



# ICAO

International Civil Aviation Organization  
North American, Central American and Caribbean Office

**WORKING PAPER**

ANI/WG/2 — WP/14  
26/05/15

**Second NAM/CAR Air Navigation Implementation Working Group Meeting (ANI/WG/2)**  
Puntarenas, Costa Rica, 1 to 4 June 2015

**Agenda Item 5: Performance Monitoring of Air Navigation Systems**  
**5.2 Progress report by States**

**PROPOSAL TO MODIFY AIR NAVIGATION REPORTING FORM**

(Presented by Canada and United States of America)

<b>EXECUTIVE SUMMARY</b>	
This paper presents a proposal to modify the Air Navigation Report Form (ANRF) that is used for air navigation system and Aviation System Block Upgrades (ASBU) implementation status monitoring and reporting.	
<b>Action:</b>	Suggested actions are presented in Section 4.
<i>Strategic Objectives:</i>	<ul style="list-style-type: none"><li>• Safety</li><li>• Air Navigation Capacity and Efficiency</li></ul>
<i>References:</i>	<ul style="list-style-type: none"><li>• ICAO Doc 9750 – <i>Global Air Navigation Plan (GANP)</i></li><li>• ICAO Working Document for the Aviation System Block Upgrades, The Framework for Global Harmonization; issued March 28, 2013</li><li>• ICAO NAM/CAR Regional Performance-Based Air Navigation Implementation Plan (RPBANIP) v3.1; dated April 2014</li><li>• SIP/ASBU/MEXICO/2013-WP/21 Summary Table of Aviation System Block Upgrades (ASBU) Block 0 Modules</li></ul>

**1. Introduction**

1.1 Guided by the Global Air Navigation Plan (GANP), the regions' and States' planning process starts by identifying the homogeneous ATM areas, major traffic flows and international aerodromes. An analysis of this data leads to the identification of opportunities for performance improvement. Available technologies and ASBU Modules are evaluated to identify which Module elements best provide the needed operational improvements. Depending on the complexity of the selected technology or Module elements, additional planning steps may need to be undertaken including financing and training needs.

1.2 The Air Navigation Report Form (ANRF) currently included in the ICAO NAM/CAR RPBANIP is a revised version of the Performance Framework Form previously used by PIRGs/States. The ANRF is a customized tool for Aviation System Block Upgrades (ASBU) modules, which is recommended for setting planning targets, monitoring implementation, identifying challenges, measuring implementation/performance, and reporting. GREPECAS and the States may decide to use this report format for any air navigation improvement programs, such as Search and Rescue Services (SAR).

## 2. Existing ANRF

2.1 The sample existing ANRF is provided in **Appendix A**. The form starts with the form title, **Air Navigation Report Form (ANRF)**, as indicated by the number “1”.

2.2 **Regional/National Performance Objectives** (indicated by the number “2” in Appendix A): in the ASBU methodology, the performance objective will be the title of the ASBU module itself. The corresponding Performance Improvement Area (PIA) is shown to indicate the relationship between the respective ASBU module and ICAO PIA.

2.3 **Impact on Main Key Performance Areas** (indicated by the number “3” in Appendix A): 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 refer to 11 Key Performance Areas (KPs) 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 11 KPs shown below are in alphabetical order as they would appear in English. They include: access/equity; capacity; cost effectiveness; efficiency; environment; flexibility; global interoperability; participation of the ATM community; predictability; safety; and security. However, presently out of these 11 KPs, only 5 have been selected for reporting through ANRF. These are access/equity, capacity, efficiency, environment and safety. The KPs applicable to respective ASBU modules are to be identified by marking Y (Yes) or N (No). The impact assessment could be extended to more than the 5 mentioned KPs if maturity of the national system allows and the process is available within the State to collect the data.

2.4 **Planning Targets and Implementation Progress** (indicated by the number “4” in Appendix A): 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.

2.5 **Elements Related to ASBU Modules** (indicated by the number “5” in Appendix A): this section lists elements that are needed to implement the respective ASBU module. Furthermore, should there be elements that are not reflected in the ASBU module, e.g., in ASBU B0-ACDM, aerodrome certification and data link applications DVOLMET, D-ATIS, D-FIS are not included. Similarly, in ASBU B0-DAIM note that WGS-84 and eTOD are not included; however, if they are closely linked to the module, ANRF should specify those elements. As a part of guidance to GREPECAS/States, every Regional ANP will include the complete list of all 18 ASBU Block 0 modules along with corresponding elements, required ground and air avionics as well as metrics specific to both implementation and benefits. NAM/CAR Regional Performance-based Air Navigation Implementation Plan (RPBANIP) v3.1.

2.6 **Targets and Implementation Progress (Ground and Air)** (indicated by the number “6” in Appendix A): the planned implementation date (month/year) and current status/responsibility for each element are to be reported in this section. This should cover both avionics and ground systems.

2.7 **Implementation Challenges** (indicated by the number “7” in Appendix A): any challenges/problems that are foreseen for the implementation of module elements are to be reported in this section. The purpose of the section is to identify any issues that will delay the implementation in advance, and if so, corrective action is to be initiated by the concerned person/entity. The four areas under which ASBU module implementation issues are to be identified, if any, are as follows:

- Ground System Implementation
- Avionics Implementation
- Procedures Availability
- Operational Approvals

If there are no ASBU module implementation challenges to be resolved, indicate as “NIL.”

2.8 **Performance Monitoring and Measurement** (indicated by the number “8” in Appendix A): performance monitoring and measurement is done through the collection of data for the supporting metrics. In other words, metrics are the quantitative measurement 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 system 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 implementation status of module elements. 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 assessment of benefit(s) accrued as a result of module implementation. This approach would facilitate collecting data for the chosen metrics. If it is not possible to identify performance metrics for an individual module, qualitative benefits are to be reflected.

### 3. **Proposed ANRF**

3.1 The FAA has used the existing ANRF to monitor and report the ASBU Block 0 implementation status. While using the form, the FAA has identified several improvements that would enhance the usability of the form. The proposed ANRF is provided in **Appendix B**.

3.2 The **Header block** consists of seven items:

- (1) The form title: **Air Navigation Report Form (ANRF)**.
- (2) The **Date Updated** is a nice feature to have since the ANRF is used for the entire implementation lifecycle and will be updated multiple times.
- (3) **Region (or State)** name will identify the geographical scope of the ANRF.
- (4) **Block** indicates the ASBU block.
- (5) **Module Code** indicates the ASBU Module/Thread. The 3 or 4 letter codes are defined in the GANP.
- (6) **PIA** indicates the Performance Improvement Area to which the Module belongs.
- (7) **Module Description** describes the module as it appears in the GANP.

3.3 When an ANRF is used to describe a Performance Objective which is not included in an ASBU Module, the same information would be entered into (1), (2) and (3); (7), would be used to provide a description of the performance objectives for the air navigation system improvement.

3.4 The “Impact on Main Key Performance Areas (KPA)” section in the existing ANRF lists five key KPAs in “Yes” or “No” form. The recommended ANRF omitted this section because the same five KPAs are listed in the Quantitative and Qualitative Benefits from the Implementation block and contents are provided.

3.5 The **Elements description block** consists of four items:

- The **Element** section lists all the elements described in the *Working Document for the Aviation System Block Upgrades - The Framework for Global Harmonization*; issued March 28, 2013. In addition, any Elements identified by the region and state are also listed. If the ANRF is being used to describe a non-ASBU Performance Objective, the **Element** section is used to describe the elements that are required to complete the improvement.
- The **Date** indicates the planned implementation date or the implemented date. If the Region/State chooses not to implement certain elements, enter N/A for Date.
- The **Status** is determined as depicted in Figure 1 and should be indicated as follows:
  - **Not Analyzed** - The analysis of the applicability of the ASBU Module (or Performance Objective) elements has not been completed
  - **N/A** – None of the ASBU Module elements were found to be required, and/or the cost and benefits analysis did not support implementation
  - **Planning** – The regulatory and financial arrangements for the implementation are in progress, the required work and resources are being scheduled, suppliers are being identified, project plans are being prepared, etc.
  - **Developing** – Equipment is being purchased or manufactured, procedures are being designed and Operational Readiness Demonstrations are taking place. This Status Phase is completed from a technical perspective with a process such as Site Acceptance Testing (SAT) and certification. From an operational perspective, regulatory approvals, as required, have been completed and procedures, if required, have been approved.
  - **Partial** – The improvement has been implemented in at least one of the planned locations or by some of the applicable aircraft.
  - **Complete** – The improvement has been implemented at all of the planned locations or by all of the applicable aircraft.

- Any **Implementation Challenges** that are foreseen for the implementation of elements of the Module or Performance Objective are to be reported in this section in plain language. Challenges should be described in relation to one or more of the following possible areas:
  - Ground System Implementation
  - Avionics Implementation
  - Procedures Availability
  - Operational Approvals

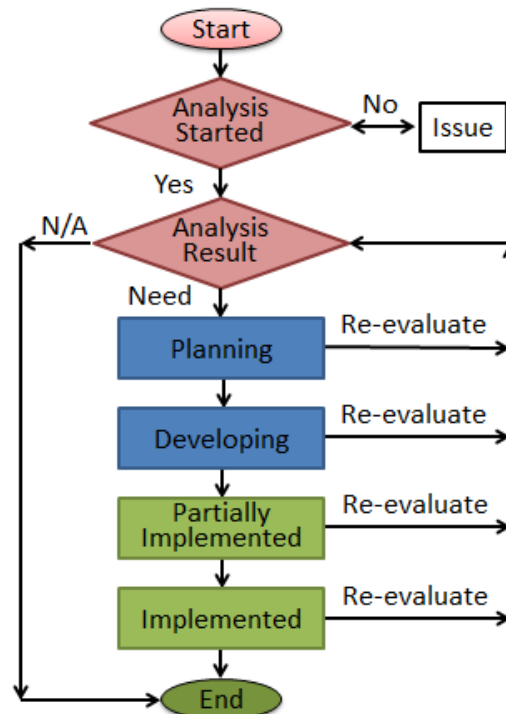


Figure 1 – Implementation Status Workflow

3.6 The **Element Implementation Status Description block** lists all the applicable elements and describes the status.

3.7 The Quantitative and Qualitative Benefits from the Implementation block list all the applicable elements and describes the anticipated/estimated benefits or measured/calculated benefits. For each applicable element, the five KPIs used for the existing ANRF should be considered: Access & Equity, Capacity, Efficiency, Environment, and Safety.

3.8 The **Note block** is for the report preparer/keeper to record the history of the ANRF, record follow-up actions, note irregularities, etc. This block may be removed when submitting the report to the official destination.

**4. Suggested action**

4.1 The meeting is invited to:

- a. note the proposal regarding modification of the Air Navigation Reporting Form; and
- b. provide comments on this proposal.

-----

## APPENDIX A

## Sample Existing ANRF

## 1. AIR NAVIGATION REPORT FORM (ANRF)

<b>1. REGIONAL/NATIONAL PERFORMANCE OBJECTIVE – B0-05/CDO: Improved Flexibility and Efficiency in Continuous Descent Operations (CDOs)</b>					
<b>Performance Improvement Area 4: Efficient Flight Path – Through Trajectory-based Operations</b>					
<b>3. ASBU B0-05/CDO: Impact on Main Key Performance Areas (KPA)</b>					
	<b>Access &amp; Equity</b>	<b>Capacity</b>	<b>Efficiency</b>	<b>Environment</b>	<b>Safety</b>
<b>Applicable</b>	N	N	Y	Y	Y
<b>4. ASBU B0-05/CDO: Planning Targets and Implementation Progress</b>					
<b>5. Elements</b>			<b>6. Targets and implementation progress (Ground and Air)</b>		
1. CDO implementation			50% of selected. Aerodromes with continuous descent operations (CDO) implemented by Dec.2016		
2. PBN STARs			80% of selected. Aerodromes with PBN STARs implemented by Dec.2016		
<b>7. ASBU B0-05/CDO: Implementation Challenges</b>					
<b>Elements</b>	<b>Implementation Area</b>				
	<b>Ground system Implementation</b>	<b>Avionics Implementation</b>	<b>Procedures Availability</b>	<b>Operational Approvals</b>	
1. CDO implementation	The ground trajectory calculation function will need to be upgraded	Lack of aircraft avionics	LOAs, training, and airspace complexity	In accordance with application requirements	
2. PBN STARs	Airspace design	Lack of aircraft avionics	LOAs and training		
<b>8. Performance Monitoring and Measurement</b>					
<b>8A. ASBU B0-05/CDO: Implementation Monitoring</b>					
<b>Elements</b>		<b>Performance Indicators/Supporting Metrics</b>			
1. CDO implementation		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
--------------	--

<b>8. Performance Monitoring and Measurement</b> <b>8 B. ASBU B0-05/CDO: Performance Monitoring</b>	
<b>Key Performance Areas</b> (Out of eleven KPAs, for the present until experienced gained, only five have been selected for reporting through ANRF)	<b>Metrics (if not indicate qualitative benefits)</b>
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).

-----



**APPENDIX B**  
**Sample Proposed ANRF**

AIR NAVIGATION REPORT FORM (ANRF)		
		<b>Date Updated</b>   December 2, 2015
<b>Region (or State)</b>	United States	
<b>Block</b>	<b>0</b>	<b>Module Description</b> Improved Flexibility and Efficiency in Descent Profiles using Continuous Descent Operations (CDO)
<b>Module Code</b>	<b>CDO</b>	
<b>PIA</b>	<b>4</b>	

*or*

AIR NAVIGATION REPORT FORM (ANRF)		
		<b>Date Updated</b>   December 2, 2015
<b>Region (or State)</b>	NAM	
<b>Regional (or National) Performance Objective</b>		
<i>Provide a description for a planned performance improvement which is not included in an ASBU Module. (For example: Improved interoperability through the sharing of surveillance data)</i>		

Elements	Date	Status
1. CDO implementation	Dec 2014	Implemented
2. PBN STARS	Spring 2014	Implemented
3. <i>If applicable, list ASBU Module element(s) the State does not plan to implement</i>		
4. <i>Add Regional/State specific elements if any (for example enroute PBN feeding into the PBN STARS); list elements associated with a Regional (or National) Performance Objective</i>		
<b>Implementation Challenges</b>		
<i>Enter description – Classify by whether the challenges are in the area of Ground System Implementation, Avionics Implementation, Procedures Availability or Operational Approvals Availability.</i>		

Element Implementation Status Description		
1	CDO implementation	<p><b>International aerodromes with CDO implemented</b></p> <p>CDO/OPD is implemented at approximately 98 airports (as of October 2013). The RNAV STARS designated as OPD were identified based on the below criteria:</p> <ul style="list-style-type: none"> <li>● The procedure has coded altitudes.</li> <li>● ATC can use 'descend via' phraseology with it.</li> <li>● An 'expect' altitude is okay with other coded altitudes. The 'expect' can be 'cleared' by ATC issuing a restriction for the WP.</li> <li>● It should NOT have any 'jets cross at xxx, turboprops cross at xxx' notes on it.</li> </ul>

2	PBN STARs	<p><b>International aerodromes/TMAs with PBN STARs implemented</b>                  PBN STARs are implemented at approximately 197 airports (as of October 2013).                  253 RNAV STARs in the NAS with some of the procedures serving multiple airports (as of October 2013).</p>
---	-----------	--

**Quantitative and Qualitative Benefits from the Implementation**

**Element 1. CDO implementation**

Access & Equity	Only at locations where PBN STARs can be published to deconflict traffic flows with additional/different routing options. For example, RNAV STARs with OPDs implemented at Dulles and Regan National airports are now laterally separated.
-----------------	--

Capacity	N/A
----------	-----

Efficiency	<p>Cost savings through reduced fuel burn due to improved vertical profiles. Reduction in the number of required radio transmissions, and therefore controller and pilot workloads; however, we do not have empirical data to evaluate this particular benefit.</p> <p>Operational benefits:</p> <ul style="list-style-type: none"> <li>— Arrivals exhibited more efficient vertical profiles</li> <li>— Average time and distance within 250 nm of the airport did not change</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="7">Vertical Profile Performance Outcomes</th> <th colspan="2">Additional Efficiency Performance Outcomes</th> </tr> <tr> <th>Weather</th> <th>Proportion of Flights (%)</th> <th>Number of Level Segments</th> <th>Time in Level Flight (min)</th> <th>Distance in Level Flight (nm)</th> <th>Time-Weighted Altitude (feet)</th> <th>Flights Without Level Segments (%)</th> <th>Time (min)</th> <th>Distance (nm)</th> </tr> </thead> <tbody> <tr> <td>VMC</td> <td>86</td> <td>2.0 (-16%)</td> <td>5.4 (-13%)</td> <td>31.2 (-12%)</td> <td>17,300 (6%)</td> <td>17 (72%)</td> <td>43.4 (0%)</td> <td>269.7 (0%)</td> </tr> <tr> <td>Non-VMC</td> <td>14</td> <td>2.6 (-9%)</td> <td>8.0 (-6%)</td> <td>41.6 (-6%)</td> <td>14,500 (6%)</td> <td>9 (37%)</td> <td>47.0 (0%)</td> <td>280.7 (0%)</td> </tr> <tr> <td>All</td> <td>100</td> <td>2.1 (-15%)</td> <td>5.7 (-12%)</td> <td>32.7 (-11%)</td> <td>16,800 (6%)</td> <td>16 (70%)</td> <td>43.9 (0%)</td> <td>271.2 (0%)</td> </tr> </tbody> </table>	Vertical Profile Performance Outcomes							Additional Efficiency Performance Outcomes		Weather	Proportion of Flights (%)	Number of Level Segments	Time in Level Flight (min)	Distance in Level Flight (nm)	Time-Weighted Altitude (feet)	Flights Without Level Segments (%)	Time (min)	Distance (nm)	VMC	86	2.0 (-16%)	5.4 (-13%)	31.2 (-12%)	17,300 (6%)	17 (72%)	43.4 (0%)	269.7 (0%)	Non-VMC	14	2.6 (-9%)	8.0 (-6%)	41.6 (-6%)	14,500 (6%)	9 (37%)	47.0 (0%)	280.7 (0%)	All	100	2.1 (-15%)	5.7 (-12%)	32.7 (-11%)	16,800 (6%)	16 (70%)	43.9 (0%)	271.2 (0%)
Vertical Profile Performance Outcomes							Additional Efficiency Performance Outcomes																																							
Weather	Proportion of Flights (%)	Number of Level Segments	Time in Level Flight (min)	Distance in Level Flight (nm)	Time-Weighted Altitude (feet)	Flights Without Level Segments (%)	Time (min)	Distance (nm)																																						
VMC	86	2.0 (-16%)	5.4 (-13%)	31.2 (-12%)	17,300 (6%)	17 (72%)	43.4 (0%)	269.7 (0%)																																						
Non-VMC	14	2.6 (-9%)	8.0 (-6%)	41.6 (-6%)	14,500 (6%)	9 (37%)	47.0 (0%)	280.7 (0%)																																						
All	100	2.1 (-15%)	5.7 (-12%)	32.7 (-11%)	16,800 (6%)	16 (70%)	43.9 (0%)	271.2 (0%)																																						

Environment	Reduced emissions as a result of reduced fuel burn – if there is a quantitative value, show the value.
-------------	--

Safety	<p>RNAV STARs facilitate executing stabilized approaches.</p> <p>Example of a quantitative benefit: In 10 years prior to implementation, there were x CFIT occurrences that were attributed to non-stabilized descent. In the 3 years since the implementation, there have been 0 CFIT occurrences where non-stabilized descent was suspected or attributed.</p>
--------	--

**Element 2. PBN STARs**

Access & Equity	N/A (from GANP)
-----------------	-----------------

Capacity	N/A (from GANP)
----------	-----------------

Efficiency	Cost savings and environmental benefits 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. (from GANP)
------------	--

Environment	N/A (from GANP)
-------------	-----------------

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. (from GANP)
--------	---

**Notes**

*Enter notes/comments, etc. if any.*