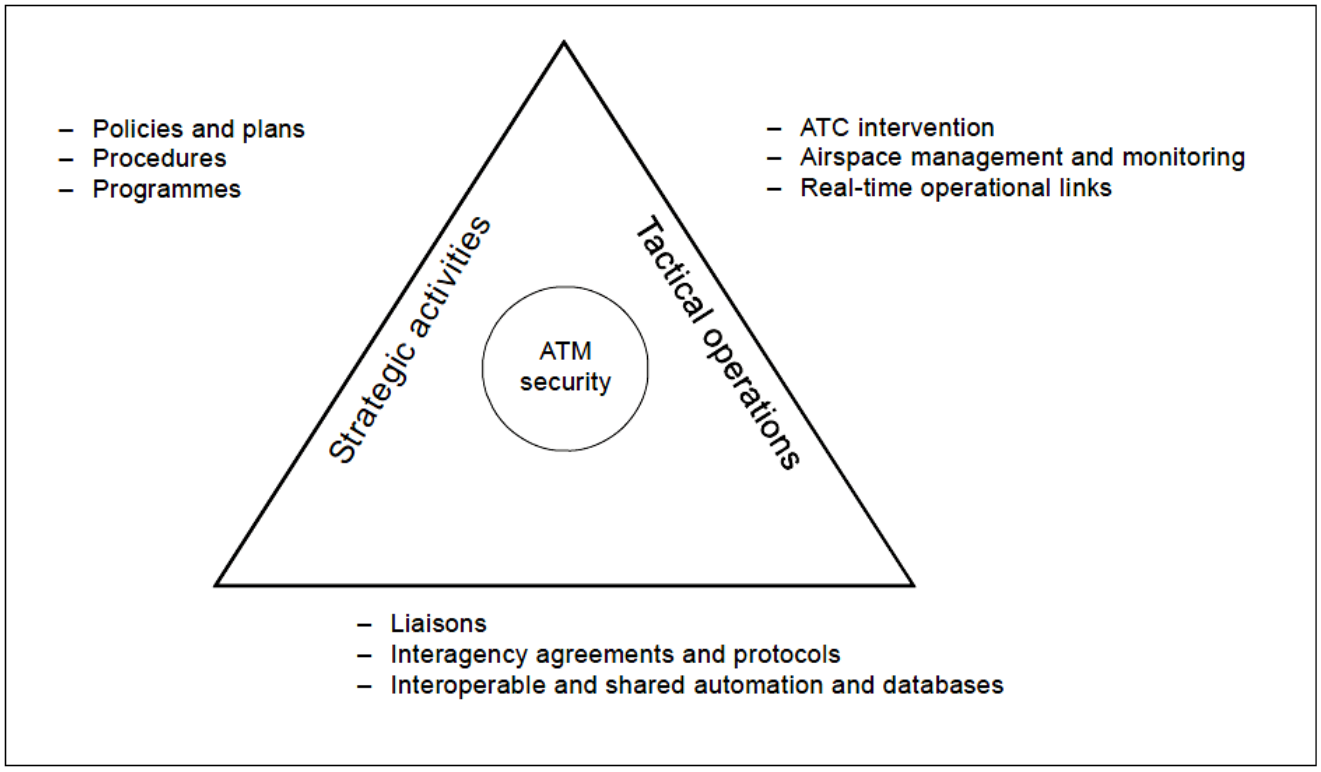
One of the most significant consequences of the present situation is evidenced whenever a military aircraft that intends to use civil route structures has to be accommodated using special handling or by applying exemption policies for the airborne equipage. It needs to be realized that the need for an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

as a measure of last resort.

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

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

Figure 1 below shows the key cooperation components.



3. THE FLEXIBLE USE OF AIRSPACE CONCEPT

Meeting future air traffic requirements for increased safety, security, capacity, efficiency, environmental sustainability, and sovereignty depends on effective civil/military coordination.

Flexible use of airspace (FUA) is an airspace management concept based on the principle that airspace should not be designated as purely civil or military, but rather as a finite resource in which all user requirements are accommodated to the greatest possible extent. The optimum result is one in which large volumes of permanent restricted airspace or special use airspace are replaced by agreed designated volumes of segregated airspace reserved for specific times for military purposes then returned to civil use.

The FUA concept includes consideration of effective communication, cooperation and coordination necessary to ensure a safe, efficient and predictable use of airspace. Joint civil/military coordination for airspace organization and management is essential to the realization of current and future CNS/ATM initiatives.

Temporarily segregating airspace based on actual military requirements, through an effective collaborative civil/military process, should be developed to release the unused capacity for effective use by civil aviation. In order to enable effective flexible use of airspace, some basic prerequisites are the:

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

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

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

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

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

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

Today aircraft are more capable of accurate navigation than in the past. Using global navigation

satellite systems (GNSS) and performance-based navigation (PBN), aircraft can fly between terminals and en-route phases of flight with negligible deviations. However, lack of civil/military coordination of airspace management has resulted in inefficient airspace use and limited use of aircraft capabilities.

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

3.1 FUA PRINCIPLES

An FUA concept embraces the following principles:

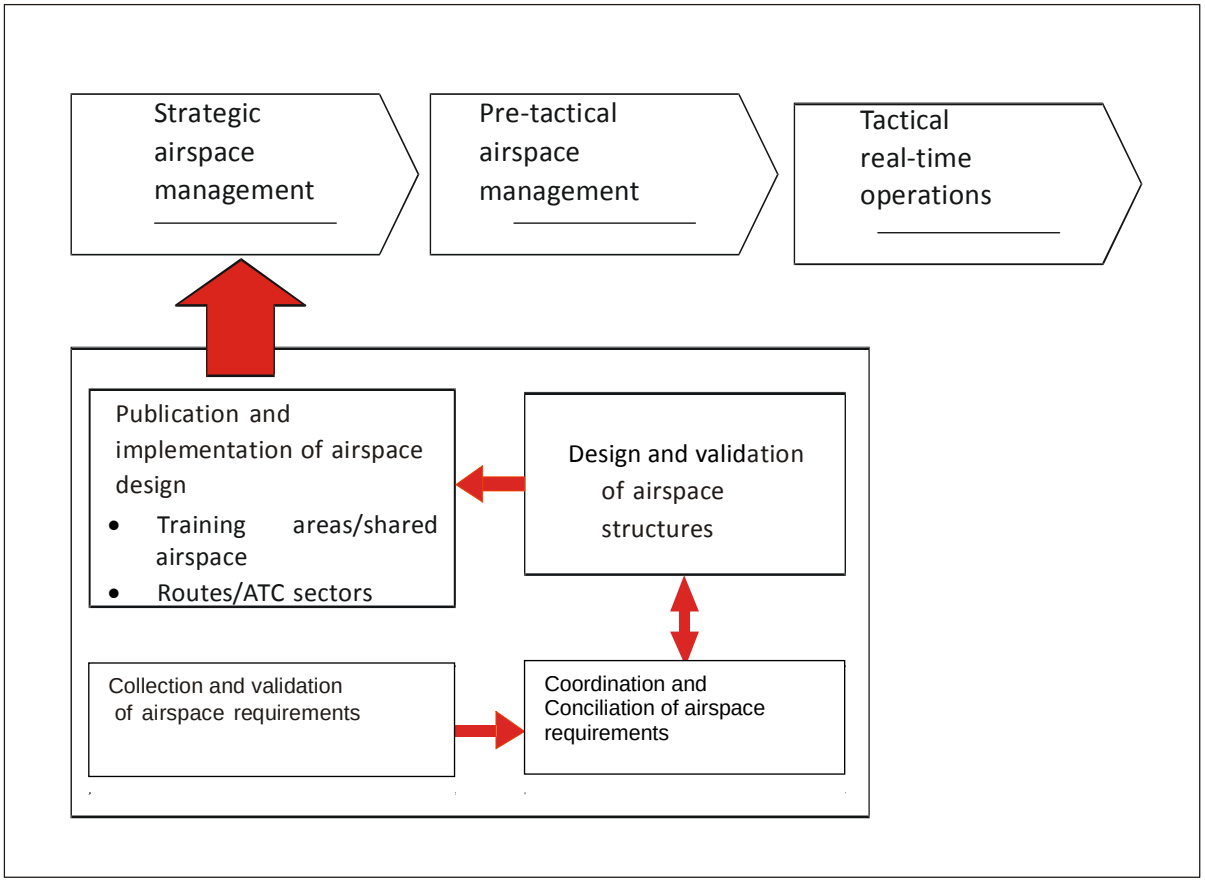
a) Coordination between civil and military authorities should be carried out at the strategic, pre-tactical and tactical levels in order to increase safety and airspace capacity and to improve the efficiency of aircraft operations.

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

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

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

Figure 2. Coordination between civil and military authorities carried out at the strategic, pre-tactical and tactical levels



3.2 STRATEGIC AIRSPACE MANAGEMENT

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

a) establish airspace structures and the ATS route network in conjunction with adjacent Regulatory, military and ANSPs in order to provide, as much as possible, a flexible airspace structure;

b) agree the priorities and negotiation procedures;

c) develop coordination procedures and airspace management procedures to empower the activities of the pre-tactical level unit/s;

d) review as required the airspace needs; and

e) develop cross-border coordination processes to allow airspace planning and harmonized airspace management between ANSPs in adjacent states.

3.3 PRE-TACTICAL AIRSPACE MANAGEMENT

The day to day allocation of airspace according to user requirements takes place at the pre-tactical level, where operational management of airspace within the structures developed by the strategic level occurs. Airspace structures determined at this level are disseminated to interested airspace stakeholders as an Airspace Operational Use Plan.

Availability of Conditional routes covering the period of the Airspace Operational Use Plan would be promulgated to all interested airspace users for planning purposes.

3.4 TACTICAL AIRSPACE MANAGEMENT

Tactical ASM should be carried out at the level of ATS units and controlling military units. Dedicated coordination procedures and communication facilities should enable mutual provision of airspace data in a timely manner to allow effective real-time activation, deactivation or reallocation of the airspace allocated at the pre-tactical level. All affected users should be notified of the current status of the airspace. This will allow maximum joint safe use of the available airspace asset and minimize specific airspace issues between military and civil traffic. Airspace problems are resolved at this level to ensure a safe separation of both military operations within sufficient airspace reserved for that purpose and civil operations within adjacent airspace.

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

Appendix 1: Civil Military ASBU elements

Block 0 Upgrades Related to Civil Military Coordination				
Module	**Summary**	**Elements**	**Required Actions**	**Timelines**
0-FRTO- Improved Operations through Enhanced En-Route Trajectories	To allow the use of airspace which would otherwise be segregated (i.e. special use airspace) along with flexible routing adjusted for specific traffic patterns. This will allow greater routing possibilities, weather avoidance and reduced congestion on trunk routes and busy crossing points, resulting in reduced flight length and fuel burn.	1 airspace planning: possibility to plan, coordinate and inform on the use of airspace. This includes collaborative decision-making (CDM) applications for en-route airspace to anticipate on the knowledge of the airspace use requests, take into account preferences and inform on constraints.	Establish ASM structure including Flexible Use of Airspace (FUA).	ASAP
		2 flexible use of airspace (FUA) to allow both the use of airspace otherwise segregated, and the reservation of suitable volumes for special usage; this includes the definition of conditional routes.	Collaborative operational real time airspace management; PBN and RNP introduction	ASAP
		3 flexible routing (flex tracking): route configurations designed for specific traffic pattern.	PBN and RNP introduction; Flexible route structure development; Regional agreements	ASAP
0-CDO-Improved Flexibility and Efficiency in Descent profiles (CDO)	To use performance-based airspace and arrival procedures allowing aircraft to fly their optimum profile using continuous descent operations (CDOs). This will optimize throughput, allow fuel efficient descent profiles and increase capacity in terminal areas.	1 Continuous descent is one of several tools available to aircraft operators and ANSPs to benefit from existing aircraft capabilities and reduce noise, fuel burn and the emission of greenhouse gases. CDO can provide for a reduction in fuel burn and emissions, while increasing flight stability and the predictability of flight path to both controllers and pilots. CDO is enabled by airspace design, procedure design and facilitation by ATC, in which an arriving aircraft descends continuously, to the greatest possible extent, from the top-of-descent (TOD) and uses descent profiles that reduce controller-pilot communications and segments of level flight.	Airspace design to facilitate optimum descent profiles, which will require separation from temporary reserved airspace. ATS Training Regional coordination/LoA	ASAP
		1. Introduction of PBN within the UAE airspace	Navigation performance requirements mandated.	2015

Block 0 Upgrades Related to Civil Military Coordination				
Module	**Summary**	**Elements**	**Required Actions**	**Timelines**
0-CCO— Improved Flexibility and Efficiency Departure Profiles - Continuous Climb Operations (CCO)	To implement continuous climb operations in conjunction with Performance-based navigation (PBN) to provide opportunities to optimize throughput, improve flexibility, enable fuel-efficient climb profiles and increase capacity at congested terminal areas.	This module is a first step towards harmonization and a more optimized organization and management of the airspace. Integration with other airspace and procedures (PBN, continuous descent operations (CDO), and airspace management) to increase efficiency, safety, access and predictability; and minimize fuel use, emissions, and noise. Inefficient routing can both cause and be caused by under-use of available airspace capacity. Efficiency of climb profiles may be compromised by level off segments, vectoring around reserved airspace. Existing procedure design techniques do not cater for current FMS capability to manage the most efficient climb profiles.	Regional cooperation on ATS sectorisation to ensure climb is contained within one ATS unit's airspace where possible. Airspace design to ensure that optimum profiles are considered in development of temporary reserved airspace.	2018

Block 1 Upgrades Related to Civil Military Coordination				
Module	**Summary**	**Elements**	**Required Actions**	**Timelines**
1-FRTO- Improved Operations through Optimised ATS Routing	To provide, through performance-based navigation (PBN), closer and consistent route spacing, curved approaches, parallel offsets and the reduction of holding area size. This will allow the sectorisation of airspace to be adjusted more dynamically. This will reduce potential congestion on trunk routes and busy crossing points and reduce controller workload. The main goal is to allow flight plans to be filed with a significant part of the intended route specified by the user-preferred profile. Maximum freedom will be granted within the limits posed by the other traffic flows and airspace reservations. The overall benefits are reduced fuel burn and emissions.	1 free routing: Free routing corresponds to the ability for flights to file a flight plan with at least a significant part of the intended route which is not defined according to published route segments but specified by the airspace users. It is a user-preferred route, not necessarily a direct route, but the flight is supposed to be executed along the direct route between any specified way-points. The use of free routing may be subject to conditions, in particular inside a defined volume of airspace, at defined hours, for defined flows.	Regional cooperation. The airspace requirements (RNAV, RNP) may require new ATM procedures and ground system functionalities. Some of the ATM procedures required for this module are linked with the processes of notification, coordination and transfer of control. Care needs to be taken so that the development of the required ATM procedures provides for a consistent application across regions. An adequate navigation infrastructure in the airspace is required. For free routings, the flight planning and the flight data processing functionalities need to be upgraded to support the air traffic controller with the means to understand/visualise the flight paths and their interactions, as well as to communicate with adjacent controllers.	2018
		2.Dynamic Sectorisation: The improvements in the design of the route network or the possibility to fly outside of a fixed route network make the pattern and concentration of traffic not always the same. Where sectorisation is designed to create capacity for ATC, the implementation of the above elements requires that the sectorisation be adjusted more dynamically than only in strategic ATC phases. Dynamic sectorisation is applied in real-time by selecting the most suitable configuration among those available	Dynamic sectorisation requires the flight data processing functionality to be able to work with different sector lay-outs and sector grouping/de-grouping functionality. This functionality is available in many systems today. Training requirements exist	2018

Block 1 Upgrades Related to Civil Military Coordination				
Module	**Summary**	**Elements**	**Required Actions**	**Timelines**
1-CDO—Improved Flexibility and Efficiency in Descent Profiles (CDOs)	To enhance vertical flight path precision during descent, arrival, and enables aircraft to fly an arrival procedure not reliant on ground based vertical guidance. The main benefit is higher utilisation of airports, improved fuel efficiency, increased safety through improved flight predictability, reduced radio transmissions, and better utilization of airspace.	VNAV contributes to terminal airspace design and efficiency due to an aircraft's ability to maintain a vertical path during descent. This profile would be further enhanced if the airspace structure was created around optimum profiles.	Regional coordination on ATC sectors to contain profile within 1 ANSP's airspace wherever possible. Airspace design to incorporate optimum profile. Training for crew and ATCOs.	2018
Block 2 Upgrades Related to Civil Military Coordination				
Module	**Summary**	**Elements**	**Required Actions**	**Timelines**
2-CDO—Improved Flexibility and Efficiency in Descent Profiles (CDOs) using VNAV, required speed and time at arrival	A key emphasis is on the use of arrival procedures that allow the aircraft to apply little or no throttle in areas where traffic levels would otherwise prohibit this operation. This block will consider airspace complexity, air traffic workload, and procedure design to enable optimized arrivals in dense airspace.	1 Accurate trajectory modeling: This element is focused on obtaining the most accurate trajectory model for use by all automation systems. This includes accurate position information, clearance information, and the use of automated resolutions that reduce controller workload.	Airspace design, in conjunction with military, required to accommodate profiles to minimise need for collaboration on profile management.	2023
		2 Advanced aircraft capabilities: This element will focus on cockpit capabilities that enable optimal trajectory selection and the ability to fly point-to-point RNAV and RNP procedures. This element will also examine cockpit automation that enables the aircraft to self-separate and avoid potential conflicts. This element will focus on globally-harmonized standards development for trajectory data exchange between the ground and aircraft avionics systems such as the frequency management system (FMS).	Ability for profile data to be shared with civil and military ANSPs as required.	2023
		3 Traffic flow management and time-based metering: This element will harmonize the traffic flow	Being developed	2023

		management automation which continuously predicts the demand and capacity of all system resources, and will identify when the congestion risk for airspace is predicted to exceed an acceptable risk. Traffic management will take action in the form of just in time reroutes and metering times to congested resources. The problem resolution element will create a solution that meets all system constraints.		
Block 3 Upgrades Related to Civil Military Coordination				
Module	**Summary**	**Elements**	**Required Actions**	**Timelines**
3-FRTO- Traffic Complexity Management	Introduction of complexity management to address events and phenomena that affect traffic flows due to physical limitations, economic reasons or particular events and conditions by exploiting the more accurate and rich information environment of a SWIM-based ATM. Benefits will include, optimized usage and efficiency of system capacity	None specifically defined yet, however the long-term evolution of trajectory management is addressed in this module in relation with traffic densities higher than the present ones, and/or with a view to improve the solutions applied so far and provide optimized services while working closer to the system limits. This is referred to as “managing complexity”.	This is an area of active research, where innovative solutions are probably as important as the understanding of the uncertainties inherent to ATM and of the air transport mechanisms and behaviours to which ATM performance is sensitive to.	2028