



International Civil Aviation Organization

**MIDANPIRG CNS/ATM/IC Sub-Group
(CNS/ATM/IC SG IDANPIRG STEERING GROUP)**

Seventh Meeting
(Cairo, Egypt, 07 – 09 October 2013)

Agenda Item 3: Air Navigation Global Developments

PERFORMANCE MONITORING OF THE AIR NAVIGATION SYSTEMS

(Presented by the Secretariat)

SUMMARY

This paper introduces the Aviation System Block Upgrades (ASBU) methodology and the Regional Dash Boards also explains the Regional Air Navigation Report Forms (ANRF).

Action by the meeting is at paragraph 3.

REFERENCES

- AN-Conf/12 Report
- Global Plan (Doc 9750)
- MSG/3 Report

1. INTRODUCTION

1.1 The Fourth Edition of the *Global Air Navigation Plan* (Doc 9750, GANP) version provides a global planning framework which, among other it provides a timeline for which future improvements can be implemented by States in accordance with their needs. In addition, it identifies the need for the development of standards and recommended practices, regulatory requirements, procedures and technology associated with the Aviation System Block Upgrades (ASBU).

1.2 The ASBUs are supplemented by Communications, Navigation, Surveillance (CNS), avionics and information management roadmaps. High-level impediments to implementation such as cyber security were identified and considered during the Twelfth Air Navigation Conference (AN-Conf/12) discussions. Arrangements to ensure the periodic update of the ASBUs and roadmaps on a rolling fifteen-year planning horizon were also discussed.

1.3 The PIRGs are progressing with regional performance improvements through implementation of relevant ASBU Block 0 Modules of the GANP, the latest version of ASBU working document dated 28 March 2013 is available on the ICAO Website at: <http://www.icao.int/Meetings/anconf12/Pages/Aviation-System-Block-Upgrades.aspx>

2. DISCUSSION

2.1 The meeting may wish to note that Modules from the ASBUs would be evaluated to identify which of those modules best provide the needed operational improvements. Depending on the complexity of the module, additional planning steps may need to be undertaken including financing and training needs. Finally, regional plans would be developed for the deployment of modules by drawing on supporting technology requirements. This is an iterative planning process which may require repeating several steps until a final plan with specific regional targets is in place. This planning methodology requires full involvement of States, service providers, airspace users and other stakeholders, thus ensuring commitment by all for implementation. This approach would facilitate the response to Recommendation 6/1 of the AN-Conf/12 that calls on States and PIRGs to finalize the alignment of Regional Air Navigation Plans with the Fourth Edition of the Global Air Navigation Plan by May 2014.

2.2 The meeting may wish to note that, in accordance with Recommendation 6/1 of the AN-Conf/12 and the outcome of the Planning and Implementation Regional Groups (PIRGs) and Regional Aviation Safety Groups (RASGs) Global Coordination Meeting (GCM) held in Montreal on 19 March 2013, the DGCA-MID/2 meeting reiterated the need for the establishment of regional priorities and targets for air navigation by May 2014 consistent with the GANP and ASBU framework. Accordingly, the DGCA-MID/2 meeting:

- a) urged States to:
 - i. establish a performance measurement strategy for their air navigation system;
 - ii. share successful initiatives among each other; and
 - iii. support the ICAO MID Regional Office by providing the requisite information to demonstrate operational improvements; and
- b) tasked MIDANPIRG and its Steering Group (MSG) with:
 - i. the establishment of priorities and targets for air navigation by May 2014, in accordance with Recommendation 6/1 of the Twelfth Air Navigation Conference (AN Conf/12);
 - ii. the monitoring and measurement of the agreed air navigation Metrics and indicators, at regional level; and
 - iii. the identification of necessary measures/action plans to reach the agreed air navigation targets.

2.3 The meeting may wish to recall that ICAO MID Regional Office held Workshop in Cairo 30 September-4 October 2012 related to ASBU methodology, during which the Air Navigation Report Form (ANRF) were explained and it was noted that the ANRF is a customized tool for ASBUs (just a revised PFF) which is recommended for application for setting planning targets, identifying implementation challenges, determining implementation/performance monitoring and reporting. Also, the PIRGs and States could use this ANRF report format at **Appendix A** to this working paper for any other air navigation improvement programmes such as Search and Rescue, as it is not necessarily for ASBU modules only. The ANRF template was initially drafted by the Technical Team and subsequently matured over period of time through multiple worldwide ASBU workshops. The ANRF template contains detailed user Explanatory Notes and accompanying implementation and performance metrics.

2.4 The meeting may wish to note that ICAO is presently introducing regional “Performance Dashboard” homepages for every public website of the ICAO Regional Offices. These dashboards will illustrate the regional implementation status relating to the strategic objectives on Safety, Air Navigation Capacity and Efficiency, and Environmental Protection. They will show targeted performance at the regional level and will, initially, contain graphics and maps with a planned expansion to include the Aviation System Block upgrades (ASBU) Block 0 Modules. This new interactive online system will be in place in January 2014 and will be updated at regular intervals.

2.5 In the same vein, the meeting may also wish to note that the First Edition of the Global Air Navigation Report is planned for release in March 2014. The initial Report will cover the following subjects:

- global air navigation challenges;
- measuring against those challenges;
- status of operational measures for performance improvement;
- implementation progress of selected priority ASBU Block 0 Modules. The metrics or initial dataset that includes key global air navigation priorities are Performance Based Navigation (PBN), Continuous Decent Operation (CDO), Continuous Climb Operations (CCO), Aeronautical Information Management (AIM), Air Traffic Flow Management (ATFM) and estimated environmental benefits accrued from operational improvements based on ICAO Fuel Savings Estimation Tool (IFSET) or any other more rigorous tool recognized by Committee on Aviation Environmental Protection (CAEP). This initial dataset for both Regional Performance Dashboard and the Global Air Navigation Report was recently agreed by the PIRG Chairs; and
- sharing of successful initiatives and key demonstrations.

2.6 The meeting may wish to note that detailed monitoring of the ASBU Module implementation will be done in Volume III of the new revised Regional Air Navigation Plans (ANP).

3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information in this paper and take action as appropriate.

APPENDIX A



SAMPLE TEMPLATE

1. AIR NAVIGATION REPORT FORM (ANRF)

(This template demonstrates how ANRF to be used.

The data inserted here refers to ASBU B0-05/CDO as an example only)

Regional and National planning for ASBU Modules

**2. REGIONAL/NATIONAL PERFORMANCE OBJECTIVE – B0-05/CDO:
Improved Flexibility and Efficiency in Descent Profiles**

**Performance Improvement Area 4:
Efficient Flight Path – Through Trajectory-based Operations**

3. ASBU B0-05/CDO: Impact on Main Key Performance Areas (KPA)

	Access & Equity	Capacity	Efficiency	Environment	Safety
Applicable	N	N	Y	Y	Y

4. ASBU B0-05/CDO: Planning Targets and Implementation Progress

5. Elements	6. Targets and implementation progress (Ground and Air)
1. CDO	
2. PBN STARs	

7. ASBU B0-05/CDO: Implementation Challenges

Elements	Implementation Area			
	Ground system Implementation	Avionics Implementation	Procedures Availability	Operational Approvals
1. CDO				
2. PBN STARs				

8. Performance Monitoring and Measurement 8A. ASBU B0-05/CDO: Implementation Monitoring	
Elements	Performance Indicators/Supporting Metrics
1. CDO	Indicator: Percentage of international aerodromes/TMAs with CDO implemented Supporting metric: Number of international aerodromes/TMAs with CDO implemented
2. PBN STARS	Indicator: Percentage of international aerodromes/TMAs with PBN STARS implemented Supporting metric: Number of international aerodromes/TMAs with PBN STARS implemented

8. Performance Monitoring and Measurement 8 B. ASBU B0-05/CDO: Performance Monitoring	
Key Performance Areas (Out of eleven KPAs, for the present until experienced gained, only five have been selected for reporting through ANRF)	Where applicable, indicate qualitative Benefits,
Access & Equity	Not applicable
Capacity	Not applicable
Efficiency	Cost savings through reduced fuel burn. Reduction in the number of required radio transmissions.
Environment	Reduced emissions as a result of reduced fuel burn
Safety	More consistent flight paths and stabilized approach paths. Reduction in the incidence of controlled flight into terrain (CFIT).
<p>9. Identification of performance metrics: It is not necessary that every module contributes to all of the five KPAs. Consequently, a limited number of metrics per type of KPA, serving as an example to measure the module(s)' implementation benefits, without trying to apportion these benefits between module, have been identified on page 5. For the family of ASBU modules selected for air navigation implementation, States/Region to choose the applicable performance (benefit) metrics from the list available on page 5. This approach would facilitate States in collecting data for the chosen performance metrics. States/Region, however, could add new metrics for different KPAs based on maturity of the system and ability to collect relevant data.</p>	

AIR NAVIGATION REPORT FORM HOW TO USE - EXPLANATORY NOTES

- Air Navigation Report Form (ANRF):** This form is nothing but the revised version of Performance Framework Form that was being used by Planning and Implementation Regional Groups (PIRGs)/States until now. The ANRF is a customized tool for Aviation System Block Upgrades (ASBU) Modules which is recommended for application for setting planning targets, monitoring implementation, identifying challenges, measuring implementation/performance and reporting. Also, the PIRGs and States could use this report format for any other air navigation improvement programmes such as Search and Rescue. If necessary, other reporting formats that provide more details may be used but should contain as a minimum the elements described in this ANRF template. The results will be analysed by ICAO and aviation partners and utilized in developing the Regional Performance Dashboard and the Annual Global Air Navigation Report. The conclusions from the Global Air Navigation Report will serve as the basis for future policy adjustments, aiding safety practicality, affordability and global harmonization, amongst other concerns.
- Regional/National Performance objective:** In the ASBU methodology, the performance objective will be the title of the ASBU module itself. Furthermore, indicate alongside corresponding Performance Improvement area (PIA).
- Impact on Main Key Performance Areas:** Key to the achievement of a globally interoperable ATM system is a clear statement of the expectations/benefits to the ATM community. The expectations/benefits are referred to eleven Key Performance Areas (KPA) and are interrelated and cannot be considered in isolation since all are necessary for the achievement of the objectives established for the system as a whole. It should be noted that while safety is the highest priority, the eleven KPAs shown below are in alphabetical order as they would appear in English. They are access/equity; capacity; cost effectiveness; efficiency; environment; flexibility; global interoperability; participation of ATM community; predictability; safety; and security. However, out of these eleven KPAs, for the present, only five have been selected for reporting through ANRF, which are Access & Equity, Capacity, Efficiency, Environment and Safety. The KPAs applicable to respective ASBU module are to be identified by marking Y (Yes) or N (No). The impact assessment could be extended to more than five KPAs mentioned above if maturity of the national system allows and the process is available within the State to collect the data.
- Planning Targets and Implementation Progress:** This section indicates planning targets and status of progress in the implementation of different elements of the ASBU Module for both air and ground segments.
- Elements related to ASBU module:** Under this section list elements that are needed to implement the respective ASBU Module. Furthermore, should there be elements that are not reflected in the ASBU Module (example: In ASBU B0-80/ACDM, Aerodrome certification and data link applications D-VOLMET, D-ATIS, D-FIS are not included; Similarly in ASBU B0-30/DAIM, note that WGS-84 and eTOD are not included) but at the same time if they are closely linked to the module, ANRF should specify those elements. As a part of guidance to PIRGs/States, every Regional ANP will have the complete list of all 18 Modules of ASBU Block 0 along with corresponding elements, equipage required on the ground and in the air as well as metrics specific to both implementation and performance (benefits).

6. **Targets and implementation progress (Ground and Air):** Planned implementation date (month/year) and the current status/responsibility for each element are to be reported in this section. Please provide as much details as possible and should cover both avionics and ground systems. This ANRF being high level document, develop necessary detailed action plan separately for each element/equipage.
7. **Implementation challenges:** Any challenges/problems that are foreseen for the implementation of elements of the Module are to be reported in this section. The purpose of the section is to identify in advance any issues that will delay the implementation and if so, corrective action is to be initiated by the concerned person/entity. The four areas, under which implementation issues, if any, for the ASBU Module to be identified, are as follows:
- Ground System Implementation:
 - Avionics Implementation:
 - Procedures Availability:
 - Operational Approvals:

Should be there no challenges to be resolved for the implementation of ASBU Module, indicate as “NIL”.

8. **Performance Monitoring and Measurement:** Performance monitoring and measurement is done through the collection of data for the supporting metrics. In other words, metrics are quantitative measure of system performance – how well the system is functioning. The metrics fulfil three functions. They form a basis for assessing and monitoring the provision of ATM services, they define what ATM services user value and they can provide common criteria for cost benefit analysis for air navigation systems development. The Metrics are of two types:
- A. **Implementation Monitoring:** Under this section, the indicator supported by the data collected for the metric reflects the status of implementation of elements of the Module. For example- Percentage of international aerodromes with CDO implemented. This indicator requires data for the metric “number of international aerodromes with CDO”.
- B. **Performance Monitoring:** The metric in this section allows to asses benefits accrued as a result of implementation of the module. The benefits or expectations, also known as Key Performance Areas (KPA), are interrelated and cannot be considered in isolation since all are necessary for the achievement of the objectives established for the system as a whole. It should be noted that while safety is the highest priority, the eleven KPAs shown below are in alphabetical order as they would appear in English. They are access/equity; capacity; cost effectiveness; efficiency; environment; flexibility; global interoperability; participation of ATM community; predictability; safety; and security. However, out of these eleven KPAs, for the present until experienced gained, only five have been selected for reporting through ANRF, which are Access & Equity, Capacity, Efficiency, Environment and Safety. Where applicable, mention qualitative benefits under this section.

9. **Identification of performance metrics:** It is not necessary that every module contributes to all of the five KPAs. Consequently, a limited number of metrics per type of KPA, serving as an example to measure the module(s)' implementation benefits, without trying to apportion these benefits between module, have been identified on page 6. For the family of ASBU modules selected for air navigation implementation, States/Region to choose the applicable performance (benefit) metrics from the list available on page 6. This approach would facilitate States in collecting data for the chosen performance metrics. States/Region, however, could add new metrics for different KPAs based on maturity of the system and ability to collect relevant data.

-END-

**LIST OF PERFORMANCE METRICS FOR
ASBU MODULES RELATED TO ELEVEN KPAs - EXAMPLES**

Key Performance Area	Related Performance Metrics
1. Access & Equity	1. KPA/Access: Number of international aerodromes with APV
	2. KPA/Access: Percentage of time Special Use Airspace (SUA) available to Civil Operations
	3. KPA/Access: Percentage of requested flight level versus cleared flight level
	4. KPA/Access: Number of access denials due to equipment failure
	5. KPA/Equity: Percentage of aircraft operators by class who consider that equity is achieved
	6. KPA/Equity: Percentage of different types of aircraft operating in a particular airspace or international aerodrome.
2. Capacity	1. Number of operations (arrivals+departures) per international aerodrome per day
	2. Average ATFM delay per flight at an international aerodrome
	3. Number of landings before and after APV per international aerodrome
	4. Average en-route ATFM delay generated by airspace volume
	5. Number of aircraft in a defined volume of airspace for a period of time
3. Cost effectiveness	1. IFR movements per ATCO hour on duty
	2. IFR flights (en-route) per ATCO hour duty
4. Efficiency	1. Kilograms of fuel saved per flight
	2. Average ATFM delay per flight at the international aerodrome
	3. Percentage of PBN routes
5. Environment	1. Kilograms of CO ₂ emissions reduced per flight (= KGs fuel saved per flight x 3.157)
	2. The number of electronic pages dispatched
6. Flexibility	1. Number of backups available in emergency
	2. Number of changes approved to the flight plan
	3. Number of alternatives granted
7. Global Interoperability	1. Number of ATC automated systems that are interconnected
8. Participation of the ATM Community	1. Level of participation in meetings
	2. Level of responses to planning activities
9. Predictability	1. Arrival/departure delay (in minutes) at international aerodrome
10. Safety	1. Number of runway incursions per international aerodrome per year
	2. Number of incidents/accidents with MET conditions as a sole or as a contributory factor
	3. Number of ACAS RA events
	4. Number of CFIT accidents
	5. Number of missed approaches avoided due to use of CDO
11. Security	Not Applicable