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

WORKING PAPER

CAR/DCA/OPSAN — WP/11
06/02/14

Safety and Air Navigation Directors of the CAR Region Meeting (CAR/DCA/OPSAN)
Mexico City, Mexico, 18 to 19 February 2014

Agenda Item 4: **Regional Performance Indicators and Metrics for Implementation of Improvements in Safety and Air Navigation**
4.8 Meteorology (MET) Improvements

MET IMPROVEMENTS

(Presented by Secretariat)

EXECUTIVE SUMMARY

This working paper addresses the emerging System-Wide Information Management (SWIM) environment intended to enable a globally interoperable Air Traffic Management (ATM) system in the future. In particular, this paper focuses on the integration of MET information into SWIM through the application of digital information exchange consistent with other information domains within SWIM. It also considers the evolution of MET information provisions in the context of supporting trajectory-based operations where operations will be optimized through all phases of flight. The paper shows that the NAM/CAR Regional Performance-Based Air Navigation Implementation Plan (NAM/CAR RPBANIP) is aligned with all Regional Performance Objectives (RPOs) corresponding to MET targets, using the ICAO Aviation System Block Upgrade (ASBU) methodology.

Action:	Action by the Meeting is contained in Section 6
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency
References:	• Doc 9750 – *Global Air Navigation Plan* • Annex 3 – *Meteorological Service for International Air Navigation* • First NAM/CAR Air Navigation Implementation Working Group Meeting (ANI/WG/1)

1. Introduction

1.1 A key enabler identified to meet emerging air traffic management (ATM) system information needs and consequently established as a module in the ASBU methodology contained in ICAO's *Global Air Navigation Plan* (GANP; Doc 9750) is SWIM. Solutions within the future SWIM environment will be defined at the overall system level rather than individually at each major subsystem (data domain/process/function) and interface level, as is the current standard.

1.2 To support the evolution of the ATM system and required implementation of ASBUs, it is essential that the evolution of aeronautical meteorological information exchange and associated provisions be considered an integral component of SWIM.

2. Discussion

2.1 Migration of Meteorological Information to the SWIM Environment

2.1.1 Current information exchange systems may constrain implementation of necessary ATM system operational improvements. Important limitations include but are not limited to a lack of information harmonization (including aeronautical, meteorological and flight information), proprietary interfaces and data formats, message-size limitations, and a non-scalable approach to information exchange with the present infrastructure.

2.1.2 SWIM will complement human-to-human communication with machine-to-machine communication and improve data distribution and accessibility in terms of various quality-of-service needs such as the timeliness and quality of the data exchanged.

2.1.3 The future ATM "SWIM environment" will shift from point-to-point data exchanges to system-wide data discovery and accessibility, thus supporting interoperability. This assumes a service orientation for information exchanges between ATM stakeholders operating within the global ATM interoperability framework, meaning that information providers (including aeronautical meteorological service providers) will publish and disclose services for the users.

3. The "One Sky" concept through the Global Air Navigation Plan (GANP) framework and ASBU methodology

3.1 In 2010, the 37th Session of the ICAO Assembly directed the Organization to increase its efforts to meet the global need for airspace interoperability while maintaining its focus on safety. Consequently, under the concept of "One Sky" for international air navigation, the Organization proposed the ASBU methodology, intended to develop a set of ATM solutions or upgrades, take advantage of existing equipage, establish a transition plan, and enable global interoperability. The ASBU methodology was formalized at ICAO's 12th Air Navigation Conference (AN-Conf/12) in 2012 and has formed the basis of the fourth edition of the GANP.

3.2 In essence, the ASBUs provide a system engineering modernization strategy for international air navigation, comprising a series of modules across four performance improvement areas and four blocks. **Figure 1** at the **Appendix** provides an illustration of the performance improvement areas and blocks.

3.3 Each block represents the target availability timeline for a group of operational improvements — both technological and procedural — that will eventually realize a fully-harmonized global air navigation system. The technologies and procedures for each block are organized according to modules that are based on the specific performance improvement area to which they relate.

3.4 By way of example, Block 0 features modules characterized by operational improvements, which have already been developed and implemented in many parts of the world today. It therefore has a near-term implementation period of 2013–2018, where 2013 refers to the availability of all components of its particular performance modules and 2018 the target implementation deadline. It is important to realize that not all States will need to implement each and every module. ICAO is working with States, in particular through the Planning and Implementation Regional Groups (PIRGs), to help determine exactly which capabilities States should have in place based on their unique operational requirements.

3.5 The AN-Conf/12, through the formulation of Recommendation 4/7, invited the Meteorology Divisional Meeting to develop initial provisions in Annex 3 relating to the ASBU modules concerning meteorological information, work on defining the meteorological information exchange model as an enabler for SWIM, and develop a long-term strategy to support further development and full implementation.

4. The Meteorological Component of the ASBU Methodology

4.1 The modules that make up the ASBU methodology, from Block 0 to Block 3, are numerous and often highly inter-related. A module thread is associated with a specific performance improvement area. Some of the modules in each consecutive block feature the same link acronym, indicating that they are elements of the same performance improvement area as it progresses toward its target. Every module within the ASBU methodology serves to progress towards one of the four target performance improvement areas.

4.2 Aeronautical Meteorology (AERMET) is a thread running through the performance improvement area titled *Globally Interoperable Systems and Data*. Through SWIM, meteorological information will be a key enabler to the realization of the global ATM operational concept. **Figure 2,** located at the Appendix to this paper, provides an illustration of the MET modules within the globally interoperable systems and data performance improvement areas. The advanced meteorological information (AMET) modules can be summarized as follows:

Module B0-AMET

Performance Capability: Meteorological information supporting enhanced operational efficiency and safety. Global, regional, and local meteorological information provided by World Area Forecast Centres (WAFCs), Volcanic Ash Advisory Centres (VAACs), Tropical Cyclone Advisory Centres (TCACs), aerodrome meteorological offices, and Meteorological Watch Offices (MWOs) in support of flexible airspace management, improved situational awareness, collaborative decision-making, and dynamically-optimized flight trajectory planning.

Module B1-AMET

Performance Capability: Enhanced operational decisions through integrated meteorological information (planning and near-term service). Meteorological information supporting automated decision processes or aids involving meteorological information, meteorological translation, ATM impact conversion, and ATM decision support.

Module B3-AMET

Performance Capability: Enhanced operational decisions through integrated meteorological information (near-term and immediate service). Meteorological information supporting both air and ground automated decision support aids for implementing weather mitigation strategies.

5. NAM/CAR Air Navigation Targets from the Regional Performance-Based Air Navigation Implementation Plan (RPBANIP)

5.1 Established since 2008 under the performance-based approach, the NAM/CAR RBPANIP includes agreement of performance metrics and indicators to track and present operational metrics.

5.2 Subsequently, the NAM/CAR Air Navigation Implementation Working Group (NAM/CAR ANI/WG) was established and the RBPANIP was brought up-to-date to align all Regional Performance Objectives (RPOs) with the ICAO ASBU methodology. The RPOs illustrate necessary implementation activities to support air navigation regional priorities. Specifically, among the meteorological elements are the following:

- World Area Forecast System (WAFS)
- International Airways Volcano Watch (IAVW)
- Tropical Cyclone Watch (TCW)
- Aerodrome warnings
- Wind shear warnings and alerts
- Information concerning en-route weather phenomena which may affect the safety of aircraft operations (SIGMET)

6. Action by the Meeting

6.1 The Meeting is invited to:

a) note the contents of this working paper and Appendix; and

b) remind the Directors of Air Navigation regarding implementation of the actions contained in paragraph 5.2 concerning the RPOs pertaining to MET.

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APPENDIX
ASBU METHODOLOGY IN THE GLOBAL AIR NAVIGATION PLAN (DOC 9750)

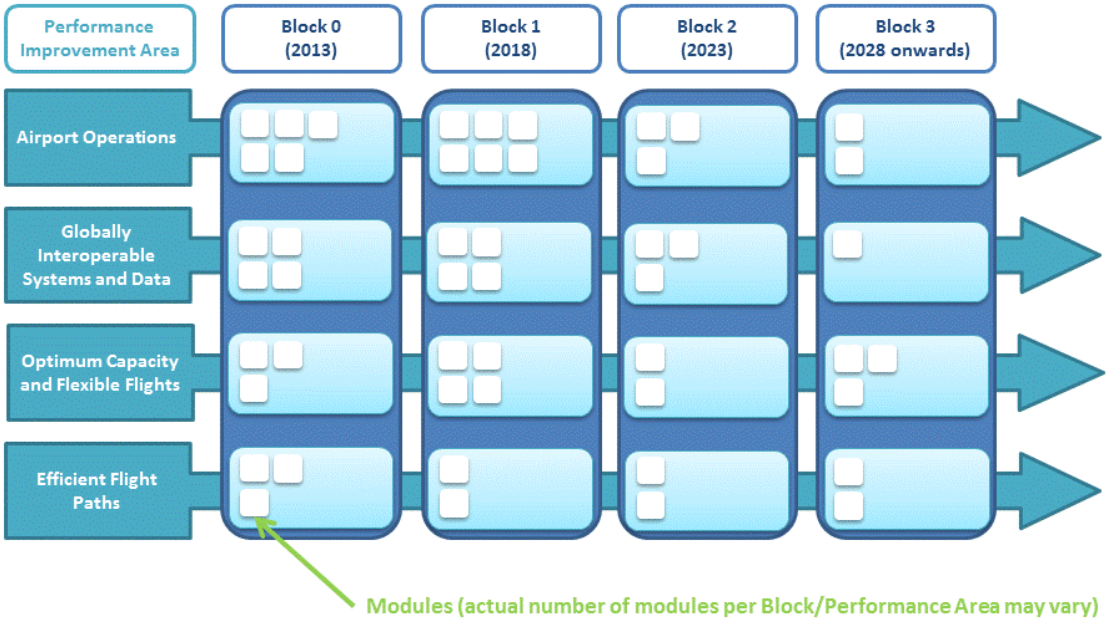

Figure 1. Illustration of the performance improvement areas (horizontal) and blocks (vertical) within the ASBU methodology

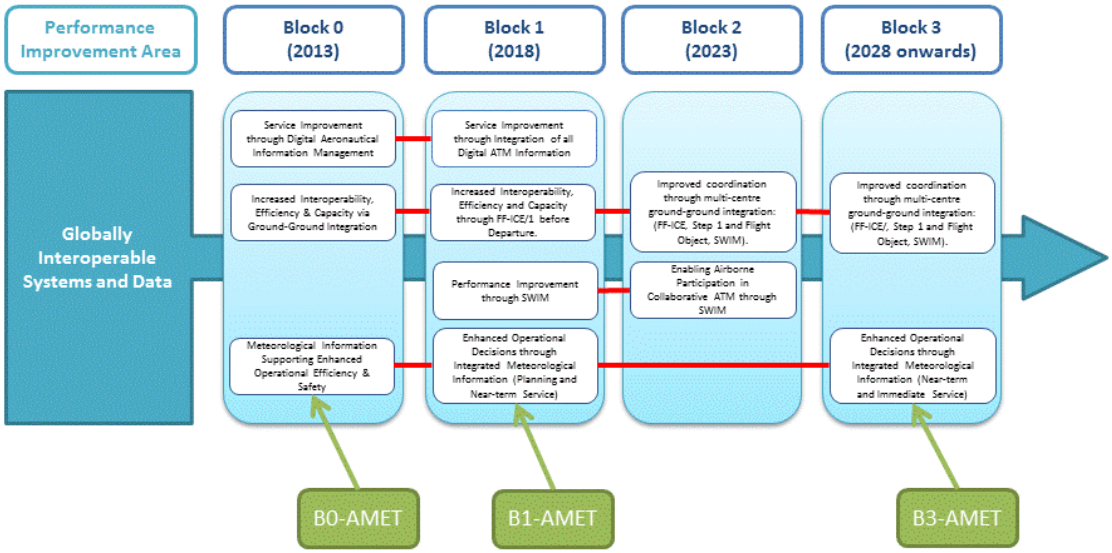

Figure 2. Illustration of the MET component of the globally interoperable systems and data performance improvement area

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