



INTERNATIONAL CIVIL AVIATION ORGANIZATION

A United Nations Specialized Agency

ICAO Aviation System Block Upgrade (ASBU) and the implementation of the AMHS Systems

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Surveillance**

III Workshop/Meeting on the Follow-up to the Implementation of the ATS Message Handling System (AMHS) in the NAM/CAR Regions

Santo Domingo, Dominican Republic, 24 to 27 September 2013

12th Air Navigation Conference

Summary of Discussions



12th Air Navigation Conference

ICAO Headquarters
Montréal, Canada
19-30 November 2012



- ✈️ Common understanding for future air navigation system
- ✈️ Harmonization of ATM modernization
- ✈️ Formalize future of infrastructure & equipage
- ✈️ Endorsement of revised ICAO Global Air Navigation Plan (GANP)
- ✈️ Agreement of Aviation System Block Upgrades (ASBU)



- Item 1 Strategic Issues in Support of One Sky*
- Item 2: Improving Airport Performance*
- Item 3: Interoperability & Data – SWIM*
- Item 4: Optimum Capacity & Efficiency*
- Item 5: Efficient Flight Paths – through TBO*
- Item 6: Future Direction*

Next Steps coming from AN-Conf/12



Environmental & Operational Assessments

- ✓ **Committee on Aviation Environmental Protection (CAEP)** modeling environmental benefits of ASBU Block 0 modules.
- ✓ **IATA** assessing the operational benefits

• Technical Work

- ✓ Air Navigation Information Management (IM) Divisional Meeting
- ✓ Aviation Data Link Symposium: Now and Tomorrow
- ✓ Four priority areas (CDM/ATFM/Continuous Operations (CCO)/ Continuous Descent Operations (CDO))
- ✓ Use of the ICAO Fuel Savings Estimation Tool (IFSET)
- ✓ An end-to-end system demonstration of new air traffic management concepts



Relevant AMHS related ANConf/12 Recommendations



Recommendations in support of the Global System-wide Information management (SWIM):

- REC 3/1 ICAO ASBU relating to performance improvement through the application of SWIM
- REC 3/2 Development of SWIM Concept
- REC 3/4 States and Industry to support SWIM
- REC 3/8 States actions relating to service improvement through AIM as well as digital ATM information

Recommendation 6/1 – Regional performance framework – planning methodologies and tools

That States and PIRGs:

- a) finalize the alignment of regional air navigation plans with the Fourth Edition of the *Global Air Navigation Plan* (Doc 9750, GANP) by May 2014;
- b) focus on implementing aviation system block upgrade Block 0 Modules according to their operational needs, recognizing that these modules are ready for deployment;
- c) use the eANPs as the primary tool to assist in the implementation of the agreed regional planning framework for air navigation services and facilities;
- d) involve **regulatory and industry personnel** during all stages of planning and implementation of aviation system block upgrade modules;
- e) develop action plans to address the identified impediments to air traffic management modernization as part of aviation system block upgrade planning and implementation activities;

4th edition of the Global Air Navigation Plan

GANP History

Appendix to FANS Report, 1992

Doc 9750 Edition 1, 1998

Doc 9750 Edition 2, 2001

Doc 9750 Edition 3, 2006

Doc 9854, 2005
Global ATM Operational Concept

Doc 9882, 2008
ATM System Requirements

Doc 9883, 2008
Global Performance Manual

Encompasses Performance Framework

Addresses ANSP, Regulatory and User requirements

Includes ASBU Methodology

**Doc 9750
Global Air Navigation Plan, Edition 4
2014-16**

Related documents

GANP- Contents (DOC 9750)



Strategic Objective: Capacity and Efficiency

Executive summary

Introduction: Presentation of GANP

Chapter 1: ICAO's Ten Key Air Navigation Policy Principles

Chapter 2: Implementation

Chapter 3: Aviation System Performance

Appendices:

Appendix 1 Global Air Navigation Plan Evolution and Governance

Appendix 2 Aviation System Block Upgrades

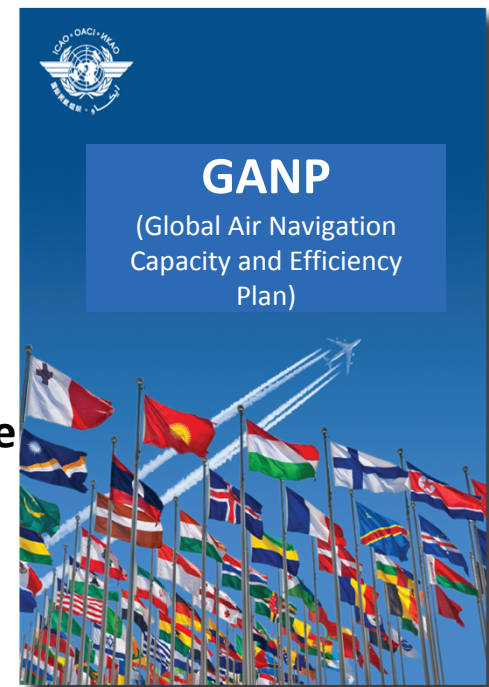
Appendix 3 Hyperlinked Online Support Documentation

Appendix 4 Frequency Spectrum Considerations

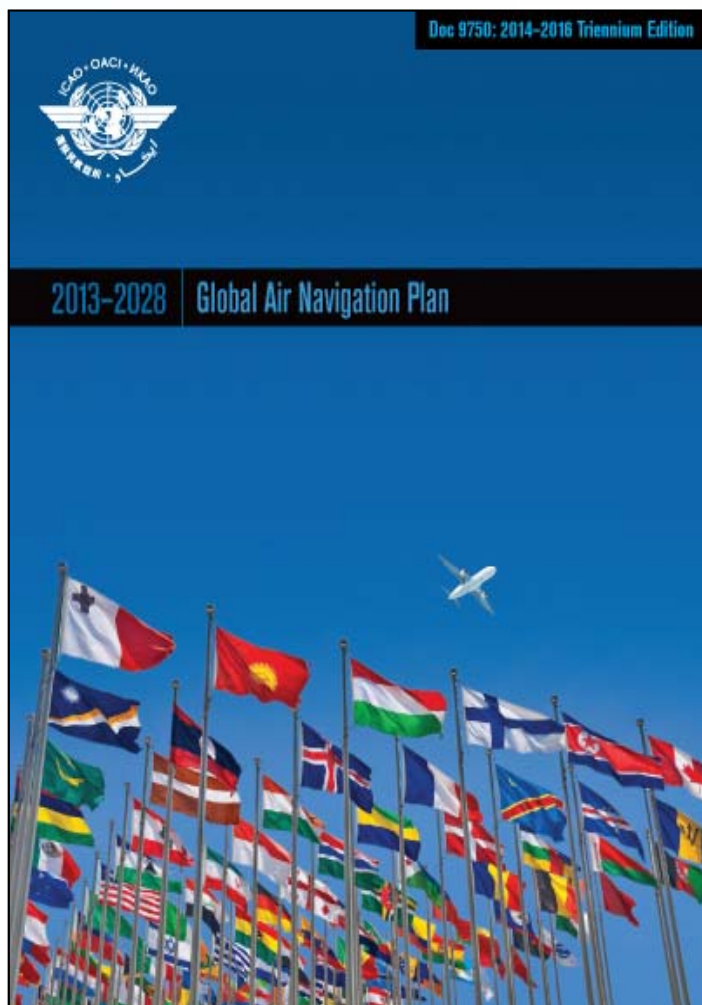
Appendix 5 Technology Roadmaps

Appendix 6 Module Dependencies

Appendix 7 Acronym Glossary



GANP Policy Principles



1. Commitment to the Implementation of ICAO's Strategic Objectives and KPAs
2. Aviation Safety is the highest priority
3. Tiered Approach to Air Navigation Planning
4. Global Air Traffic Management Operational Concept (GATMOC)
5. Global Air Navigation Priorities
6. Regional and State Air Navigation Priorities
7. Aviation System Block Upgrades (ASBUs), Modules and Roadmaps
8. Use of ASBU Blocks and Modules
9. Cost Benefit and Financial issues
10. Review and Evaluation of Air Navigation Planning

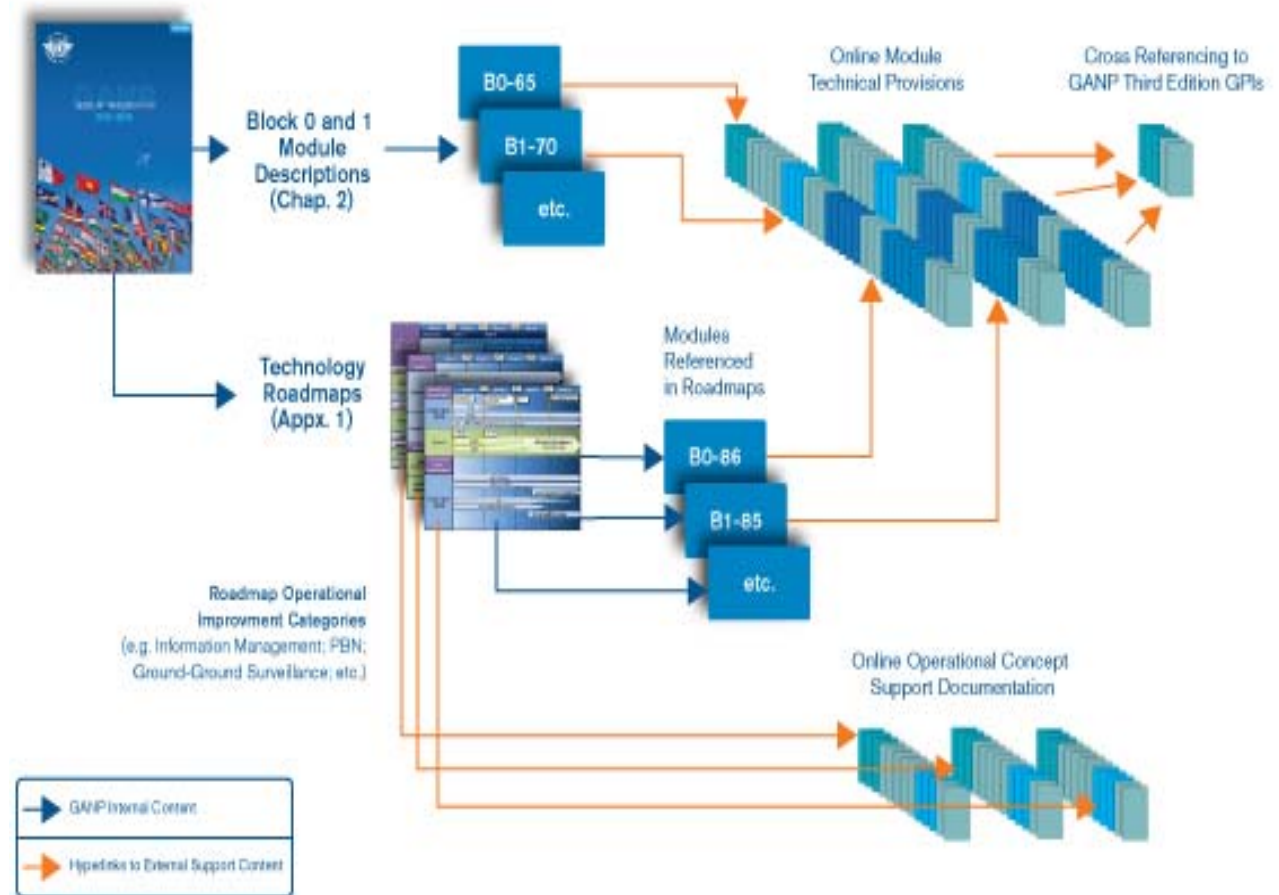
4th edition of the Global Air Navigation Plan

Mapping of the hyperlinked documents



New GANP characteristics

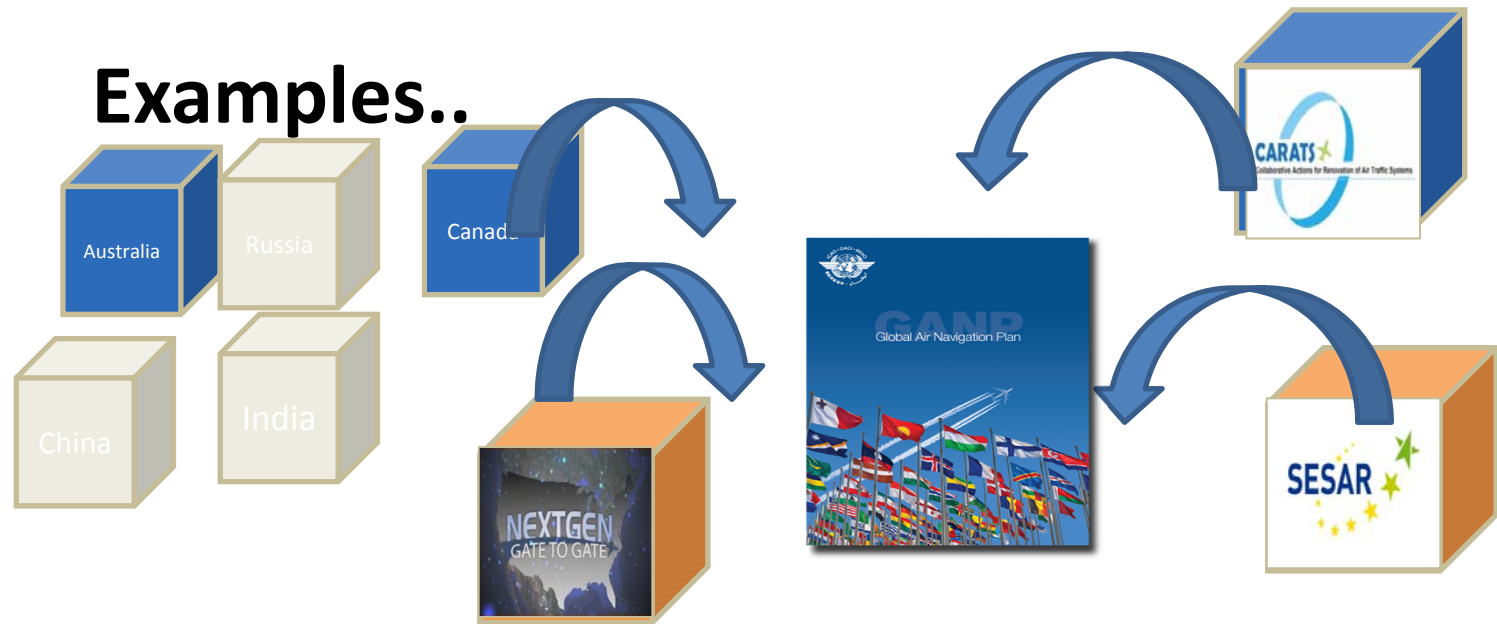
- Scope extends to airspace users and regulators
- E (electronic)–based
- Separate technology roadmaps for C, N, S, IM and avionics
- Implementation is based on near, medium and long terms through Blocks 0, 1, 2 and 3 timeframes
- Supported by web based Regional ANPs, called eANPs
- ICAO Fuel Savings Estimation Tool (IFSET) will be a part of the revised global plan



ASBU: New National/Regional Plans - interoperability challenges



- Air traffic growth expands rapidly every 15 years
- Growth can be a double-edged sword. Challenge is how to achieve both safety and operational improvements
- The 37th session of ICAO General Assembly advised to redouble our efforts with focus on ensuring interoperability of systems while at the same time maintaining or enhancing aviation safety.



Many Regional and National ATM modernization programmes are being developed worldwide

- They are following ICAO's Global Air Navigation Plan and Operational Concept, but nevertheless they are different in their own way
- thus resulting in interoperability challenges

ASBU: Global Harmonized Framework



Global framework is needed to ensure:

- ✈️ Safety is maintained and enhanced
- ✈️ ATM improvement programs are harmonized
- ✈️ Barriers to future efficiency and environmental gains are removed, at reasonable cost



- Aligned with ICAO ATM Operational Concept
- Block upgrades will allow structured approach to meet regional and local needs, while considering associated business cases
- They reflect recognition that all modules are not required in all airspaces



ASBU methodology



Current methodology

- Scope covers only ground equipment for ANSPs
- Planning based on short and medium term
- Implementation process is through GPs

ASBU methodology

- ✎ Scope extends to airspace users and regulators
- ✎ Planning based on short, medium and long terms
- ✎ Implementation process is through Blocks and corresponding modules

ASBU Advantages

- Takes into account all related issues such as air/ground Systems, air/ground procedures, air/ground regulatory requirements and business case formulation,
- One stop planning at the same time flexible and scalable
- Modules provide a series of measurable, operational performance improvements, which could be introduced as needed

Aviation System Block Upgrades – Definition



Each Module is defined as follows:

- ✈️ Intended *Operational Improvement/Metric* to determine success
- ✈️ Necessary *Procedures*/Air and Ground
- ✈️ Necessary *Technology*/Air and Ground
- ✈️ Positive *Business Case* per Upgrade
- ✈️ *Regulatory Approval Plan*/Air and Ground
- ✈️ *Well understood* by a Global Demonstration Trial
 - ✈️ All synchronized to allow initial implementation
 - ✈️ Won't matter *when or where* implemented

- 4 Main Performance improvement areas (B0)

- Airport Operations (5 modules)

- Globally interoperable systems & data (3 modules)

- Optimum capacity & flexible flights (7 modules)

- Efficient flight path (3 modules)

- Block 0 will serve as the enabler and foundation for the envisioned future aviation systems.

ASBU: Global Readiness Checklist



Global Readiness Checklist		Status (ready or date)
	Standards Readiness	√
	Avionics Availability	√
	Infrastructure Availability	√
	Ground Automation Availability	√
	Procedures Available	√
	Operations Approvals	√

- ✈️ Each Module is evaluated for its readiness
- ✈️ If any component is not found to be ready it moves to a future Block for implementation
- ✈️ Those Modules that are not specifically ready at a Block release are noted as “dates of readiness”

All Block 0 Modules Have Met the Readiness Criteria

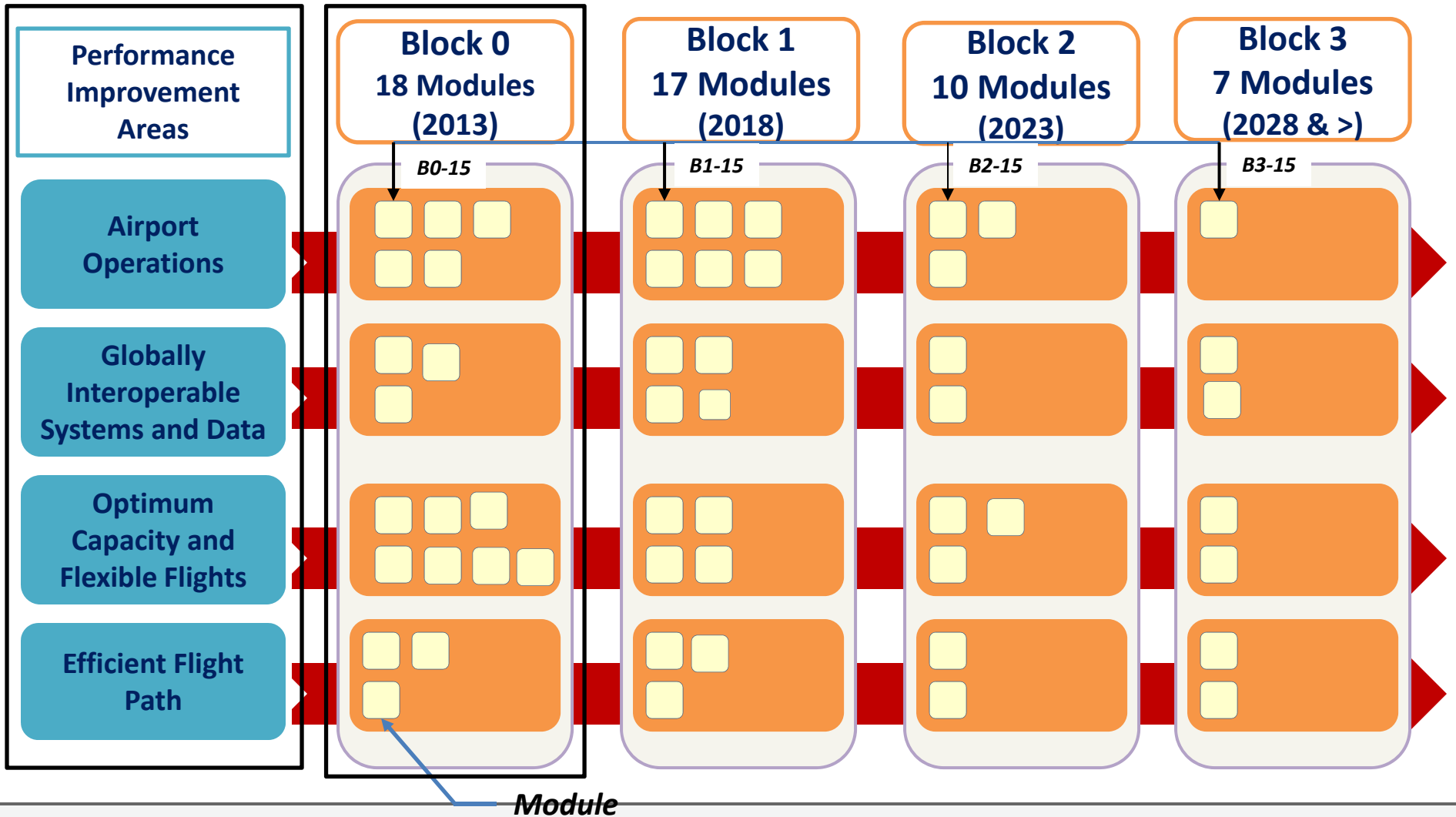
ASBU – Checklist



Performance Improvement Area 2: Globally Interoperable Systems and Data – Through Globally Interoperable System Wide Information Management

Title of the Module:					
B0-FICE: Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration					
<u>Elements:</u>		<u>Equipage/Air</u>		<u>Equipage/Ground</u>	
1. AIDC 2. (Not included in the Module but added here as they are closely linked to this Module) AMHS/IPS		- Nil		- A set of AIDC messages in FDPS - AFTN (AMHS/IPS)	
Implementation monitoring and intended performance impact					
<u>Implementation progress</u>	<u>Qualitative performance benefits associated with five main KPAs only</u>				
1. Indicator: <i>Percentage of ATS units with AIDC</i>	<u>KPA-Access/Equity</u> Not Applicable	<u>KPA-Capacity</u> Reduced controller workload and increased data integrity supporting reduced separations translating directly to cross sector or boundary capacity flow increases.	<u>KPA-Efficiency</u> The reduced separation can also be used to more frequently offer aircraft flight levels closer to the optimum; in certain cases, this also translates into reduced en-route holding.	<u>KPA-Environment</u> Not Applicable	<u>KPA-Safety</u> Better knowledge of more accurate flight plan information.
2. Indicator: <i>States implementing AMHS/IPS</i>					

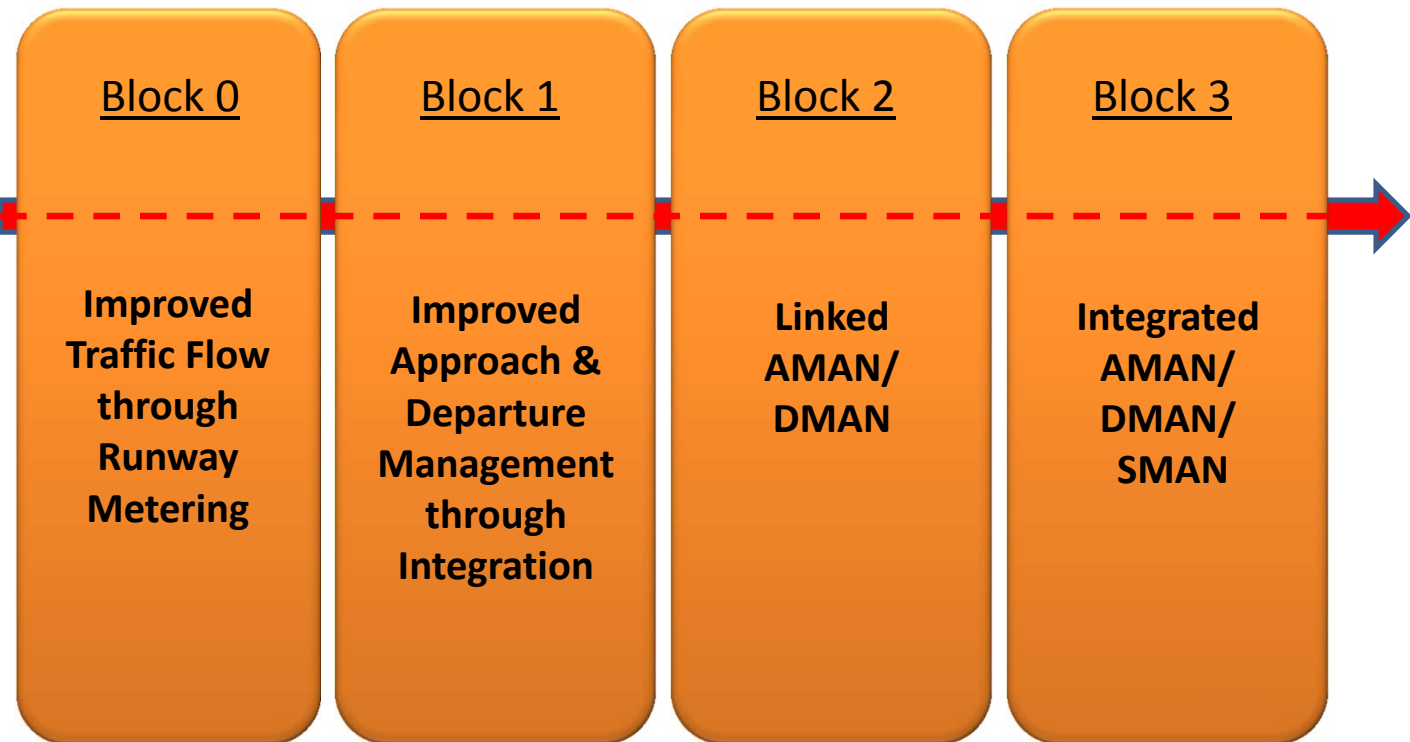
ASBU: Understanding the Relationships



Threads Between Modules... and Across Blocks



Airport Operations



New ASBU Modules Identifiers: Number vrs acronym



Old ASBU Modules Numbering System	New ASBU Modules Identifiers	
65	APTA	Airport Accessibility
70	WAKE	Wake Turbulence Separation
15	RSEQ	Runway Sequencing
75	SURF	Surface Operations
80	ACDM	Airport Collaborative Decision Making
81	RATS	Remote Air Traffic Services
25	FICE	FF/ICE
30	DAIM	Digital Aeronautical Management
31	SWIM	System Wide Information Management
105	AMET	Advanced Meteorological Information
10	FRTO	Free Route Operations
35	NOPS	Network Operations
84	ASUR	Alternative Surveillance
85	ASEP	Airborne Separation
86	OPFL	Optimum Flight Levels
101	ACAS	Airborne Collision Avoidance Systems
102	SNET	Ground-Based Safety Nets
05	CDO	Continuous Descent Operations
40	TBO	Trajectory-Based Operations
20	CCO	Continuous Climb Operations
90	RPAS	Remotely Piloted Aircraft Systems

ASBU Approach



- Timing/sizing of the block upgrades are in response to
 - need for Mature standards,
 - Integrated air and ground solutions and
 - Establishment of positive business cases
- Block “0” optimizes current onboard equipment and provides baseline
- Modules lacking specific maturity are purposefully placed in later blocks
- Block upgrades respond to issue of non-homogeneous areas

- ✔✔ Addresses ANSP, aircraft and regularity requirements
- ✔✔ Identified 4 improvement areas
- ✔✔ Implementation through Block Upgrades (0, 1, 2, and 3) each comprising a number of modules
- ✔✔ Each module is explained in a standardized 4-5 pages template (checklist)
 - ✔✔ provide a series of measurable, operational performance improvements
 - ✔✔ Organized into flexible & scalable building blocks
 - ✔✔ Could be introduced as needed
 - ✔✔ all modules are **not** required in all airspaces



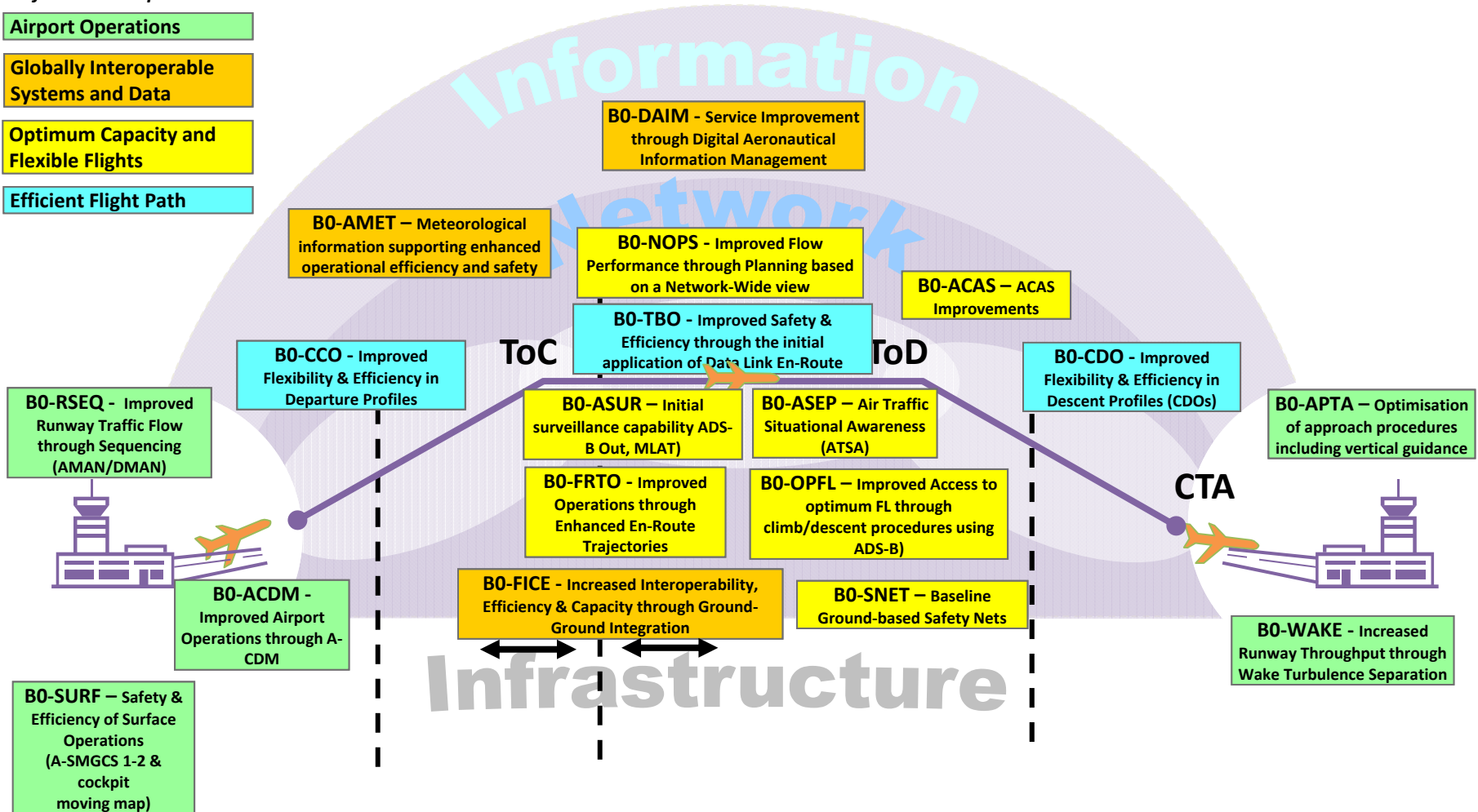
NAM/CAR Regions adopted 15 Block 0 modules for the 2013-2018 period (RPBANIP)

ASBU Block 0 in Perspective



Performance Improvement Areas

- Airport Operations
- Globally Interoperable Systems and Data
- Optimum Capacity and Flexible Flights
- Efficient Flight Path



Globally Interoperable Systems and Data (PIA 2)



B0-25 FICE

Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration

Supports the coordination of ground-ground data communication between ATSU based on ATS Inter-facility Data Communication (AIDC) defined by ICO Document 9694

B0-105 AMET

Meteorological information supporting enhanced operational efficiency and safety

This module includes meteorological information supporting ATM decision support such as WAFS, IAVW, TCAC, Aerodrome warnings, Wind shear and SIGMET. This module enables the reliable identification of applicable ATM solutions when meteorological conditions are impacting (observed) or expected to impact (forecast) aerodromes or airspace

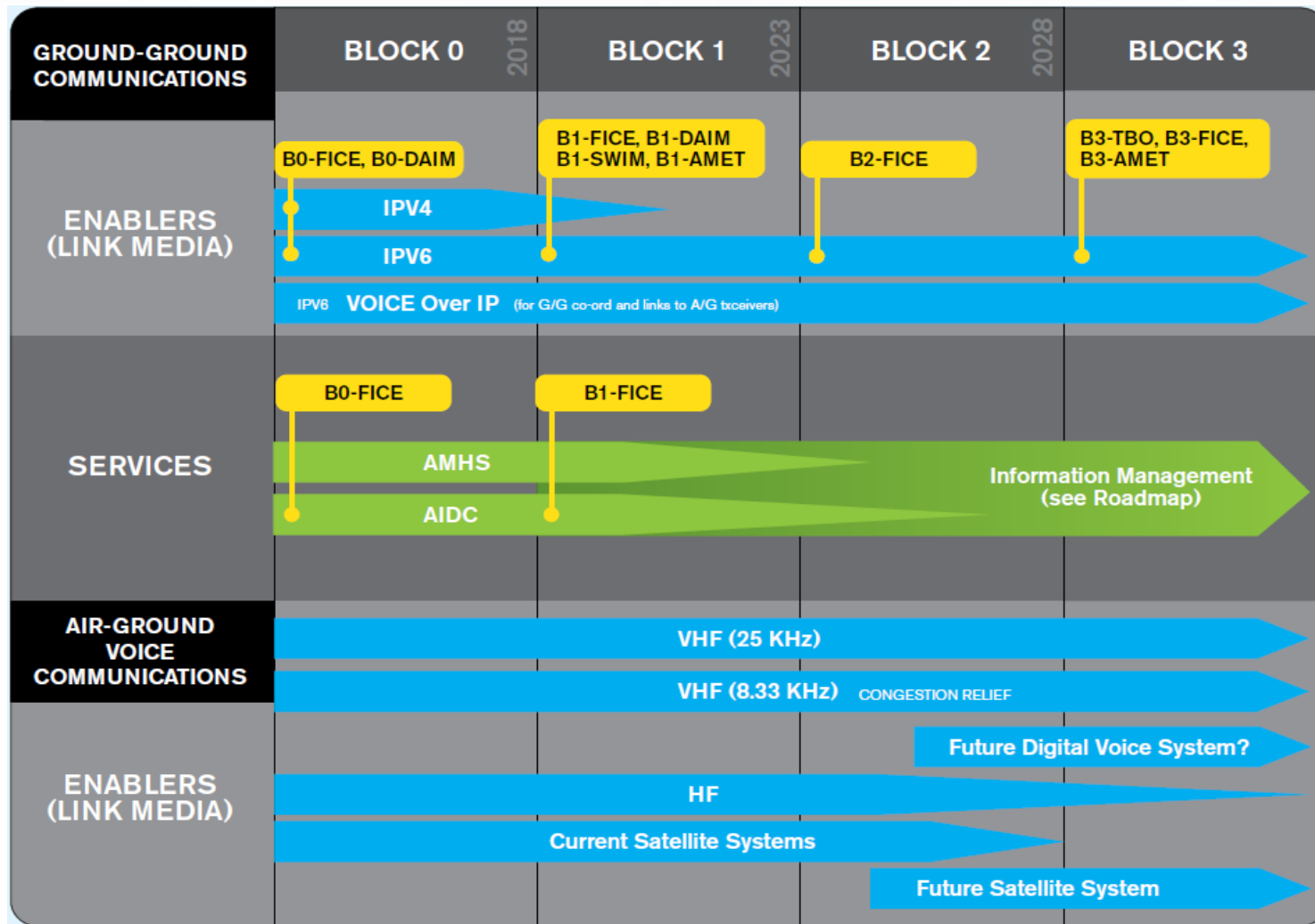
B0-30 DAIM

Service Improvement through Digital Aeronautical Information Management

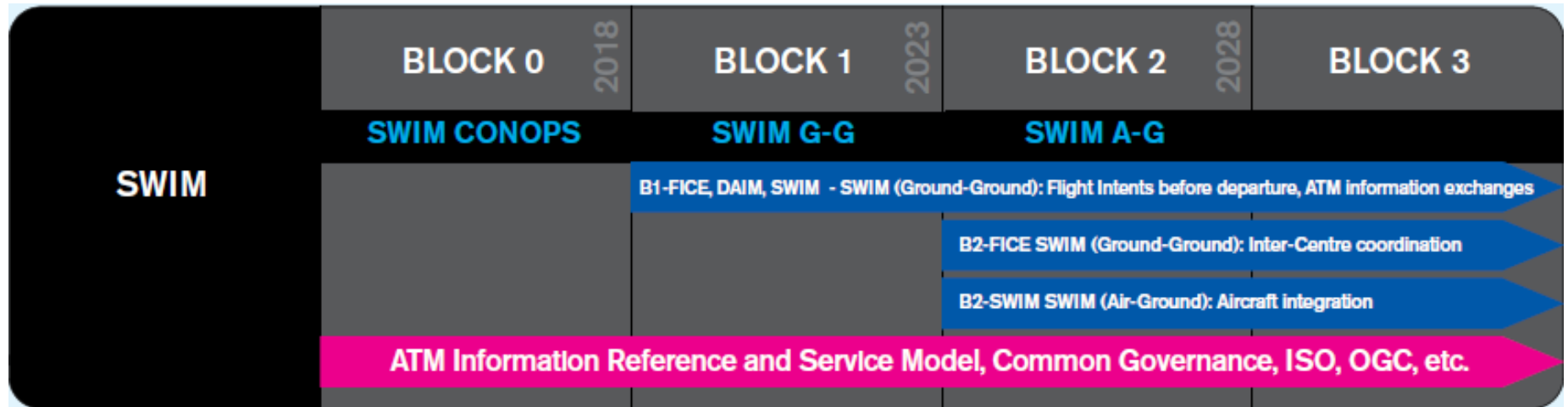
Transition from product centric to data centric. Introduction of digital processing and management of information, by the implementation of AIS/AIM making use of AIXM, moving to electronic AIP and better quality and availability of data

In Block 0 we improve overall operations and continue to enable Collaborative Decision Making through improved interfacilities communications using standard information formats and baseline Met Services

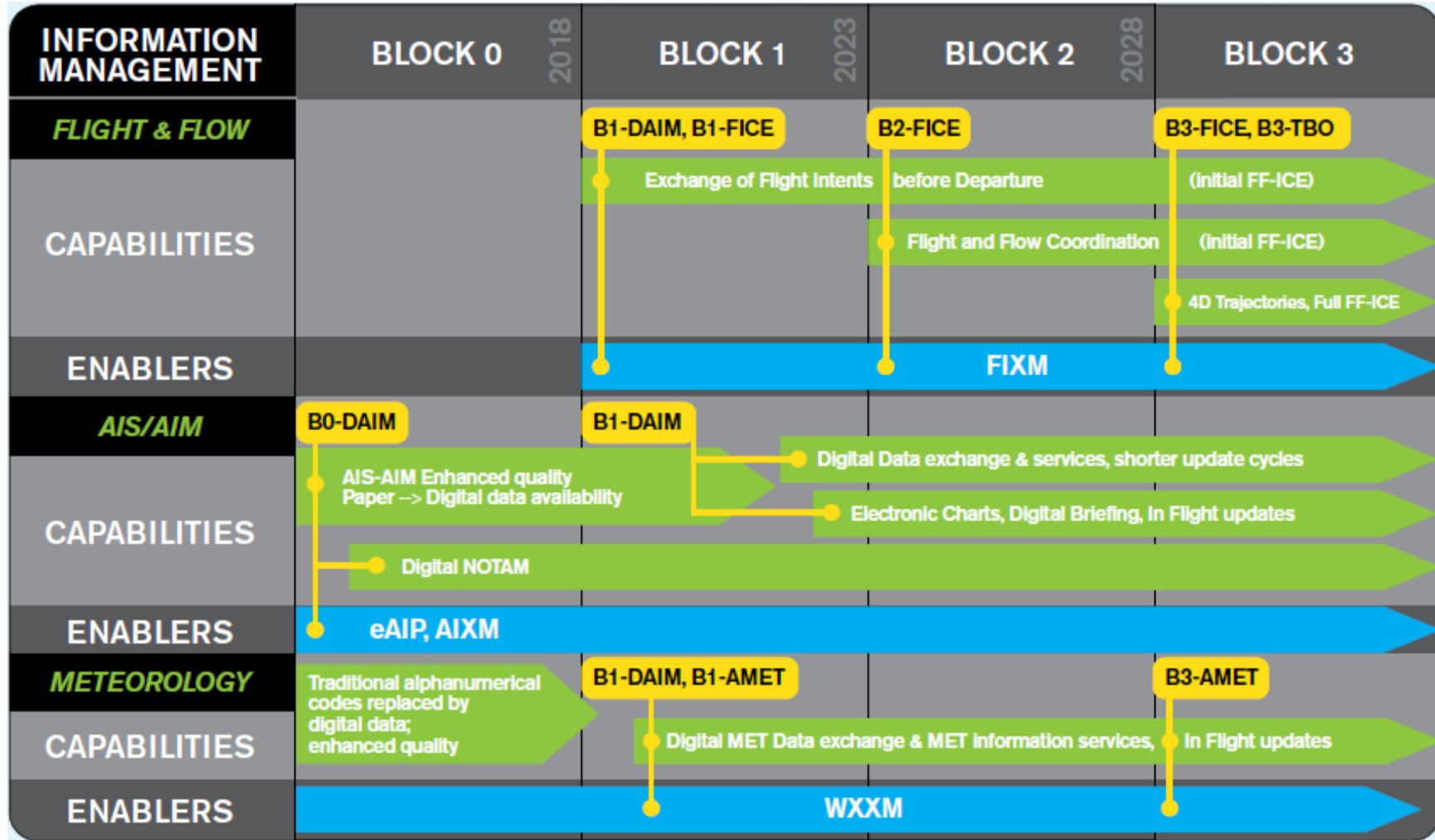
AMHS related- CNS/ AIM/ Avionic Roadmaps



AMHS related -CNS/ AIM/ Avionic Roadmaps



AMHS-related CNS/ AIM/ Avionic Roadmaps



Block 0: Priority



- ✈️ Block 0 initiatives must leverage on existing on-board avionics
- ✈️ 3 Priorities have been agreed to by the Global community:
 - ✈️ Performance Based Navigation (PBN)
 - ✈️ Continuous Descent Operations (CDO)
 - ✈️ Continuous Climb Operations (CCO)



- Block 0 risks are minimum
 - Global Readiness Checklist is complete
 - The Modules are well understood and supported
- States need to ensure successful deployment of Block 0
 - If Block 0 is not implemented as a foundation, certain functionalities may not be available as enablers for future blocks
- Identify and resolve policies necessary to enable the future blocks now

ASBU B0 Implementation



The Modules of Block 0 are ready for implementation today

- ✔ Standards are ready
- ✔ Avionics are ready
- ✔ Procedures and Operational Approvals are in place
- The Infrastructure is available
- Ground Automation is ready

Need to ensure that regional implementation of the Blocks or the Modules are well described and ready for implementation



- ICAO and States (training organization, Administration, etc.) to provide training on ASBU approach
- Training entities to update training curricula for ASBU Approach
- Training to ensure interoperability and effective ASBU implementation



Air Navigation Reporting



PROCESS

- ✎ PIRGs are progressing with planning and implementation of ASBUs
- ✎ The next step calls for an air navigation performance measurement, monitoring and reporting strategy.
- ✎ Methodology for reporting
 - ✎ States to send data to RO through Air Navigation Report Form (ANRF) or equivalent form/on ongoing basis
 - ✎ RO will consolidate data from all States and publish through Regional Performance Dashboard /on ongoing basis
 - ✎ HQ will consolidate data from all ROs and publish Global Air Navigation Report/annually

- The current Performance Framework Form (PFF) has been redesigned and aligned with ASBU framework and called the Air Navigation Report Form (ANRF)
- ANRF will be the basis for performance reporting of the ASBU implementation
- The ANRF templates for all the 18 Modules of ASBU Block 0 will be available in the upcoming Regional eANP.

Regional Reporting

Regional Performance Dashboard



Transparency and sharing of information are fundamental to a safe and efficient global air transportation system.



ICAO is introducing “Regional ‘Performance Dashboard’ - the 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.
- The Dashboard 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 for March 2014 for the all ICAO regions and will be updated at regular intervals.
- Dashboard will be user friendly and able to deliver the message at glance.

Regional Performance Dashboard Proposed Format – Home page of ICAO RO website

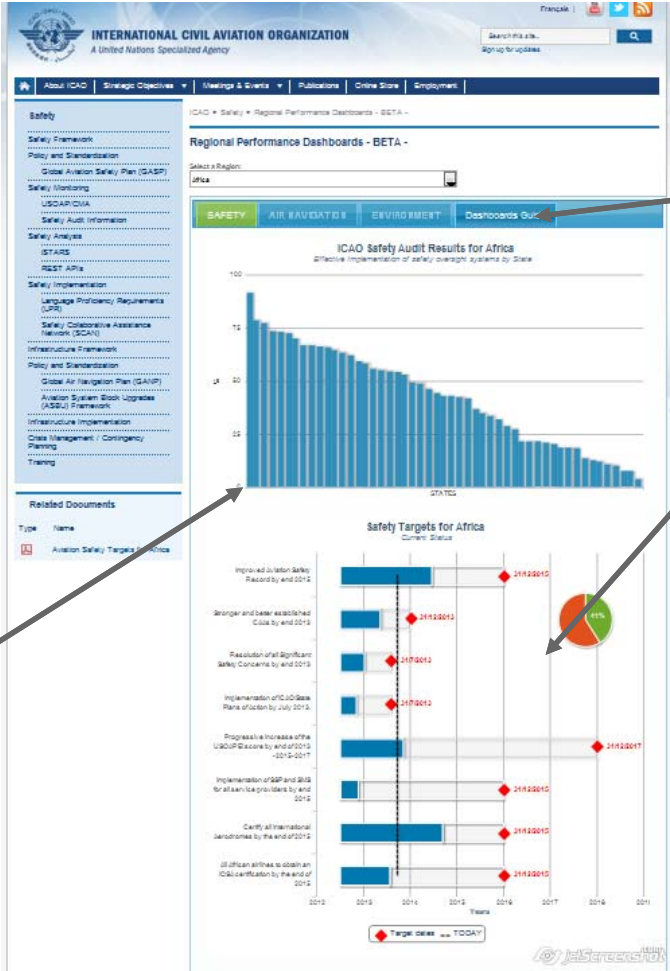


GENERAL FORMAT

For Safety:
Effective Implementation
(No State names)

For Efficiency:
Air Navigation Implementation
(by State)

For Environment:
Fuel savings and CO2 reduction
(by State)



Regional Performance by **Strategic Objective**

Regional Performance Indicators

Message:
Provide the status of Safety, Efficiency, and Environment for the Region

Regional Performance Dashboard

Indicators/metrics for Safety and Air Navigation



SAFETY

Metrics

- 1. Safety Oversight**
Effective Implementation by State
- 2. Accidents and serious incidents**
Number of accidents per million departures
- 3. Runway Excursions and Incursions**
Runway excursion and incursion accidents as a percentage of all accidents
- 4. Aerodrome certification**
Number of certified international aerodromes
- 5. SSP/SMS Implementation**
Implement Phase 1 of State Safety Programmes (SSP) and ensure that all Service Providers implement a Safety Management System (SMS)

AIR NAVIGATION

Metrics

- 1. PBN TERMINAL**
% of international aerodromes with APV
- 2. PBN ENROUTE**
% of PBN routes/airspace
- 3. CDO**
% of international aerodromes/TMAs with CDO
- 4. CCO**
% of international aerodromes/TMAs with CCO
- 5. Estimated Fuel Savings/ CO2 Emissions Reduction Based on IFSET**
- 6. ATFM**
% of ATS Units/international aerodromes providing ATFM service
- 7. AIM**
% of needed elements (from AIS to AIM Roadmap) facilitating the transition from AIS to AIM that have been implemented – PHASE I

Regional Target in RPBANIP on AMHS



6. OPTIMIZATION AND MODERNIZATION OF COMMUNICATION INFRASTRUCTURE				
Benefits				
Efficiency	<ul style="list-style-type: none"> Improvements in ATS coordination Increase availability of communications Avoid misunderstandings in communications Facilitate the utilization of advanced technologies 			
Continuity	<ul style="list-style-type: none"> improvement of airspace interoperability and seamlessness; and allow improvements to the provision of air traffic control services to all aircraft operations. 			
Safety	<ul style="list-style-type: none"> Improvement in safety in airspaces and aerodromes 			
Strategy				
ATM-Component	TASK-DESCRIPTION	START-END	RESPONSIBLE	STATUS
AO, TS, CM, AUO AOM, SDM	a) Review the status of performance of current AFS Services and identify deficiencies or improvements (AFTN, oral ATS services, A-G communications)	2013-2015	States, Territories	Valid
	b) Implementation of improvements to communication services in accordance to required RCPs.	2014-2018	States, Territories	Valid
	c) Develop Regional ATN Planning documents	2013-2015	GREPECAS	Valid
	d) Coordination and testing of ATN G-G Application implementation aspects (AMHS, AIDC, etc.)	2013-2018	States, Territories	Valid
	e) Planning, trial and implementation activities for A-G data Applications (DCL, D-ATIS, etc.)	2014-2018	States, Territories	Valid
	f) Technical review of Regional Telecommunication networks for ATN implementation	2013-2015	States, Territories	Valid
	g) Implement available technologies in to facilitate ground and airborne applications (CPDLC, ADS-C, ADS-B)	2013-2018	States, Territories	Valid
	h) Implement the necessary communication network for ACDM	2014-2018	States, Territories	Valid

Regional Target in RPBANIP on AMHS



1. → REGIONAL PERFORMANCE OBJECTIVE -- B0-25/FICE: ¶ Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration ¶					
Performance Improvement Area 2: ¶ Globally Interoperable Systems and Data -- Through Globally Interoperable System-Wide Information Management ¶					
3. ASBU B0-25/FICE: Impact on Main Key Performance Areas (KPA) ¶					
Access & Equity ¶	Capacity ¶	Efficiency ¶	Environment ¶	Safety ¶	
Applicable ¶	No	Yes	Yes	No	Yes

4. ASBU B0-25/FICE: Planning Targets and Implementation Progress ¶	
5. Elements ¶	6. Targets and implementation progress ¶ (Ground and Air) ¶
1. → MEVA III HP Network implementation ¶	100% implementation, August 2015 ¶
2. → AMHS implementation ¶	6 States by December 2014 ¶
3. → AIDC implementation ¶	5 AIDC communications by December 2014 ¶
4. → ATN router structure implementation ¶	70% by June 2016 ¶

7. ASBU B0-25/FICE: Implementation Challenges ¶				
Elements ¶	Implementation Area ¶			
	Ground System Implementation ¶	Avionics Implementation ¶	Procedures Availability ¶	Operational Approvals ¶
1. → MEVA III implementation ¶	Local site readiness ¶	NIL ¶	NIL ¶	NIL ¶
2. → Full AMHS operation and transition from AFTN ¶	Training and funding issues ¶	NIL ¶	Update procedures ¶	NIL ¶
3. → AMHS interconnection ¶	Network bandwidth availability and last mile connection ¶	NIL ¶	NIL ¶	NIL ¶
4. → Implement AIDC ¶	Training and funding issues ¶	NIL ¶	Update procedures ¶	NIL ¶
¶	¶	¶	¶	¶

ANRF on AMHS

8. ASBU B0-25/FICE: Performance Monitoring and Measurement ¶ 8A. ASBU B0-25/FICE: Implementation ¶	
Elements ¶	Performance Indicators/Supporting Metrics ¶
1. → MEVA III HP Network implementation ¶	Indicator: Percentage of MEVA Members implemented in MEVA III ¶ Supporting metric: MEVA III Services contracted implemented ¶
2. → AMHS implementation ¶	Indicator: Percentage of States with AMHS interconnected with other AMHS ¶ Supporting metric: Number of AMHS interconnections implemented ¶
3. → AIDC implementation ¶	Indicator: Percentage of ATS units with AIDC ¶ Supporting metric: Number of AIDC systems installed ¶
4. → ATN router structure implementation ¶	Indicator: Percentage of ATN infrastructure implemented ¶ Supporting metric: Number of ATN routers implemented in accordance to CAR/SAM/FASID Table CNS-1 Bas ¶
¶	¶

8A. ASBU B0-25/FICE: Performance Monitoring and Measurement ¶ 8B. ASBU B0-25/FICE: Performance Monitoring ¶	
Key Performance Areas ¶	Metrics (if not indicate qualitative Benefits) ¶
Access & Equity ¶	NIL ¶
Capacity ¶	• → Reduces controller workload ¶ • → increases data integrity supporting separation reduction and ¶ • → increases boundary capacity flow ¶
Efficiency ¶	Enables optimum aircraft flight levels ¶ Less aircraft in holding ¶
Environment ¶	NIL ¶
Safety ¶	Increases timely and accurate flight plan information for ATC ¶

Air Navigation Reporting Future



REPORTS

Attributes

ACTIVITY: AIR, ANS, LEG, OPS, PEL

1) STATE: Sample State

2) CITIES: Sample City

4) PROVIDER: Sample Provider

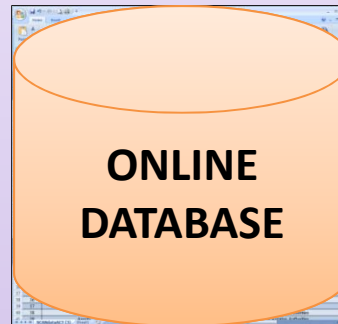
5) FUNDING: Sample Funding

Buttons: Delete, OK

ONLINE

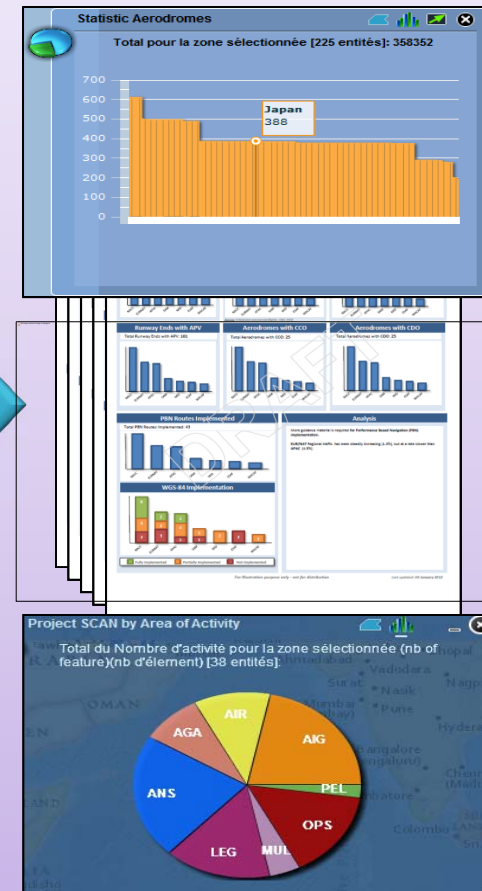
September 2013

DATA



ONLINE

ANALYSIS



ONLINE

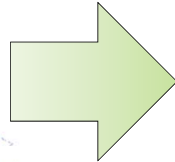
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Measuring Against the Global Plans

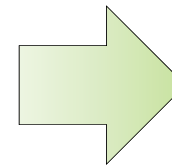
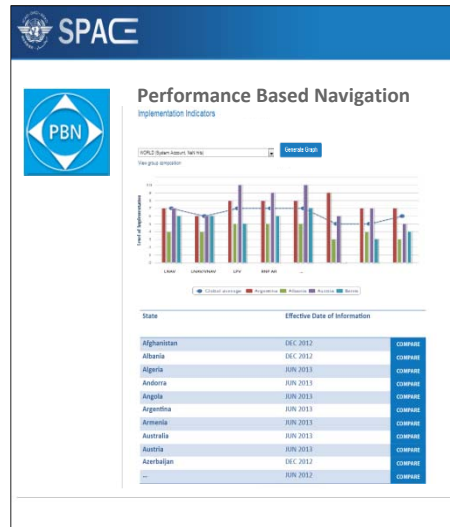
Reporting Mechanism and Tools



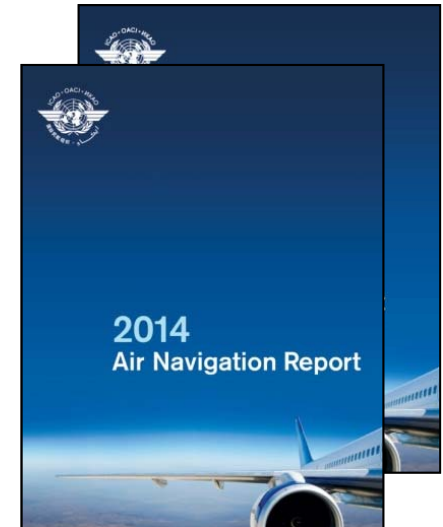
Regional Bodies



Web Portal



Report



- 🌱 **Visualize** the status of implementation through dynamic and interactive charts
- 🌱 Provide **feedback** on the data (qualification of the data)
- 🌱 Perform **self-assessments**, generate ad-hoc **reports** and **export** data
- 🌱 Provide a venue for data collection towards the **Annual Reports**



North American
Central American
and Caribbean
(NACC) Office
Mexico City

South American
(SAM) Office
Lima

**ICAO
Headquarters
Montreal**

Western and
Central African
(WACAF) Office
Dakar

European and
North Atlantic
(EUR/NAT) Office
Paris

Middle East
(MID) Office
Cairo

Eastern and
Southern African
(ESAF) Office
Nairobi

Asia and Pacific
(APAC) Office
Bangkok

Thank You

A world map is shown in a light blue color. Eight colored dots (one orange for Montreal, seven blue for other offices) are placed on the map, with thin lines connecting them to their respective text labels. A large, rounded rectangular box with a grey-to-white gradient background and a black border is centered over the map, containing the text 'Thank You' in a bold, dark blue font.