International Civil Aviation Organization

ASBU/SIP/Lima/2012-WP/24 A

Aviation System Block Upgrades

Module N° B0-10/PIA 3

Improved Operations through Enhanced En-Route Trajectories

Workshop on preparations for ANConf/12 − ASBU methodology
(Lima, 16-20 April 2012)

Module N° B0-10

Improved Operations through Enhanced En-Route Trajectories

Summary	To allow the use of airspace which would otherwise be segregated (i.e. military airspace) along with flexible routing (Enroute-PBN) adjusted for specific traffic patterns. This will allow greater routing possibilities, reducing potential congestion on trunk routes and busy crossing points, resulting in reduced flight length and fuel burn.
Main Performance Impact	-KPA01 Access & Equity -KPA02 Capacity -KPA04 Efficiency -KPA05 Environment -KPA06 Flexibility -KPA09 Predictability
Operating Environment/Phases of Flight	En-route, TMA
Applicability Considerations	en-route airspace.The larger the size of the concerned airspace the greater the benefits, in particular for flextrack aspects. Benefits accrue to individual flights and flows. Application will naturally span over a long period as traffic develops. Its features can be introduced starting with the simplest ones.
Global Concept Component(s)	AOM – Airspace Organisation & Management AUO– Airspace Users Operations DCB – Demand-Capacity Balancing
Global Plan Initiatives	GPI-1 Flexible use of airspace GPI-4 Align upper airspace classifications GPI-7 Dynamic and Flexible Management GPI-8 Collaborative airspace design and management
Global Readiness Checklist	

	Status
Standards Readiness	Ready
Avionics Availability	Ready
Ground Systems Availability	Ready
Procedures Available	Ready
Ready	Ready

Module N° B0-10 - Baseline

- Varies from States and regions
  - Airspace organizations and management
  - limited use of RNAV
  - Aligning upper airspace classifications
  - Rigid allocation of airspace between civil and military authorities
- Integration of civil and military ATC has been a way to eliminate some of the issues.
- **Airspace classification (Not included in the module but mapped to this Module)**

Module N° B0-10 – Change Brought by the Module

- **Element 1 ✈ Airspace Planning**
  - Activities to organise and manage airspace prior to the time of flight
  - Includes CDM applications for En-Route Airspace
- **Element 2 ✈ FUA: Flexible Use of Airspace**
  - Airspace should not be designated as either purely civil or purely military airspace, but should be considered as one continuum in which all users' requirements are accommodated to the maximum extent possible.
- **Element 3 ✈ Flexible Routing (Enroute-PBN)**
  - Design of routes (or tracks) to match the traffic pattern and other variable factors such as weather- RNP 2/ Advance RNP
  - When already in place, flex tracks systems can be improved in line with the new capabilities of ATM and aircraft, such as PBN and ADS.
  - A current application of the element is DARPS, Dynamic Air route Planning System, used in the Pacific Region

Module N° B0-10 – Intended Performance Operational Improvement

Access and Equity	Better access to airspace by a reduction of the permanently segregated volumes.
Capacity	The FUA gives greater possibilities to separate flights horizontally. PBN helps to reduce route spacing and aircraft separations. This in turn allows reducing controller workload by flight.
Efficiency	In particular the module will reduce flight length and related fuel burn and emissions. The potential savings are a significant proportion of the ATM related inefficiencies. The module will reduce the number of flight diversions and cancellations.
Environment	Fuel burn and emissions will be reduced;
Flexibility	The various tactical functions allow to react rapidly to changing conditions.
Predictability	Improved planning allows stakeholders to anticipate on expected situations and be better prepared.
CBA	The ground costs are lower than the benefits to airspace users.

Module N° B0-10 – Necessary Procedures (Air & Ground)

- **Element 1 ✈ Airspace Planning**
  - Required procedures exist for the main. They may need to be complemented by local practical guidance and processes
  - The airspace requirements (RNAV, RNP and the value of the performance required) may require new ATS procedures and ground system functionalities
- **Element 2 ✈ FUA: Flexible Use of Airspace**
  - The ICAO Circular 330 AN/189 Civil/Military Cooperation in Air Traffic Management offers guidance and examples of successful practices of Civil and Military Cooperation
- **Element 3 ✈ Flexible Routing (enroute PBN)**
  - A number of operational issues and requirements will need to be addressed to enable harmonized deployment of Flex Route operations in a given area such as:
    - Some adaptation of Letters of Agreement;
    - Revised procedures to consider the possibility of transfer of control at other than published fixes;
    - Review of controller manuals and current operating practices
    - Specific communication and navigation requirements

Module N° B0-10 – Necessary System Capability

- **Avionics**
  - Deployment of PBN is ongoing; Enhanced flight planning systems (FPS) available today
  - Flight dispatchers must ensure the applicability of Overflight permissions for the over flown countries
- **Ground Systems**
  - Technology is available. Even CDM can be supported by a form of internet portal.
  - Basic FUA concept can be implemented with the existing technology. For more advanced use of conditional routes, a robust collaborative decision system is required.
  - ANSPs evaluate their FDPS to determine what, if any, modifications will be required to accommodate the implementation of Flex Route operations

Module N° B0-10 – Training and Qualification Requirements

- The required training is available and the change step is achievable from a human factors perspective. Training in the operational standards and procedures are required for this Module.
- Likewise, the qualifications requirements are identified in the regulatory requirements

Module N° B0-10 – Regulatory /Standardization needs and Approval Plan (Air & Ground)

- **Element 1 ✈ Airspace Planning**
  - ICAO material is available
- **Element 2 ✈ FUA: Flexible Use of Airspace**
  - Until today, the Chicago Convention in its Article 3 expressly excludes the consideration of State aircraft from the scope of applicability
  - ICAO provisions related to coordination between civil and military in support to the Flexile Use of Airspace can be found in several Annexes, PANS and Manuals
- **Element 3 ✈ Flexible Routing**
  - LoA/LoCs: Letters of agreement (LoA) and/or letters of coordination (LoC) might be required to reflect the specificities of Flex Route operations. Local hand-off procedures, timings and frequency allocations must be clearly detailed
- **Approval Plans:** To Be Determined, based upon regional applications. Possible regional mandates of PBN should be considered.

Module N° B0-10 – Reference Documents

- ***Standards***
  - ICAO Doc 4444, *Procedures for Air Navigation Services — Air Traffic Management*, Chapter 5
- ***Procedures:*** Nil
- ***Guidance Material***
  - ICAO Doc 9426, *Air Traffic Services Planning Manual;*
  - ICAO Doc 9554, *Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations;*
  - ICAO Doc 9613, *Performance-based Navigation (PBN) Manual;*
  - ICAO Doc 9689, *Manual on Airspace Planning Methodology for the Determination of Separation Minima;*
  - ICAO Global Collaborative Decision Making (CDM) Guidelines (under development);
  - ICAO Circular 330 AN/189, *Civil/Military Cooperation in Air Traffic Management.*
- ***Approval Documents***
  - ICAO Doc 9426, *Air Traffic Services Planning Manual*;
  - ICAO Doc 9689, *Manual on Airspace Planning Methodology for the Determination of Separation Minima;*
  - ICAO Doc 9613, *Performance-based Navigation (PBN) Manual*;
  - ICAO Doc 9554, *Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations*;
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Module N° B0-10 Implementation - Benefits and Elements

Improved Operations through Enhanced En-Route Trajectories

- Benefits: Access, Capacity, Efficiency, Environment Flexibility and Predictability
- Elements:
  - Airspace classification (not included in the Module)
  - Airspace planning and application of CDM for En-Route Airspace;
  - Flexible use of airspace, improve civil/Military coordination and determine conditional routes
  - Flexible routing –Enroute PBN (RNP2/Advance RNP)/DARPs

  To be reflected in ANRF