International Civil Aviation Organization

ASBU/SIP/Lima/2012-WP/28 A

Aviation System Block Upgrades
Module N° B0-05/ PIA 4

Improved Flexibility and Efficiency in Descent Profiles (CDOs)

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

Module N° B0-05
Improved Flexibility and Efficiency in Descent Profiles (CDOs)

Summary	Deployment of performance-based airspace and arrival procedures that allow aircrafts to fly their optimum profile taking account airspace and traffic complexity with continuous descent operations (CDOs).
Main Performance Impact	KPA-03 – Cost-effectiveness; KPA-04 – Efficiency; KPA-09 - Predictability
Operating Environment/Phases of Flight	Approach/Arrivals and En-Route.
Global Concept Component(s)	AOM – Airspace Organisation and Management AO – Aerodrome Operations TS – Traffic Synchronisation, AOM
Global Plan Initiatives (GPI)	GPI-10- Terminal Area Design and Management; GPI-11- RNP and RNAV Standard instrument Departures (SIDS)and Standard Terminal Arrivals (STARS);
Pre-Requisites	NIL
Global Readiness Checklist	Status
	Standards Readiness — Ready
	Avionics Availability — Ready
	Ground System Availability — Ready
	Procedures Available — Ready
	Operations Approvals — Ready

Module N° B0-05 - Baseline

- Varies from one State/region to the next.
- Some aspects of the movement to PBN have already been subject of local improvements in areas

Module N° B0-05 – Change brought by the Module

- **Element 1 ✈ Continuous Descent Operations (CDO)**
  - CDO is enabled by airspace design, procedure design and facilitation by ATC
  - An optimum CDO starts from the top-of-descent (TOD) and uses descent profiles that reduce controller-pilot communications and segments of level flight.
  - Ex: an arriving aircraft descends continuously, to the greatest possible extent, by employing minimum engine thrust, ideally in a low drag configuration, prior to the final approach fix/final approach point (FAF/FAP).
- **Element 2 ✈ Performance -based Navigation (PBN)**
  - The PBN concept encompasses two types of navigation specifications:
  - *RNAV specification*: navigation specification based on area navigation that does not include the requirement for on-board performance monitoring and alerting, designated by the prefix RNAV,
  - *RNP specification*: navigation specification based on area navigation that includes the requirement for on-board performance monitoring and alerting, designated by the prefix RNP, ex: PBN STARs

Module N° B0-05 – Intended Performance Operational Improvement

Efficiency	❑cost savings through reduced fuel burn ❑authorization of operations where noise limitations would otherwise result in operations being curtailed or restricted ❑reduction in the number of required radio transmissions ❑optimal management of the top-of-descent in the en-route airspace
Environment	✓Reduction on CO_2 through reduced fuel burn
Safety	▪ more consistent flight paths and stabilized approach paths ▪ reduction in the incidence of controlled flight into terrain (CFIT) ▪ separation with the surrounding traffic (especially free-routing) ▪ reduction in the number of conflicts.
CBA	✓CDO benefits are heavily dependent on each specific ATM environment; ✓If implemented within the ICAO CDO manual framework, it is envisaged that the benefit/cost ratio (BCR) will be positive. ✓The advantage of PBN to the ANSP is that PBN avoids the need to purchase and deploy navigation aids for each new route or instrument procedure.

Module N° B0-05 – Necessary Procedures (Air & Ground)

- ICAO Continuous Descent Operations (CDO) Manual (Document 9931)
  - Provides guidance on the airspace design, instrument flight procedures, ATC facilitation and flight techniques necessary to enable continuous descent profiles.
- ICAO Performance-based Navigation Manual (ICAO Document 9613)
  - Provides general guidance on PBN implementation.
- ICAO PBN operational approval guidance material will be available by June 2012

Module N° B0-05 – Necessary System Capability

- **Avionics**
  - CDO is an aircraft operating technique aided by appropriate airspace and procedure design and appropriate ATC clearances enabling the execution of a flight profile optimized to the operating capability of the aircraft.
  - CDO can be flown with or without support of a computer-generated vertical flight path (i.e. the vertical navigation (VNAV) (FMS)) and with or without a fixed lateral path
  - This is most readily determined by the onboard FMS
- **Ground Systems**
  - PBN requirements will be affected by the CNS and ATM environments
  - Performance requirements depend on what reversionary, non-RNAV means of navigation are available and what degree of redundancy is required to ensure adequate continuity of functions
  - RNP AR Approaches requires significant investment, ANSPs should work closely with airlines

Module N° B0-05 – Training and Qualification Requirements

- Since RNP AR Approaches also require significant training, ANSPs should work closely with airlines to determine where RNP AR Approach should be implemented
- Training in the operational standards and procedures are required for this module
- Likewise, the qualifications requirements are identified in the regulatory requirements

Module N° B0-05 – Regulatory/standardization needs and Approval Plan (Air and Ground)

- **Regulatory/Standardization:** Use current published requirements
- **Approval Plans:** Must be in accordance with application requirements e.g. airspace design, air traffic operations, PBN requirements for fixed radius transitions, radius-to-fix legs, Required Time of Arrival (RTA), parallel offset, etc

Module N° B0-05 – Reference Documents

- Standards
  - For flight plan requirements in Amendment 1, ICAO Document 4444; PANS/ATM v15
- Procedures
- Guidance Material
  - ICAO Doc 9613, Performance-based Navigation (PBN) Manual; ICAO Doc 9931, Continuous Descent Operations (CDO) Manual;.
  - FAA Advisory Circular, AC 90-105, Approval Guidance for RNP Operations and Barometric Vertical Navigation in the U.S. National Airspace System) which provides system and operational approval guidance for operators (only reflects the US situation).
- Approval Documents
  - ICAO Doc 9931, Continuous Descent Operations Manual;
  - ICAO Doc 9613, Performance Based Navigation Manual;
  - FAA AC120-108, CDFA.

Module N° B0-05 Implementation - Benefits and Elements

Improved Flexibility and Efficiency in Descent Profiles (CDOs)

Benefits: Efficiency, Environment and Safety

Elements: CDO and PBN STARs

No avionics or Ground systems required

To be reflected in ANRF