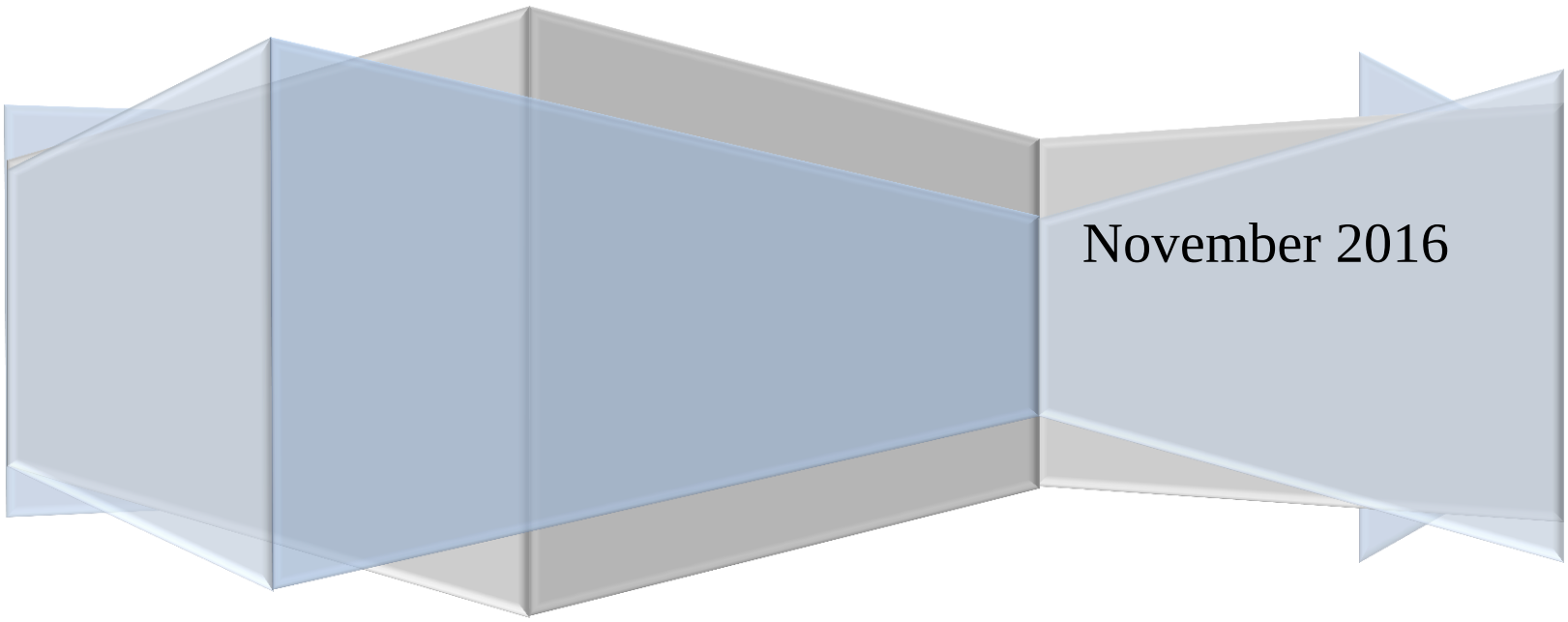
# NACC ASBU Handbook – 2016

## Supporting analysis and implementation reporting of the ICAO ASBU Modules



November 2016

# Foreword

The first Edition of the *NACC ASBU Handbook* was created to assist in the application of the Aviation System Block Upgrade (ASBU) approach as detailed in the Fourth Edition of the *Global Air Navigation Plan* (GANP, Doc 9750).

The ASBU approach was globally endorsed during the 38th Assembly of the International Civil Aviation Organization (ICAO) which took place at ICAO Headquarters in Montréal, Canada, from 28 September to 4 October 2013, via the adoption of the 4th Edition of the GANP, which was presented to the Technical Commission of the 38th Assembly by the Council of ICAO in Appendix A to A38-WP/39 - A Comprehensive Strategy for Air Navigation: Endorsement of the Global Air Navigation Plan.

As noted in A38-WP/39, the Fourth Edition of the GANP was meant to "provide clear guidance on the guiding operational targets and supporting technologies, avionics, procedures, standards and regulatory approvals needed to realize them" and to establish "a framework for incremental implementations based on the specific operational profiles and traffic densities of each State" (A38-WP/39 paragraph 2.1 refers).

The detailed material which formed the basis of the Fourth Edition of the GANP was presented at the 12th Air Navigation Conference (12th ANC) which took place at ICAO Headquarters from 19 to 30 November, 2012. This base material was subsequently updated to incorporate the recommendations of the 12th ANC and is made available by ICAO as *The Aviation System Block Upgrades - ASBUs (Edition March 2013)* (ASBU Working Document); this document is accessible on the website for the 12th ANC, via the following link:

http://www.icao.int/Meetings/anconf12/Pages/Aviation-System-Block-Upgrades.aspx

In July 2016, ICAO issued *The Aviation System Block Upgrades - The Framework for Global Harmonization* (ASBU Working Document – 2016 Edition) to support the Fifth Edition of the GANP which was endorsed by the 39th Assembly. This document is available on the GANP webpage:

http://www.icao.int/airnavigation/Pages/GANP-Resources.aspx

The 39th Assembly of ICAO agreed with the approach taken to produce the first edition of this Handbook, which was presented in A-39-WP/239 under Agenda Item 36.

The 2016 Edition of the *NACC ASBU Handbook* references the 5th Edition of the GANP and the ASBU Working Document – 2016 Edition.

Please provide any comments, corrections or suggestions regarding the *NACC ASBU Handbook* to:

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# Explanation of the Handbook

When analyzing the ASBU Modules for applicability in a Region or a State, it can be difficult to determine what specific technological or procedural implementations are associated with each Module. The descriptions provided in the GANP are at a very high level of detail. Specific information for each Module is provided in the ASBU Document – 2016 Edition, including, for most Modules, "Elements" which represented specific technical or procedural implementations. In some cases, the Elements may be directly copied from the ASBU Document, but in many cases, the specific technical or procedural implementation needs to be derived through careful review of the Module text.

The *NACC ASBU Handbook* provides an outline of the ASBU Modules to the Element level. The Elements are categorized as follows:

*Defined* - Word for word, the text for the Element as provided in the ASBU Working Document

*Derived* - An Element from the ASBU Working Document edited for clarity or specificity or developed on the basis of the Module description in the ASBU Working Document.

*Identified* - An Element developed by a Region or State which uses a similar technology or method to achieve the same results as other Elements Defined or Derived for that Module.

The sources of the detailed Module descriptions in this Handbook are indicated in the following diagram:

<table>
<tr><td rowspan="2">Module Designation<br>B# - Acronym - GANP<br>Begins page # - ASBU Working Document</td><td>Thread - Module Name<br>Thread name GANP, page 45, Module name, GANP</td></tr>
<tr><td>Performance Improvement Area (PIA)<br>GANP</td></tr>
<tr><td colspan="2">Summary Description<br>GANP</td></tr>
<tr><td colspan="2">Operating Environment/Phases of Flight<br>ASBU Working Document</td></tr>
<tr><td colspan="2">Applicability<br>GANP</td></tr>
<tr><td colspan="2">Elements<br>ASBU Working Document<br>"Derived from" indicates the paragraph number where the source concept was described<br>"Defined" indicates the Element number as per the ASBU Working Document<br>"Identified" indicates the Region or State which developed the Element</td></tr>
</table>

The Handbook provides the ASBU Modules in alphabetical order by Performance Improvement Area (PIA).

# Changes from the Previous Edition

The previous edition of this Handbook supported needs analysis and implementation reporting in relation to the 4th Edition (2013) of the GANP. This Edition of the Handbook incorporates changes in the timing of the Blocks, naming of PIAs and Threads and changes to the descriptions of Modules and Elements that were introduced in the 5th (2016) Edition of the GANP and the ASBU Working Document – 2016 Edition.

- The Foreword and Explanation of the Handbook were updated to account for the development of the ASBU Working Document – 2016 Edition and the endorsement of the 5th Edition of the GANP.
- The timeframes for Blocks 1-3 have been updated.

  Block 0 contains capabilities available for implementation in 2013

  Block 1 now begins in 2019 (rather than 2018)

  Block 2 now begins in 2025 (rather than 2023)

  Block 3 now begins in 2031 (rather than 2028)
- Some PIA titles were shortened:

  PIA 2: Globally Interoperable Systems and Data

  PIA 3: Optimum Capacity and Flexible Flights

  PIA 4: Efficient Flight Paths
- Some Thread titles were changed:

  AMET - Advanced MET Information

  DATM - Digital ATM Information

  FICE - FF-ICE

  RATS - Remote ATS

  RPAS - Remotely Piloted Aircraft Systems
- *Applicability Considerations* was changed to *Applicability*
- The reference pages for each of the Modules and the paragraph numbers for each of the Elements have been updated to reflect the content of the ASBU Working Document - 2016 Edition
- The following table describes the additional changes made to each Module:

| ***Module Designation*** | ***Changes*** |
|---|---|
| **B0-ACDM** | *Summary Description* updated – editorial only<br>*Applicability* updated<br>Elements 1 & 2 replaced and expanded to detail four specific ACDM capabilities.<br>Element 5 was formerly numbered Element 3 |

| ***Module Designation*** | ***Changes*** |
|---|---|
| **B0-APTA** | *Summary Description* and *Applicability* updated<br>The different types of approaches are now described based on the minima enabled by the different capabilities.<br>Element 2 was formerly mixed into Element 1<br>Element 3 was formerly numbered Element 4<br>Element 4 was formerly numbered Element 3; the Handbook clarifies how this Element differs from a similar Element defined for B1-APTA |
| **B0-RSEQ** | *Summary Description* updated – editorial only<br>Text deleted from *Operating Environment/Phases of Flight* as this is not specified in the ASBU Working Document – 2016 Edition<br>What was formerly Element 2 was deleted as controlled time of arrival at the aerodrome is no longer included as a capability for this Module<br>Element 2 was formerly numbered Element 3<br>Element 3 was formerly numbered Element 4<br>Element 4 was formerly numbered Element 5 |
| **B0-SURF** | Enhanced Vision Systems (EVS) has been added to this Module<br>*Summary Description* and *Applicability* updated<br>Element 2 reworded for clarity<br>New Element 4 added to refer to EVS, which was formerly included in B1-SURF<br>Element 5 was formerly numbered Element 4 |
| **B0-WAKE** | *Summary Description* updated – editorial only<br>Element 3 updated to refer to "operations" rather than "procedures" and to include new acronym WIDAO<br>Element 4 updated to include use of observed crosswinds as part of this capability and to include new acronym WTMD |
| **B0-AMET** | *Summary Description* updated – editorial only |
| **B0-DATM** | *Summary Description* and *Applicability* updated<br>Element 1 updated to reflect that the information exchange model must be standardized |
| **B0-FICE** | *Summary Description* updated |
| **B0-ACAS** | *Summary Description* updated – editorial only<br>Element 2 and Element 3 reworded to clarify they are specific TCAS functions, rather than types of TCAS |
| **B0-ASEP** | *Applicability* updated – editorial only |
| **B0-ASUR** | *Summary Description* updated – editorial only |
| **B0-FRTO** | *Summary Description* updated – editorial only<br>*Applicability* updated<br>TMA removed from *Operating Environment/Phases of Flight*<br>Element 3 reworded for clarity |
| **B0-NOPS** | *Summary Description* updated<br>Element 1 replaced and expanded to detail two specific ATFM capabilities |
| **B0-OPFL** | *Summary Description* updated |
| **B0-SNET** | *Summary Description* updated |

| ***Module Designation*** | ***Changes*** |
|---|---|
| **B0-CCO** | *Summary Description* and *Applicability* updated<br>Element 2 revised to refer to airspace rather than routes |
| **B0-CDO** | *Summary Description* and *Applicability* updated<br>Element 2 revised to refer to airspace rather than routes |
| **B0-TBO** | SATVOICE added to this Module<br>*Summary Description* and *Applicability* updated<br>Element 2 reworded for clarity<br>Element 3 added to refer to use of CPDLC over oceanic and remote areas<br>Element 4 added to refer to use of SATVOICE for DCPC |
| **B1-ACDM** | *Summary Description* and *Applicability* updated – editorial only<br>Element 6 revised for conciseness |
| **B1-APTA** | *Summary Description* updated<br>*Applicability* updated – editorial only |
| **B1-RATS** | *Summary Description* and *Applicability* updated – editorial only<br>Element 1 revised to exclude AFIS<br>Element 2 added to refer only to AFIS<br>Element 3 was formerly numbered Element 2 and was revised to exclude AFIS<br>Element 4 added to refer only to AFIS<br>Element 5 was formerly numbered Element 3 |
| **B1-RSEQ** | *Applicability* updated – editorial only<br>Element 4 revised to refer to procedures instead of routes and to provide clarity |
| **B1-SURF** | *Summary Description* and *Applicability* updated<br>What was formerly Element 2 was deleted as SURF 1A has been moved to B2-SURF<br>Element 2 was formerly numbered as Element 3<br>What was formerly Element 4 was deleted as SURF 1A has been moved to B2-SURF<br>What was formerly Element 5 was deleted as EVS for taxi operations has been moved to B0-SURF |
| **B1-WAKE** | Element 1 has been revised for clarity<br>Element 3 added to refer to WTMA on a single runway<br>Element 4 was formerly numbered as Element 3 and has been revised for conciseness and clarity |
| **B1-AMET** | *Summary Description* updated<br>Element 1 revised for clarity<br>Elements 4 and 5 revised for conciseness and clarity<br>Element 6 revised to include collaboration |
| **B1-DATM** | *Summary Description* updated<br>*Applicability* updated – editorial only<br>Element 1 added to refer to introduction of AIRM<br>Element 2 was formerly numbered Element 1 and has been reworded for clarity<br>Element 3 was formerly numbered Element 2 and has been reworded for clarity<br>Element 4 was formerly numbered Element 3 and has been reworded for clarity |

| ***Module Designation*** | ***Changes*** |
|---|---|
| **B1-FICE** | *Summary Description* and *Applicability* updated<br>Element 1 was formerly numbered as Element 4<br>Element 2 added to refer to using FIXM<br>What was formerly Element 5 has been revised to include amending FF-ICE information elements and renumbered Element 3<br>What was formerly Element 2 has been revised to clarify that trajectory elements are not included in FPL 2012 and renumbered as Element 4<br>What was formerly Element 1 has been revised to refer to trajectory planning elements, to include negotiation and renumbered as Element 5<br>What was formerly Element 3 is deleted, as the use of XML and internet protocols is no longer specified as an Element in this Module. |
| **B1-SWIM** | *Summary Description* updated – editorial only<br>Element 1 revised to specify this Element is for ground-ground data exchanges<br>What was formerly Element 2 is deleted as implementing PANS-AIM is no longer specified as an Element in this Module |
| **B1-ASEP** | *Summary Description* updated<br>Element 1 reworded for clarity and to specify this Element is for the cruise phase<br>Element 2 reworded for clarity and to specify this Element is for the descent phase<br>Element 3 added to refer to interval management between aircraft on approach<br>Element 4 added to refer to interval management between departing aircraft |
| **B1-FRTO** | *Summary Description* updated – editorial only<br>Element 1 is now Defined instead of Derived and is reworded for conciseness<br>Element 4 is added to refer to tactical use of parallel offsets<br>Element 5 is added to refer to curved PBN approaches<br>Element 6 was formerly numbered Element 4 and is revised for clarity |
| **B1-NOPS** | *Summary Description* updated – editorial only<br>Element 1 reworded<br>Element 2 revised to remove mention of designing alternative route options<br>Element 3 revised to remove applicability only to single flows and reworded for clarity<br>What was Element 4 deleted because this Module no longer focuses on use of information "as soon as possible after departure"; instead the focus is on specific capabilities<br>Element 4 was formerly numbered as Element 5 and has been revised for clarity and conciseness<br>Element 5 added to include FUA<br>Element 6 added to include use of specific tools to support decision making |
| **B1-SNET** | *Summary Description* updated<br>Element 1 revised for clarity and conciseness<br>What was formerly Element 2 was deleted as minimizing nuisance alerts is a basic requirement for any alerting software |
| **B1-CDO** | *Summary Description* updated – editorial only<br>*Applicability* updated<br>Element 1 revised for conciseness and clarity |

| ***Module Designation*** | ***Changes*** |
|---|---|
| **B1-RPAS** | *Summary Description* updated<br>Element 1 revised to refer to implementing, rather than streamlining, a process<br>Elements 2, 3 and 4 reworded for clarity<br>Element 5 removed from what was formerly Element 4 to define this separately<br>Element 6 formerly numbered as Element 5 and reworded for clarity<br>Element 7 formerly numbered as Element 6 and reworded for clarity |
| **B1-TBO** | *Summary Description* updated – editorial only<br>*Applicability* updated<br>Element 4 revised for clarity |
| **B2-RSEQ** | *Applicability* updated – editorial only |
| **B2-SURF** | *Summary Description* and *Applicability* updated<br>Formerly, no Elements were identified for this Module<br>Formerly, SURF 1A capability was part of B1-SURF |
| **B2-ACAS** | *Applicability* updated<br>All airspaces, instead of Aerodromes is specified in *Operating Environment/Phases of Flight* |
| **B2-NOPS** | *Summary Description* updated |
| **B2-CDO** | Formerly, no Elements were identified for this Module |
| **B2-RPAS** | *Summary Description* updated<br>Formerly, no Elements were identified for this Module |
| **B3-RSEQ** | *Summary Description* updated<br>JORDAN is added to *Operating Environment/Phases of Flight* |
| **B3-AMET** | Formerly, no Elements were identified for this Module |
| **B3-FICE** | *Summary Description* updated – editorial only<br>Formerly, no Elements were identified for this Module |
| **B3-RPAS** | Formerly, no Elements were identified for this Module |
| **B3-TBO** | Formerly, no Elements were identified for this Module |

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**PIA 1: Airport Operations**



**PIA 2: Globally Interoperable Systems and Data**



**PIA 3: Optimum Capacity and Flexible Flights**



**PIA 4: Efficient Flight Paths**

# Index of ASBU Modules by Thread, Block and Page

# ASBU Modules by Block

## Block 0 – Available for implementation in 2013

**PIA 1: Airport Operations**

| | |
|---|---|
| *Module Designation*<br>**B0-ACDM**<br>Begins page 107 | *Thread - Module Name*<br>Airport Collaborative Decision-Making - Improved airport operations through airport-CDM |
| | *Performance Improvement Area*<br>1: Airport Operations |
| *Summary Description*<br>To implement collaborative applications that will allow the sharing of surface operations data among the different stakeholders on the airport. This will improve surface traffic management reducing delays on movement and manoeuvring areas and enhance safety, efficiency and situational awareness. | |
| *Operating Environment/Phases of Flight*<br>Aerodrome, terminal | |
| *Applicability*<br>Local for already established airport surface infrastructure. | |
| *Elements*<br>1. (Derived from 1.1.1, 1.3.2 and 4.2.1) Interconnection between aircraft operator and ANSP systems to share surface operations information<br>2. (Derived from 1.1.1, 1.3.2 and 4.2.1) Interconnection between aircraft operator and airport operator systems to share surface operations information<br>3. (Derived from 1.1.1 and 1.3.2) Interconnection between airport operator and ANSP systems to share surface operations information<br>4. (Derived from 1.1.1, 1.3.2 and 4.2.1) Interconnection between airport operator, aircraft operator and ANSP systems to share surface operations information<br>5. (Derived from 3.1 & 7.2.1) Collaborative departure queue management | |

| *Module Designation*<br>**B0-APTA**<br>Begins on page 13 | *Thread - Module Name*<br>Airport Accessibility - Optimization of approach procedures including vertical guidance |
|---|---|
| | *Performance Improvement Area*<br>1: Airport Operations |
| *Summary Description*<br>The use of Performance-based Navigation (PBN) and ground-based augmentation system (GBAS) landing system (GLS) procedures will enhance the reliability and predictability of approaches to runways, thus increasing safety, accessibility and efficiency. This is possible through the application of basic global navigation satellite system (GNSS), Baro-vertical navigation (VNAV), satellite-based augmentation system (SBAS) and GLS. The flexibility inherent in PBN approach design can be exploited to increase runway capacity. | |
| *Operating Environment/Phases of Flight*<br>Approach | |
| *Applicability*<br>This Module is applicable to all instrument and precision instrument runway ends, and non-instrument runway ends. | |
| *Elements*<br>1. (Derived from 4.1.1) PBN approach procedures with vertical guidance to LNAV/VNAV minima<br>2. (Derived from 4.1.1) PBN approach procedures with vertical guidance to LPV minima<br>3. (Derived from 4.1.1) PBN approach procedures without vertical guidance to LNAV minima<br>4. (Derived from 4.1.1 and B1-APTA 1.2.1) GBAS Landing System (GLS) procedures to CAT I minima | |

| *Module Designation*<br>**B0-RSEQ**<br>Begins page 51 | *Thread - Module Name*<br>Runway Sequencing - Improve traffic flow through sequencing (AMAN/DMAN) |
|---|---|
| | *Performance Improvement Area*<br>1: Airport Operations |
| *Summary Description*<br>To manage arrivals and departures (including time-based metering) to and from a multi-runway aerodrome or locations with multiple dependent runways at closely proximate aerodromes, to efficiently utilize the inherent runway capacity. | |
| *Operating Environment/Phases of Flight*<br>** Note: The ASBU Working Document – 2016 Edition did not provide this information.* | |
| *Applicability*<br>Runways and terminal manoeuvring area in major hubs and metropolitan areas will be most in need of these improvements.<br>The improvement is least complex – runway sequencing procedures are widely used in aerodromes globally. However some locations might have to confront environmental and operational challenges that will increase the complexity of development and implementation of technology and procedures to realize this Module. | |
| *Elements*<br>1. (Derived from 1.2.1 and Element 1) AMAN via controlled time of arrival to a reference fix<br>2. (Defined: Element 2) Departure management<br>3. (Derived from Element 2) Departure flow management<br>4. (Defined: Element 3) Point merge | |

| *Module Designation*<br>**B0-SURF**<br>Begins page 81 | *Thread - Module Name*<br>Surface Operations - Safety and efficiency of surface operations (A-SMGCS Level 1-2) and enhanced vision systems (EVS) |
|---|---|
| | *Performance Improvement Area*<br>1: Airport Operations |

*Summary Description*

First levels of advanced-surface movement guidance and control systems (A-SMGCS) provides surveillance and alerting of movements of both aircraft and vehicles at the aerodrome, thus improving runway/aerodrome safety. Automatic dependent surveillance-broadcast (ADS-B) information is used when available (ADS-B APT). Enhanced vision systems (EVS) is used for low-visibility operations.

*Operating Environment/Phases of Flight*

Aerodrome surface movements (aircraft + vehicles), taxi, push-back, parking

*Applicability*

A-SMGCS is applicable to any aerodrome and all classes of aircraft/vehicles. Implementation is to be based on requirements stemming from individual aerodrome operational and cost-benefit assessments. ADS-B APT is an element of A-SMGCS, designed to be applied at aerodromes (ICAO codes 3D and above) with medium traffic complexity, having up to two active runways at a time.

*Elements*

1. (Derived from Element 1) A-SMGCS with at least one cooperative surface surveillance system
2. (Derived from Element 1) ADS-B APT
3. (Derived from first Element 2*) A-SMGCS alerting with flight identification information
4. (Defined: second Element 2*) EVS for taxi operations
5. (Derived from 1.4.1) Airport vehicles equipped with transponders

* *Note:* *The ASBU Working Document – 2016 Edition has two separate capabilities identified as "Element 2" for this Module.*

| *Module Designation*<br>**B0-WAKE**<br>Begins page 29 | *Thread - Module Name*<br>Wake Turbulence Separation - Increased runway throughput through optimized wake turbulence separation |
|---|---|
| | *Performance Improvement Area*<br>1: Airport Operations |
| *Summary Description*<br>Improved throughput on departure and arrival runways through optimized wake turbulence separation minima, revised aircraft wake turbulence categories and procedures. | |
| *Operating Environment/Phases of Flight*<br>Arrival and departure | |
| *Applicability*<br>Least complex – Implementation of revised wake turbulence categories is mainly procedural. No changes to automation systems are needed. | |
| *Elements*<br>1. (Defined: Element 1) New PANS-ATM wake turbulence categories and separation minima<br>2. (Derived from Element 2) Dependent diagonal paired approach procedures for parallel runways with centrelines spaced less than 760 meters (2,500 feet) apart<br>3. (Derived from Element 3) Wake independent departure and arrival operations (WIDAO) for parallel runways with centrelines spaced less than 760 meters (2,500 feet) apart<br>4. (Derived from Element 3) Wake turbulence mitigation for departures (WTMD) procedures for parallel runways with centrelines spaced less than 760 meters (2,500 feet) apart based on observed crosswinds<br>5. (Identified by the United States) 6 wake turbulence categories and separation minima | |

**PIA 2: Globally Interoperable Systems and Data**

| *Module Designation*<br>**B0-AMET**<br>Begins page 179 | *Thread - Module Name*<br>Advanced MET Information - Meteorological information supporting enhanced operational efficiency and safety |
|---|---|
| | *Performance Improvement Area*<br>2: Globally Interoperable Systems and Data |

*Summary Description*

Global, regional and local meteorological information:

a) forecasts provided by world area forecast centres (WAFCs), volcanic ash advisory centres (VAACs) and tropical cyclone advisory centres (TCAC);

b) aerodrome warnings to give concise information of meteorological conditions that could adversely affect all aircraft at an aerodrome, including wind shear; and

c) SIGMETs to provide information on occurrence or expected occurrence of specific en-route weather phenomena which may affect the safety of aircraft operations and other operational meteorological (OPMET) information, including METAR/SPECI and TAF, to provide routine and special observations and forecasts of meteorological conditions occurring or expected to occur at the aerodrome.

This information supports flexible airspace management, improved situational awareness and collaborative decision-making, and dynamically-optimized flight trajectory planning. This Module includes elements which should be viewed as a subset of all available meteorological information that can be used to support enhanced operational efficiency and safety.

*Operating Environment/Phases of Flight*

All phases of flight

*Applicability*

Applicable to traffic flow planning, and to all aircraft operations in all domains and flight phases, regardless of level of aircraft equipage.

*Elements*

1. (Defined: Element 1) WAFS
2. (Defined: Element 2) IAVW
3. (Defined: Element 3) TCAC forecasts
4. (Defined: Element 4) Aerodrome warnings
5. (Defined: Element 5) Wind shear warnings and alerts
6. (Derived from Element 6) SIGMET
7. (Derived from Element 6) Other OPMET information (METAR, SPECI and/or TAF)
8. (Identified by NAT) QMS for MET

| *Module Designation*<br>**B0-DATM**<br>Begins page 155 | *Thread - Module Name*<br>Digital ATM Information - Service improvement through digital aeronautical information management |
|---|---|
| | *Performance Improvement Area*<br>2: Globally Interoperable Systems and Data |
| *Summary Description*<br>The initial introduction of digital processing and management of information from origination to publication through, aeronautical information service (AIS)/aeronautical information management (AIM) implementation, use of aeronautical exchange model (AIXM), migration to electronic aeronautical information publication (AIP) and better quality and availability of data. | |
| *Operating Environment/Phases of Flight*<br>All phases of flight | |
| *Applicability*<br>Applicable at State level with increased benefits as more States participate. States should be able to apply the most optimal exchange formats for the exchange of data as at the global level a standardized format is far more important to ensure global interoperability. | |
| *Elements*<br>1. (Derived from 1.3.1) Standardized Aeronautical Information Exchange Model (AIXM)<br>2. (Derived from 1.3.1) eAIP<br>3. (Derived from 1.2.2) Digital NOTAM<br>4. (Identified by NACC) eTOD<br>5. (Identified by NACC) WGS-84<br>6. (Identified by NACC) QMS for AIM | |

| *Module Designation*<br>**B0-FICE**<br>Begins page 131 | *Thread - Module Name*<br>FF-ICE - Increased interoperability, efficiency and capacity through ground-ground integration |
|---|---|
| | *Performance Improvement Area*<br>2: Globally Interoperable Systems and Data |
| *Summary Description*<br>To improve coordination between air traffic service units (ATSUs) by using ATS interfacility data communication (AIDC) defined by ICAO's *Manual of Air Traffic Services Data Link Applications* (Doc 9694). An additional benefit is the improved efficiency of the transfer of communication in a data link environment. | |
| *Operating Environment/Phases of Flight*<br>All flight phases and all type of ATS units | |
| *Applicability*<br>Applicable to at least two area control centres (ACCs) dealing with en-route and/or terminal control area (TMA) airspace. A greater number of consecutive participating ACCs will increase the benefits. | |
| *Elements*<br>1. (Derived from 1.1.4) AIDC to provide initial flight data to adjacent ATSUs<br>2. (Derived from 1.1.5) AIDC to update previously coordinated flight data<br>3. (Derived from 1.1.5) AIDC for control transfer<br>4. (Derived from 1.1.6) AIDC to transfer CPDLC logon information to the Next Data Authority | |

**PIA 3: Optimum Capacity and Flexible Flights**

| *Module Designation*<br>**B0-ACAS**<br>Begins page 289 | *Thread - Module Name*<br>Airborne Collision Avoidance Systems – Airborne collision avoidance systems (ACAS) improvements |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |
| *Summary Description*<br>To provide short-term improvements to existing airborne collision avoidance systems (ACAS) to reduce nuisance alerts while maintaining existing levels of safety. This will reduce trajectory deviations and increase safety in cases where there is a breakdown of separation. | |
| *Operating Environment/Phases of Flight*<br>En-route flight phases and approach flight phases | |
| *Applicability*<br>Safety and operational benefits increase with the proportion of equipped aircraft. | |
| *Elements*<br>1. (Derived from 1.2.1) ACAS II (TCAS version 7.1)<br>2. (Derived from 1.3.7 a) APFD function<br>3. (Derived from 1.3.7 b) TCAP function | |

| *Module Designation*<br>**B0-ASEP**<br>Begins page 263 | *Thread - Module Name*<br>Airborne Separation - Air traffic situational awareness (ATSA) |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |
| *Summary Description*<br>Two air traffic situational awareness (ATSA) applications which will enhance safety and efficiency by providing pilots with the means to enhance traffic situational awareness and achieve quicker visual acquisition of targets:<br>a) AIRB (basic airborne situational awareness during flight operations).<br>b) VSA (visual separation on approach). | |
| *Operating Environment/Phases of Flight*<br>En-route, terminal, approach | |
| *Applicability*<br>These are cockpit-based applications which do not require any support from the ground hence they can be used by any suitably equipped aircraft. This is dependent upon aircraft being equipped with ADS-B OUT. Avionics availability at low enough costs for GA is not yet available. | |
| *Elements*<br>1. (Defined: Element 1) ATSA-AIRB<br>2. (Defined: Element 2) ATSA-VSA | |

| *Module Designation*<br>**B0-ASUR**<br>Begins page 253 | *Thread - Module Name*<br>Alternative Surveillance - Initial capability for ground surveillance |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |
| *Summary Description*<br>To provide initial capability for lower cost ground surveillance supported by new technologies such as ADS-B OUT and wide area multilateration (MLAT) systems. This capability will be expressed in various ATM services, e.g. traffic information, search and rescue and separation provision. | |
| *Operating Environment/Phases of Flight*<br>All airborne flight phases in continental or subsets of oceanic airspace and on aerodrome surfaces | |
| *Applicability*<br>This capability is characterized by being dependent/cooperative (ADS-B OUT) and independent/cooperative (MLAT). The overall performance of ADS-B is affected by avionics performance and compliant equipage rate. | |
| *Elements*<br>1. (Defined: Element 1) ADS-B<br>2. (Defined: Element 2) Multilateration (MLAT) | |

| *Module Designation*<br>**B0-FRTO**<br>Begins page 207 | *Thread - Module Name*<br>Free-Route Operations - Improved operations through enhanced en-route trajectories |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |
| *Summary Description*<br>To allow the use of airspace which would otherwise be segregated (i.e. special use airspace) along with flexible routing adjusted for specific traffic patterns. This will allow greater routing possibilities, reducing potential congestion on trunk routes and busy crossing points, resulting in reduced flight lengths and fuel burn. | |
| *Operating Environment/Phases of Flight*<br>En-route | |
| *Applicability*<br>Applicable to en-route and terminal airspace. Benefits can start locally. The larger the size of the concerned airspace the greater the benefits, in particular for flex track aspects. Benefits accrue to individual flights and flows. Application will naturally span over a long period as traffic develops. Its features can be introduced starting with the simplest ones. | |
| *Elements*<br>1. (Derived from Element 1) CDM incorporated into airspace planning<br>2. (Defined: Element 2) Flexible Use of Airspace (FUA)<br>3. (Defined: Element 3) Flexible routing<br>4. (Derived from 1.6.4) CPDLC used to request and receive re-route clearances | |

| *Module Designation*<br>**B0-NOPS**<br>Begins page 231 | *Thread - Module Name*<br>Network Operations - Improved flow performance through planning based on a network-wide view |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |
| *Summary Description*<br>Air traffic flow management (ATFM) is used to manage the flow of traffic in a way that minimizes delays and maximizes the use of the entire airspace. Collaborative ATFM can regulate traffic flows involving departure slots, smooth flows and manage rates of entry into airspace along traffic axes, manage arrival time at waypoints or flight information region (FIR)/sector boundaries and reroute traffic to avoid saturated areas. ATFM may also be used to address system disruptions including crisis caused by human or natural phenomena. | |
| *Operating Environment/Phases of Flight*<br>Pre-flight phases, some action during actual flight | |
| *Applicability*<br>Region or sub-region. | |
| *Elements*<br>1. (Derived from 1.3.1) Sharing prediction of traffic load for next day<br>2. (Derived from 1.3.1) Proposing alternative routings to avoid or minimize ATFM delays | |

| *Module Designation*<br>**B0-OPFL**<br>Begins page 282 | *Thread - Module Name*<br>Optimum Flight Levels - Improved access to optimum flight levels through Climb/descent procedures using ADS-B |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |
| *Summary Description*<br>To enable aircraft to reach a more satisfactory flight level for flight efficiency or to avoid turbulence for safety. The main benefit of ITP is fuel/emissions savings and the uplift of greater payloads. | |
| *Operating Environment/Phases of Flight*<br>En-route | |
| *Applicability*<br>This can be applied to routes in procedural airspaces. | |
| *Elements*<br>1. (Derived from 1.2.1) ITP using ADS-B | |

| *Module Designation*<br>**B0-SNET**<br>Begins page 303 | *Thread - Module Name*<br>Safety Nets - Increased effectiveness of ground-based safety nets |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |
| *Summary Description*<br>To enable monitoring of flights while airborne to provide timely alerts to air traffic controllers of potential risks to flight safety. Alerts from short-term conflict alert (STCA), area proximity warnings (APW) and minimum safe altitude warnings (MSAW) are proposed. Ground-based safety nets make an essential contribution to safety and remain required as long as the operational concept remains human centred. | |
| *Operating Environment/Phases of Flight*<br>All airborne flight phases | |
| *Applicability*<br>Benefits increase as traffic density and complexity increase. Not all ground-based safety nets are relevant for each environment. Deployment of this Module should be accelerated. | |
| *Elements*<br>1. (Defined: Element 1) Short Term Conflict Alert (STCA)<br>2. (Defined: Element 2) Area Proximity Warning (APW)<br>3. (Defined: Element 3) Minimum Safe Altitude Warning (MSAW)<br>4. (Identified by NACC) Medium Term Conflict Alert (MTCA) | |

**PIA 4: Efficient Flight Paths**

| *Module Designation*<br>**B0-CCO**<br>Begins page 359 | *Thread - Module Name*<br>Continuous Climb Operations - Improved flexibility and efficiency departure profiles - continuous climb operations (CCO) |
|---|---|
| | *Performance Improvement Area*<br>4: Efficient Flight Paths |
| *Summary Description*<br>To implement continuous climb operations in conjunction with performance-based navigation (PBN) to provide opportunities to optimize throughput, improve flexibility, enable fuel-efficient climb profiles, and increase capacity at congested terminal areas. The application of PBN enhances CCO.<br>*Note: The GANP refers to "CDO"; however this appears to be an editorial error, which has been corrected in this Handbook.* | |
| *Operating Environment/Phases of Flight*<br>Departure and en-route | |
| *Applicability*<br>Applicable to all aerodromes but for simplicity and implementation success, complexity can be divided into three tiers:<br>a) least complex – regional/States/locations with some foundational operational experience that could capitalize on near-term enhancements, which include integrating procedures and optimizing performance.<br>b) more complex – regional/State/locations that may or may not possess operational experience, but would benefit from introducing new or enhanced procedures. However, many of these locations may have environmental and operational challenges that will add to the complexities of procedure development and implementation; and<br>c) most complex – regional/State/locations where introducing integrated and optimized operations will be the most challenging and complex. Traffic volume and airspace constraints are added complexities that must be confronted. Operational changes to these areas can have a profound effect on the entire State, region or location. | |
| *Elements*<br>1. (Derived from 1.4.3) Procedure changes to facilitate CCO<br>2. (Derived from 1.4.3) Airspace changes to facilitate CCO<br>3. (Derived from 1.1.1) PBN SIDs | |

| *Module Designation*<br>**B0-CDO**<br>Begins page 313 | *Thread - Module Name*<br>Continuous Descent Operations - Improved flexibility and efficiency in descent profiles using continuous descent operations (CDOs) |
|---|---|
| | *Performance Improvement Area*<br>4: Efficient Flight Paths |
| *Summary Description*<br>To use performance-based airspace and arrival procedures allowing aircraft to fly its optimum profile using continuous descent operations (CDOs). This will optimize throughput, allow fuel efficient descent profiles, and increase capacity in terminal areas. The application of PBN enhances CDO. | |
| *Operating Environment/Phases of Flight*<br>Approach/arrivals and en-route | |
| *Applicability*<br>Applicable to all aerodromes but for simplicity and implementation success, complexity can be divided into three tiers:<br>a) least complex – regional/States/locations with some foundational operational experience that could capitalize on near-term enhancements, which include integrating procedures and optimizing performance;<br>b) more complex – regional/State/locations that may or may not possess operational experience, but would benefit from introducing new or enhanced procedures. However, many of these locations may have environmental and operational challenges that will add to the complexities of procedure development and implementation.<br>c) most complex – regional/State/locations where introducing integrated and optimized operations will be the most challenging and complex . Traffic volume and airspace constraints are added complexities that must be confronted. Operational changes to these areas can have a profound effect on the entire State, region or location. | |
| *Elements*<br>1. (Derived from Element 1) Procedure changes to facilitate CDO<br>2. (Derived from Element 1) Airspace changes to facilitate CDO<br>3. (Derived from 1.1.1) PBN STARs | |

| *Module Designation*<br>**B0-TBO**<br>Begins page 333 | *Thread - Module Name*<br>Trajectory-Based Operations - Improved safety and efficiency through the initial application of data Link and SATVOICE en-route |
|---|---|
| | *Performance Improvement Area*<br>4: Efficient Flight Paths |
| *Summary Description*<br>To implement a set of data link applications supporting surveillance and communications in air traffic services, which will lead to flexible routing, reduced separation and improved safety. | |
| *Operating Environment/Phases of Flight*<br>En-route flight phases, including areas where ATS surveillance systems (PSR, SSR, ADS-B, etc) cannot be installed such as remote or oceanic airspace | |
| *Applicability*<br>Applicable to the airspace where ATS surveillance is not available and/or VHF voice frequencies are scarce. Requires coordinated airborne and ground deployment to ensure that services are provided by the ground to a minimum proportion of flights suitably equipped. | |
| *Elements*<br>1. (Defined: Element 1) ADS-C over oceanic and remote areas<br>2. (Derived from Element 2) CPDLC over continental areas<br>3. (Derived from Element 2) CPDLC over oceanic and remote areas<br>4. (Derived from 1.6) SATVOICE direct controller-pilot communication (DCPC) | |

# Block 1 – Available for implementation in 2019

**PIA 1: Airport Operations**

| *Module Designation*<br>**B1-ACDM**<br>Begin page 112 | *Thread - Module Name*<br>Airport Collaborative Decision-Making - Optimized airport operations through A-CDM total airport management |
|---|---|
| | *Performance Improvement Area*<br>1: Airport Operations |
| *Summary Description*<br>To enhance the planning and management of airport operations and allows their full integration in air traffic management using performance targets compliant with those of the surrounding airspace. This entails implementing collaborative airport operations planning (AOP) and where needed, an airport operations centre (APOC). | |
| *Operating Environment/Phases of Flight*<br>Surface in, turn around, surface out | |
| *Applicability*<br>AOP: for use at all the airports (sophistication will depend on the complexity of the operations and their impact on the network).<br>APOC: will be implemented at major/complex airports (sophistication will depend on the complexity of the operations and their impact on the network).<br>Not applicable to aircraft. | |
| *Elements*<br>1. (Derived from 1.3.1 a) Airport Operations Plan (AOP) which encompasses local airport information and information that is shared with the ATM system/ATM network manager<br>2. (Derived from 1.3.1 b) Airport performance framework integrated into AOP<br>3. (Derived from 1.3.1 b) Airport performance framework aligned with regional/national performance framework(s)<br>4. (Derived from 1.3.1 c) Decision making support to facilitate communication and coordination between airport stakeholders for joint planning<br>5. (Derived from 1.3.1 d) Accessible information on airport resource availability and planned aircraft operations for use by airport operators and ATM system/network managers<br>6. (Derived from 1.3.1 e) Real time monitoring and alerting to activate collaborative airside/landside airport operations to respond to specific conditions/events | |

| *Module Designation*<br>**B1-APTA**<br>Begins on page 21 | *Thread - Module Name*<br>Airport Accessibility - Optimized airport accessibility |
|---|---|
| | *Performance Improvement Area*<br>1: Airport Operations |
| *Summary Description*<br>To progress further with the universal implementation of performance-based navigation (PBN) approaches. PBN and ground-based augmentation system (GBAS) landing system (GLS) approaches. GLS (CAT II/III) procedures to enhance the reliability and predictability of approaches to runways, increasing safety, accessibility and efficiency. | |
| *Operating Environment/Phases of Flight*<br>Approach and landing. | |
| *Applicability*<br>This Module is applicable to all runway ends. | |
| *Elements*<br>1. (Derived from 1.3.1) CAT II PBN approach procedures<br>2. (Derived from 1.3.1) CAT III PBN approach procedures<br>3. (Derived from 1.3.1) CAT II GLS approach procedures<br>4. (Derived from 1.3.1) CAT III GLS approach procedures<br>5. (Derived from 1.3.1) PBN STARs directly integrated to approaches with vertical guidance | |

| *Module Designation*<br>**B1-RATS**<br>Begins on page 119 | *Thread - Module Name*<br>Remote ATS - Remotely operated aerodrome control |
|---|---|
| | *Performance Improvement Area*<br>1: Airport Operations |
| *Summary Description*<br>To provides a safe and cost-effective air traffic services (ATS) from a remote facility to one or more aerodromes where dedicated, local ATS are no longer sustainable or cost-effective, but there is a local economic and social benefit from aviation. This can also be applied to contingency situations and depends on enhanced situational awareness of the aerodrome under remote control. | |
| *Operating Environment/Phases of Flight*<br>TMA, descent, airport surface, climb out | |
| *Applicability*<br>The main target for the single and multiple remote tower services are small rural airports, which today are struggling with low business margins. Both ATC and AFIS aerodromes are expected to benefit.<br>The main targets for the contingency tower solution are medium to large airports – those that are large enough to require a contingency solution, but who require an alternative to A-SMGCS-based "heads down" solutions or where maintaining a visual view is required.<br>Although some cost benefits are possible with remote provision of ATS to a single aerodrome, maximum benefit is expected with the remote provision of ATS to multiple aerodromes. | |
| *Elements*<br>1. (Derived from Element 1) Provision of tower control (TWR) for single aerodrome(s) by remotely located air traffic controllers (ATCO)<br>2. (Derived from Element 1) Provision of aerodrome flight information service (AFIS) for single aerodrome(s) by remotely located aerodrome flight information service officers (AFISO)<br>3. (Derived from Element 2) Provision of TWR for multiple aerodromes by a single ATCO<br>4. (Derived from Element 2) Provision of AFIS for multiple aerodromes by a single AFISO<br>5. (Defined: Element 3) Remote provision of ATS for contingency situations | |

| *Module Designation*<br>**B1-RSEQ**<br>Begins on page 59 | *Thread - Module Name*<br>Runway Sequencing - Improved airport operations through departure, surface and arrival Management |
|---|---|
| | *Performance Improvement Area*<br>1: Airport Operations |
| *Summary Description*<br>Extension of arrival metering and integration of surface management with departure sequencing will improve runway management and increase airport performance and flight efficiency. | |
| *Operating Environment/Phases of Flight*<br>Aerodrome and terminal | |
| *Applicability*<br>Runways and terminal manoeuvring areas in major hubs and metropolitan areas will be most in need of these improvements. Complexity in implementation of this Module depends on several factors. Some locations might have to confront environmental and operational challenges that will increase the complexity of development and implementation of technology and procedures to realize this Module. Performance-based navigation (PBN) routes need to be in place. | |
| *Elements*<br>1. (Derived from Element 1 and 4.1.1) Surface management of runway demand and sequencing aircraft on the ground to support departure operations based on precise surface movement tracking<br>2. (Derived from Element 2) Integration of departure sequencing and surface management<br>3. (Derived from Element 3) Arrival metering extended across FIR boundaries<br>4. (Derived from Element 4) Assignment of RNAV/RNP procedures to support controlled time of arrival at metering fixes | |

| *Module Designation*<br>**B1-SURF**<br>Begins on page 89 | *Thread - Module Name*<br>Surface Operations - Enhanced safety and efficiency of surface operations-SURF |
|---|---|
| | *Performance Improvement Area*<br>1: Airport Operations |
| *Summary Description*<br>To provide enhancements for surface situational awareness, including both cockpit and ground elements, in the interest of runway and taxiway safety, and surface movement efficiency. Cockpit improvements including the use of surface moving maps with traffic information (SURF) for flight crew traffic situational awareness on the taxiways and on the runway. | |
| *Operating Environment/Phases of Flight*<br>Aerodrome operations | |
| *Applicability*<br>SURF has been designed to be applicable to larger aerodromes (ICAO codes 3 and 4) and all classes of aircraft. Cockpit capabilities work independently of ground infrastructure, however additional ground surveillance capability will improve the availability of the service. Applicability to aerodrome types other than ICAO code 3 and 4 has to be validated. | |
| *Elements*<br>1. (Derived from Element 1) Basic surface situation awareness (SURF) through display of other aerodrome traffic to aircraft via ADS-B or TIS-B<br>2. (Derived from 3.4) SURF for airport vehicles | |

| *Module Designation*<br>**B1-WAKE**<br>Begins on page 37 | *Thread - Module Name*<br>Wake Turbulence Separation - Increased runway throughput through dynamic wake turbulence separation |
|---|---|
| | *Performance Improvement Area*<br>1: Airport Operations |
| *Summary Description*<br>Improved throughput on departure and arrival runways through the dynamic management of wake turbulence separation minima based on the real-time identification of wake turbulence hazards. | |
| *Operating Environment/Phases of Flight*<br>Aerodrome | |
| *Applicability*<br>Least complex – implementation of re-categorized wake turbulence is mainly procedural. No changes to automation systems are needed. | |
| *Elements*<br>1. (Defined: Element 1) Implement leader/follower pair-wise static matrix wake turbulence separation minima.<br>2. (Derived from Element 2 and 1.6.3) Wake Turbulence Mitigation for Arrivals (WTMA) on parallel runways with runway centre lines spaced less than 760 m (2 500 feet) apart<br>3. (Derived from Element 2 and 1.6.3) WTMA on a single runway<br>4. (Derived from Element 3) WTMD on parallel runways with runway centre lines spaced less than 760 m (2 500 feet) based on aircraft-derived wind information | |

**PIA 2: Globally Interoperable Systems and Data**

| *Module Designation*<br>**B1-AMET**<br>Begins on page 189 | *Thread - Module Name*<br>Advanced MET Information - Enhanced operational decisions through integrated meteorological information (planning and near-term service) |
|---|---|
| | *Performance Improvement Area*<br>2: Globally Interoperable Systems and Data |

*Summary*

To enable the reliable identification of solutions when forecast or observed meteorological conditions impact aerodromes, airspace or operations in general. Full ATM-Meteorology integration is needed to ensure that meteorological information is included in the logic of a decision process and the impact of the meteorological conditions are automatically derived, understood and taken into account. The supported decision time-horizons range from minutes, to several hours or days ahead of the ATM operation. This includes optimum flight profile planning and execution, and support to tactical in-flight avoidance of hazardous meteorological conditions (improved in-flight situational awareness) to typical near-term and planning (>20 minutes) type of decision making. This Module promotes the establishment of Standards for global exchange of the MET information closely aligned with other data domains and adhering to a single reference (ICAO-AIRM). It also promotes the further enhancement of meteorological information on various quality-of-service aspects including the accuracy and consistency of the data when used in inter-linked operational decision making processes.

Appreciating that the number of flights operating on cross-polar and trans-polar routes continues to steadily grow and recognizing that space weather affecting the earth's surface or atmosphere (such as solar radiation storms) pose a hazard to communications and navigation systems and may also pose a radiation risk to flight crew members and passengers, this Module acknowledges the need for space weather information services in support of safe and efficient international air navigation.

This Module builds, in particular, upon Module B0-AMET, which detailed a sub-set of all available meteorological information that can be used to support enhanced operational efficiency and safety.

*Operating Environment/Phases of Flight*

All flight phases

*Applicability*

Applicable to traffic flow planning, and to all aircraft operations in all domains and flight phases, regardless of level of aircraft equipage.

*Elements*

1. (Derived from Element 1) Data designated as authoritative meteorological information
2. (Derived from Element 2) Automated processing of meteorological information to derive predicted effects on airspace capacity
3. (Derived from Element 2) Automated processing of meteorological information to derive predicted effects on aerodrome capacity
4. (Derived from Element 3) ATM Impact Conversion for airspace
5. (Derived from Element 3) ATM Impact Conversion for aerodrome(s)
6. (Derived from Element 4) Meteorological information integrated decision support that creates ranked mitigation strategies based on collaboratively agreed rules

| *Module Designation*<br>**B1-DATM**<br>Begins on page 161 | *Thread - Module Name*<br>Digital ATM Information - Service improvement through integration of all digital ATM information |
|---|---|
| | *Performance Improvement Area*<br>2: Globally Interoperable Systems and Data |
| *Summary Description*<br>This Module addresses the need for increased information integration and will support a new concept of ATM information exchange fostering access via internet-protocol-based tools. This includes the cross-exchange of common elements with the initial introduction of the ATM Information Reference Model (AIRM), which integrates and consolidates all ATM information in a transversal way. Exchange models such as AIXM, FIXM (for flight and flow information; and aircraft performance-related data), IWXXM (for meteorological information) and others relate their concepts to the AIRM fostering convergence, re-use, and collaborative alignment. | |
| *Operating Environment/Phases of Flight*<br>All phases of flight | |
| *Applicability*<br>Applicable at the State level, with increased benefits as more States participate. | |
| *Elements*<br>1. (Derived from 1.1.1) Initial introduction of AIRM<br>2. (Derived from 1.1.1) Implementation of IWXXM for digital management of meteorological information<br>3. (Derived from 1.1.1) Implementation of FIXM for digital management of flight and flow information<br>4. (Derived from 1.1.1) Implementation of FIXM for digital management of aircraft performance-related data | |

| *Module Designation*<br>**B1-FICE**<br>Begins on page 137 | *Thread - Module Name*<br>FF-ICE - Increased interoperability, efficiency and capacity though FF-ICE, Step 1 application before departure |
|---|---|
| | *Performance Improvement Area*<br>2: Globally Interoperable Systems and Data |
| *Summary Description*<br>To introduce FF-ICE, Step 1 providing ground-ground exchanges before departure using a common flight information reference model (FIXM) and extensible markup language (XML) standard formats. FIXM, pre-requisite to trajectory-based operations, will allow richer content exchange with the goal to better support user needs. | |
| *Operating Environment/Phases of Flight*<br>Planning phase for FF-ICE, Step 1 | |
| *Applicability*<br>Applicable between ATS units, airspace users and airport operators to facilitate exchange of flight information where the need arises for content richer than what the current flight plan format can provide. | |
| *Elements*<br>1. (Derived from 1.3.3 a) Allocation and use of globally unique flight identifiers (GUFI)<br>2. (Derived from 1.3.3 b) Use of FIXM<br>3. (Derived from 1.3.5 c) Implementation of submission and maintenance procedures for FF-ICE information elements<br>4. (Derived from 1.3.3 d) Use of planning elements not included in FPL 2012 for trajectory description<br>5. (Derived from 1.3.3 e) Use of trajectory planning elements for negotiation | |

| *Module Designation*<br>**B1-SWIM**<br>Begins on page 167 | *Thread - Module Name*<br>System-Wide Information Management - Performance improvement through the application of system-wide information management (SWIM) |
|---|---|
| | *Performance Improvement Area*<br>2: Globally Interoperable Systems and Data |
| *Summary Description*<br>Implementation of system-wide information management (SWIM) services (applications and infrastructure) creating the aviation intranet based on standard data models and internet-based protocols to maximize interoperability. | |
| *Operating Environment/Phases of Flight*<br>All phases of flight | |
| *Applicability*<br>Applicable at State level, with increased benefits as more States participate. | |
| *Elements*<br>1. (Derived from 1.1.5 a) Implementation of structure/protocols for sharing information within communities of interest for ground-ground data exchanges | |

**PIA 3: Optimum Capacity and Flexible Flights**

| *Module Designation*<br>**B1-ASEP**<br>Begins on page 269 | *Thread - Module Name*<br>Airborne Separation - Increased capacity and efficiency through interval management |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |
| *Summary Description*<br>Interval management improves the organization of traffic flows and aircraft spacing. Precise management of intervals between aircraft with common or merging trajectories, maximize airspace throughput while reducing ATC workload along with more efficient aircraft fuel burn reducing environmental impact. | |
| *Operating Environment/Phases of Flight*<br>En-route, arrival, approach, departure. | |
| *Applicability*<br>En-route and terminal areas | |
| *Elements*<br>1. (Derived from 1.3.1 and 1.3.2) Implementation of interval management between aircraft in cruise<br>2. (Derived from 1.3.1 and 1.3.2) Implementation of interval management between aircraft in descent<br>3. (Derived from 1.3.1 and 1.3.2) Implementation of interval management between aircraft on approach<br>4. (Derived from 1.3.1 and 1.3.2) Implementation of interval management between departing aircraft | |

| *Module Designation*<br>**B1-FRTO**<br>Begins on page 221 | *Thread - Module Name*<br>Free-Route Operations - Improved operations through optimized ATS routing |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |

*Summary Description*

To provide, through performance-based navigation (PBN), closer and consistent route spacing, curved approaches, parallel offsets and the reduction of holding area size. This will allow the sectorization of airspace to be adjusted more dynamically. This will reduce potential congestion on trunk routes and busy crossing points and reduce controller workload. The main goal is to allow flight plans to be filed with a significant part of the intended route specified by the user-preferred profile. Maximum freedom will be granted within the limits posed by the other traffic flows. The overall benefits are reduced fuel burn and emissions.

*Operating Environment/Phases of Flight*

En-route, including oceanic and remote areas and TMA

*Applicability*

Region or sub-region: the geographical extent of the airspace of application should be large enough; significant benefits arise when the dynamic routes can apply across flight information region (FIR) boundaries rather than imposing traffic to cross boundaries at fixed predefined points.

*Elements*

1. (Defined: Element 1) Free routing
2. (Derived from Element 2) Maintaining same PBN route spacing between straight and turning segments
3. (Derived from Element 2) Publishing PBN holding procedures
4. (Derived from Element 2) Use of tactical PBN-based parallel offset procedures
5. (Derived from Element 3) Curved PBN approaches
6. (Derived from Element 3) Dynamic sectorization using pre-defined airspace volumes

| *Module Designation*<br>**B1-NOPS**<br>Begins on page 236 | *Thread - Module Name*<br>Network Operations - Enhanced flow performance through network operational planning |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |
| *Summary Description*<br>To introduce enhanced processes to manage flows or groups of flights in order to improve overall flow. The resulting increased collaboration among stakeholders in real-time, regarding user preferences and system capabilities will result in better use of airspace with positive effects on the overall cost of ATM. | |
| *Operating Environment/Phases of Flight*<br>Mainly applicable to pre-flight phases, with some application in flight | |
| *Applicability*<br>Region or sub-region for most applications; specific airports in case of initial user-driven prioritization process (UDPP). This Module is more particularly needed in areas with the highest traffic density. However, the techniques it contains would also be of benefit to areas with less traffic, subject to the business case. | |
| *Elements*<br>1. (Derived from Element 1) Implementation of improved ATFM algorithms and techniques<br>2. (Derived from Element 1) Integrating ATFM and Airspace Organization and Management (AOM)<br>3. (Derived from Element 2) Using trajectory projections after departure to update ATFM requirements and perform additional ATFM smoothing<br>4. (Derived from Element 3) User Driven Prioritization Process (UDPP) for ATFM collaborative decision making for single airports<br>5. (Defined: Element 4) Full flexible use of airspace (FUA)<br>6. (Derived from Element 5) Use of ATM complexity and workload assessment tools to support ATFM decision making | |

| *Module Designation*<br>**B1-SNET**<br>Begins on page 307 | *Thread - Module Name*<br>Safety Nets - Ground-based safety nets on approach |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |
| *Summary Description*<br>to enhance safety by reducing the risk of controlled flight into terrain accidents on final approach and the risk of unstable approach through the use of approach path monitor (APM). APM warns the controller of increased risk of controlled flight into terrain during final approaches or of an approach path above nominal that could lead to unstable approaches. The major benefit is a significant reduction of the number of major incidents. | |
| *Operating Environment/Phases of Flight*<br>Approach | |
| *Applicability*<br>This Module will increase safety benefits during final approach particularly where terrain or obstacles represent safety hazards. Benefits increase as traffic density and complexity increase. | |
| *Elements*<br>1. (Derived from 1.3.1) Implementation of Approach Path Monitor (APM)to generate alerts to ATCOs if aircraft is not remaining in its approach envelope | |

**PIA 4: Efficient Flight Paths**

| *Module Designation*<br>**B1-CDO**<br>Begins on page 321 | *Thread - Module Name*<br>Continuous Descent Operations - Improved flexibility and efficiency in descent profiles (CDOs) using VNAV |
|---|---|
| | *Performance Improvement Area*<br>4: Efficient Flight Paths |
| *Summary Description*<br>To enhance vertical flight path precision during descent, arrival, and to enable aircraft to fly an arrival procedure not reliant on ground-based equipment for vertical guidance. The main benefit is higher utilization of airports, improved fuel efficiency, increased safety through improved flight predictability and reduced radio transmission, and better utilization of airspace. | |
| *Operating Environment/Phases of Flight*<br>Descent, arrival, flight in terminal area | |
| *Applicability*<br>Descent, arrival, flight in terminal area. | |
| *Elements*<br>1. (Derived from 1.1.1) CDO procedures using VNAV | |

| *Module Designation*<br>**B1-RPAS**<br>Begins on page 369 | *Thread - Module Name*<br>Remotely Piloted Aircraft Systems - Initial integration of remotely piloted aircraft (RPA) into non-segregated airspace |
|---|---|
| | *Performance Improvement Area*<br>4: Efficient Flight Paths |
| *Summary Description*<br>Implementation of basic procedures for operating remotely piloted aircraft (RPA) in non-segregated airspace. | |
| *Operating Environment/Phases of Flight*<br>En-route, oceanic, terminal (arrival and departure), aerodrome (taxi, takeoff and landing) | |
| *Applicability*<br>Applies to all RPA operating in non-segregated airspace and at aerodromes. Requires good synchronization of airborne and ground deployment to generate significant benefits, in particular to those able to meet minimum certification and equipment requirements. | |
| *Elements*<br>1. (Derived from 1.3.1 a) Implementation of a process for RPA to access non-segregated airspace<br>2. (Derived from 1.3.1 b) RPA airworthiness certification<br>3. (Derived from 1.3.1 c) RPA operator certification<br>4. (Derived from 1.3.1 d) Communication performance requirements to support Command and Control (C2) links<br>5. (Derived from 1.3.1 d) Communication performance requirements to support ATC communications in relation to RPA operations<br>6. (Derived from 1.3.1 e) Remote pilot licencing requirements<br>7. (Derived from 1.3.1 f) Detect and avoid performance requirements | |

| *Module Designation*<br>**B1-TBO**<br>Begins on page 341 | *Thread - Module Name*<br>Trajectory-Based Operations - Improved traffic synchronization and initial trajectory-based operation |
|---|---|
| | *Performance Improvement Area*<br>4: Efficient Flight Paths |
| *Summary*<br>To improve the synchronization of traffic flows at en-route merging points and to optimize the approach sequence through the use of 4DTRAD capability and airport applications, e.g. D-TAXI. | |
| *Operating Environment/Phases of Flight*<br>All flight phases | |
| *Applicability*<br>Requires good synchronization of airborne and ground deployment to ensure that services are provided by the ground to a minimum proportion of flights suitably equipped. | |
| *Elements*<br>1. (Derived from 1.3.1) Ability to download trajectory information via air-ground data link<br>2. (Derived from 1.3.1) Ability to exchange complex route clearances via ground-ground data link from one ANSP to another<br>3. (Derived from 1.3.1) Ability to exchange complex route clearances via ground-ground data link across multiple airspace boundaries<br>4. (Derived from Element 1) Using Required Time of Arrival (RTA) in FMS<br>5. (Defined: Element 2) Data Link Operational Terminal Information Service (D-OTIS)<br>6. (Derived from Element 3) Departure clearances via data link (DCL)<br>7. (Defined: Element 4) Data Link Taxi (D-TAXI) | |

# Block 2 – Available for implementation in 2025

**PIA 1: Airport Operations**

| *Module Designation*<br>**B2-RSEQ**<br>Begins page 68 | *Thread - Module Name*<br>Runway Sequencing - Linked arrival management and departure management (AMAN/DMAN) |
|---|---|
| | *Performance Improvement Area*<br>1: Airport Operations |
| *Summary Description*<br>Integrated AMAN/DMAN to enable dynamic scheduling and runway configuration to better accommodate arrival/departure patterns and integrate arrival and departure management. This Module also summarizes the benefits of such integration and the elements that facilitate it. | |
| *Operating Environment/Phases of Flight*<br>Aerodrome and terminal | |
| *Applicability*<br>Runways and terminal manoeuvring area in major hubs and metropolitan areas will be most in need of these improvements. The implementation of this Module is least complex. Some locations might have to confront environmental and operational challenges that will increase the complexity of development and implementation technology and procedures to realize this Block. Infrastructure for RNAV/RNP routes need to be in place. | |
| *Elements*<br>1. TBD | |

| *Module Designation*<br>**B2-SURF**<br>Begins page 94 | *Thread - Module Name*<br>Surface Operations - Optimized surface routing and safety benefits (A-SMGCS Level 3-4 and SVS) and enhanced safety and efficiency of surface operations (SURF-1A) |
|---|---|
| | *Performance Improvement Area*<br>1: Airport Operations |
| *Summary Description*<br>To improve efficiency and reduce the environmental impact of surface operations, even during periods of low visibility. Queuing for departure runways is reduced to the minimum necessary to optimize runway use and taxi times are also reduced. Operations will be improved so that low visibility conditions have only a minor effect on surface movement. This module also provides runway safety alerting logic (SURF-1A). | |
| *Operating Environment/Phases of Flight*<br>Aerodrome | |
| *Applicability*<br>Most applicable to large aerodromes with high demand, as the Upgrades address issues surrounding queuing and management and complex aerodrome operations. For SURF-1A, applicable to ICAO codes 3 and 4 aerodromes and all classes of aircraft; cockpit capabilities work independently of ground infrastructure. | |
| *Elements*<br>1. (Defined: Element 1) Initial surface traffic management (A-SMGCS Level 3)<br>2. (Defined: Element 2) Enhanced surface traffic management (A-SMGCS Level 4)<br>3. (Derived from Element 3) Implementation of synthetic vision systems for flight crews<br>4. (Defined: Element 4) Enhanced traffic situational awareness on the surface of airport with indications and alerts (SURF-1A) | |

| *Module Designation*<br>**B2-WAKE**<br>Begins page 44 | *Thread - Module Name*<br>Wake Turbulence Separation - Advanced wake turbulence separation (time-based) |
|---|---|
| | *Performance Improvement Area*<br>1: Airport Operations |
| *Summary Description*<br>The application of time-based aircraft-to-aircraft wake separation minima and changes to the procedures the ANSP uses to apply wake separation minima. | |
| *Operating Environment/Phases of Flight*<br>Aerodrome | |
| *Applicability*<br>Most complex – establishment of time-based separation criteria between pairs of aircraft extends the existing variable distance re-categorization of existing wake turbulence into a conditions-specific time-based interval. This will optimize the inter-operation wait time to the minimum required for wake disassociation and runway occupancy. Runway throughput is increased as a result. | |
| *Elements*<br>1. TBD | |

**PIA 2: Globally Interoperable Systems and Data**

| *Module Designation*<br>**B2-FICE**<br>Begins page 142 | *Thread - Module Name*<br>FF-ICE - Improved coordination through multi-centre ground-ground Integration (FF ICE, Step 1 and flight object, SWIM) including execution phase |
|---|---|
| | *Performance Improvement Area*<br>2: Globally Interoperable Systems and Data |
| *Summary Description*<br>FF-ICE supporting trajectory-based operations through exchange and distribution of information for multi-centre operations using flight object implementation and interoperability (IOP) standards. Extension of use of FF-ICE after departure, supporting trajectory-based operations. New system interoperability SARPs to support the sharing of ATM services involving more than two air traffic service units (ATSUs). | |
| *Operating Environment/Phases of Flight*<br>All flight phases and all types of ground stakeholders | |
| *Applicability*<br>Applicable to all ground stakeholders (ATS, airports, airspace users) in homogeneous areas, potentially global. | |
| *Elements*<br>1. TBD | |

| *Module Designation*<br>**B2-SWIM**<br>Begins page 173 | *Thread - Module Name*<br>System-Wide Information Management - Enabling airborne participation in collaborative ATM through SWIM |
|---|---|
| | *Performance Improvement Area*<br>2: Globally Interoperable Systems and Data |
| *Summary Description*<br>This allows the aircraft to be fully connected as an information node in SWIM, enabling full participation in collaborative ATM processes with exchange of data including meteorology. This will start with non-safety critical exchanges supported by commercial data links. | |
| *Operating Environment/Phases of Flight*<br>All phases of flight | |
| *Applicability*<br>Long-term evolution potentially applicable to all environments. | |
| *Elements*<br>1. TBD | |

**PIA 3: Optimum Capacity and Flexible Flights**

| *Module Designation*<br>**B2-ACAS**<br>Begins page 285 | *Thread - Module Name*<br>Airborne Collision Avoidance Systems - New collision avoidance system |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |
| *Summary Description*<br>Implementation of the airborne collision avoidance system (ACAS) adapted to trajectory-based operations with improved surveillance function supported by ADS-B and adaptive collision avoidance logic aiming at reducing nuisance alerts and minimizing deviations.<br>The implementation of a new airborne collision warning system will enable more efficient operations and future airspace procedures while complying with safety regulations. The new system will accurately discriminate between necessary alerts and "nuisance alerts". This improved differentiation will lead to a reduction in controller workload as personnel will spend less time to respond to "nuisance alerts". This will result in a reduction in the probability of a near mid-air collision. | |
| *Operating Environment/Phases of Flight*<br>All airspaces | |
| *Applicability*<br>Global, high density airspace (based on the United States FAA procedures). | |
| *Elements*<br>1. TBD | |

| *Module Designation*<br>**B2-ASEP**<br>Begins page 275 | *Thread - Module Name*<br>Airborne Separation - Airborne separation (ASEP) |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |
| *Summary Description*<br>Creation of operational benefits through temporary delegation of responsibility to the flight deck for separation provision with suitably equipped designated aircraft, thus reducing the need for conflict resolution clearances while reducing ATC workload and enabling more efficient flight profiles. The flight crew ensures separation from suitably equipped designated aircraft as communicated in new clearances, which relieve the controller of the responsibility for separation between these aircraft. However, the controller retains responsibility for separation from aircraft that are not part of these clearances. | |
| *Operating Environment/Phases of Flight*<br>En-route phase, oceanic, and approach, departure and arrival | |
| *Applicability*<br>The safety case needs to be carefully done and the impact on capacity is still to be assessed in case of delegation of separation for a particular situation implying new regulation on airborne equipment and equipage roles and responsibilities (new procedure and training). First applications of ASEP are envisaged in Oceanic airspace and in approach for closely-spaced parallel runways. | |
| *Elements*<br>1. TBD | |

| *Module Designation*<br>**B2-NOPS**<br>Begins page 243 | *Thread - Module Name*<br>Network Operations - Increased user involvement in the dynamic utilization of the network |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |
| *Summary Description*<br>CDM applications supported by SWIM that permit airspace users to manage competition and prioritization of complex ATFM solutions when the network or its nodes (airports, sector) no longer provide capacity commensurate with user demands. This further develops the CDM applications by which ATM will be able to offer/delegate to the users the optimization of solutions to flow problems. Benefits include an improvement in the use of available capacity and optimized airline operations in degraded situations. | |
| *Operating Environment/Phases of Flight*<br>Pre-flight phases | |
| *Applicability*<br>Region or subregion. | |
| *Elements*<br>1. TBD | |

**PIA 4: Efficient Flight Paths**

| *Module Designation*<br>**B2-CDO**<br>Begins page 325 | *Thread - Module Name*<br>Continuous Descent Operations - Improved flexibility and efficiency in descent profiles (CDOs) using VNAV, required speed and time at arrival |
|---|---|
| | *Performance Improvement Area*<br>4: Efficient Flight Paths |
| *Summary Description*<br>A key emphasis is on the use of arrival procedures that allow the aircraft to apply little or no throttle in areas where traffic levels would otherwise prohibit this operation. This Block will consider airspace complexity, air traffic workload, and procedure design to enable optimized arrivals in dense airspace. | |
| *Operating Environment/Phases of Flight*<br>En-route, terminal area, descent | |
| *Applicability*<br>Global, high-density airspace (based on the United States FAA procedures). | |
| *Elements*<br>1. (Defined: Element 1) Accurate trajectory modelling<br>2. (Derived from Element 2) Aircraft capability to fly point-to-point RNAV and RNP procedures and to self-separate as per B2-ASEP<br>3. (Derived from Element 3) Continuous ATFM prediction updates integrated with time-based metering | |

| *Module Designation*<br>**B2-RPAS**<br>Begins page 377 | *Thread - Module Name*<br>Remotely Piloted Aircraft Systems - Remotely piloted aircraft (RPA) integration in traffic |
|---|---|
| | *Performance Improvement Area*<br>4: Efficient Flight Paths |
| *Summary Description*<br>Continuing to improve the remotely piloted aircraft (RPA) access to non-segregated airspace; continuing to improve the remotely piloted aircraft system (RPAS) approval/certification process; continuing to define and refine the RPAS operational procedures; continuing to refine communication performance requirements; standardizing the lost command and control (C2) link procedures and agreeing on a unique squawk code for lost link; and working on detect and avoid technologies, to include automatic dependent surveillance – broadcast (ADS-B) and algorithm development to integrate RPA into the airspace. | |
| *Operating Environment/Phases of Flight*<br>All phases of flight including taxi | |
| *Applicability*<br>Applies to all RPA operating in non-segregated airspace and at aerodromes. Requires good synchronization of airborne and ground deployment to generate significant benefits, in particular to those able to meet minimum certification and equipment requirements. | |
| *Elements*<br>1. (Derived from 1.3.1) Access to most airspace for select RPA without specific airspace constraints<br>2. (Derived from 1.3.1) RPA certification procedure based on Minimum Aircraft System Performance Specifications (MASPs)<br>3. (Derived from 1.3.1) Lost link procedures<br>4. (Derived from 1.3.1) Special purpose transponder code to indicate lost link<br>5. (Derived from 1.3.1) Revised separation minima<br>6. (Derived from 1.3.1) Defined RPA classes based on ADS-B equipage<br>7. (Derived from 1.3.1) Detect and avoid required performance standards defined<br>8. (Derived from 1.3.1) Protected frequency spectrum for RPAS command and control | |

# Block 3 – Available for implementation in 2031

**PIA 1: Airport Operations**

| *Module Designation*<br>**B3-RSEQ**<br>Begins page 75 | *Thread - Module Name*<br>Runway Sequencing - Integration AMAN/DMAN/SMAN |
|---|---|
| | *Performance Improvement Area*<br>1: Airport Operations |
| *Summary Description*<br>Fully synchronized network management between departure airport and arrival airports for all aircraft in the air traffic system at any given point in time. | |
| *Operating Environment/Phases of Flight*<br>All phases of flight (JORDAN) | |
| *Applicability*<br>Runways and terminal manoeuvring areas in major hubs and metropolitan areas will be most in need of these improvements. Complexity in implementation of this Block depends on several factors. Some locations might have to confront environmental and operational challenges that will increase the complexity of development and implementation of technology and procedures to realize this Block. Infrastructure for RNAV/RNP routes need to be in place. | |
| *Elements*<br>1. TBD | |

**PIA 2: Globally Interoperable Systems and Data**

| *Module Designation*<br>**B3-AMET**<br>Begins page 199 | *Thread - Module Name*<br>Advanced Meteorological Information - Enhanced operational decisions through integrated meteorological information (near-term and immediate service) |
|---|---|
| | *Performance Improvement Area*<br>2: Globally Interoperable Systems and Data |
| *Summary*<br>The aim of this Module is to enhance global ATM decision-making in the face of hazardous meteorological conditions in the context of decisions that should have an immediate effect. This Module builds upon the initial information integration concept and capabilities developed under B1-AMET. Key points are a) tactical avoidance of hazardous meteorological conditions in especially the 0-20 minute time frame; b) greater use of aircraft based capabilities to detect meteorological parameters (e.g. turbulence, winds, and humidity); and c) display of meteorological information to enhance situational awareness. This Module also promotes further the establishment of Standards for the global exchange of the information. | |
| *Operating Environment/Phases of Flight*<br>All | |
| *Applicability*<br>Applicable to air traffic flow planning, en-route operations, terminal operations (arrival/departure) and surface. Aircraft equipage is assumed in the areas of ADS-B IN/CDTI, aircraft-based meteorological observations, and meteorological information display capabilities, such as EFBs. | |
| *Elements*<br>1. (Derived from Element 1) Enhanced MET information integrated into ATM decision making procedures<br>2. (Derived from Element 2) Enhanced MET information integrated into ATM decision support tools<br>3. (Derived from Element 3) Provision of enhanced MET information to cockpit display systems using global information exchange models and formats | |

| *Module Designation*<br>**B3-FICE**<br>Begins page 147 | *Thread - Module Name*<br>FF-ICE - Improved operational performance through the introduction of Full FF-ICE |
|---|---|
| | *Performance Improvement Area*<br>2: Globally Interoperable Systems and Data |
| *Summary Description*<br>Data for all relevant flights is systematically shared between the air and ground systems using SWIM in support of collaborative ATM and trajectory-based operations. | |
| *Operating Environment/Phases of Flight*<br>All phases of flight from initial planning to post-flight | |
| *Applicability*<br>Air and ground. | |
| *Elements*<br>1. (Derived from 1.3.1) Use of Flight Object in SWIM applications<br>2. (Derived from 1.3.3) Airborne access to ATM information using SWIM | |

**PIA 3: Optimum Capacity and Flexible Flights**

| *Module Designation*<br>**B3-NOPS**<br>Begins page 247 | *Thread - Module Name*<br>Network Operations - Traffic complexity management |
|---|---|
| | *Performance Improvement Area*<br>3: Optimum Capacity and Flexible Flights |
| *Summary Description*<br>Introduction of complexity management to address events and phenomena that affect traffic flows due to physical limitations, economic reasons or particular events and conditions by exploiting the more accurate and rich information environment of SWIM-based ATM. Benefits will include optimized usage and efficiency of system capacity. | |
| *Operating environment/Phases of flight*<br>Pre-flight and in-flight | |
| *Applicability*<br>Regional or subregional. Benefits are only significant over a certain geographical size and assume that it is possible to know and control/optimize relevant parameters. Benefits mainly useful in the higher density airspace. | |
| *Elements*<br>1. TBD | |

**PIA 4: Efficient Flight Paths**

| *Module Designation*<br>**B3-RPAS**<br>Begins page 385 | *Thread - Module Name*<br>Remotely Piloted Aircraft Systems (RPAS) - Remotely piloted aircraft (RPA) transparent management |
|---|---|
| | *Performance Improvement Area*<br>4: Efficient Flight Paths |
| *Summary Description*<br>Continuing to improve the certification process for remotely piloted aircraft (RPA) in all classes of airspace, working on developing a reliable command and control (C2) link, developing and certifying airborne detect and avoid (ABDAA) algorithms for collision avoidance, and integration of RPA into aerodrome procedures. | |
| *Operating Environment/Phases of Flight*<br>En-route, oceanic, terminal (arrival and departure), aerodrome (taxi, take-off and landing) | |
| *Applicability*<br>Applies to all RPA operating in non-segregated airspace and at aerodromes. Requires good synchronization of airborne and ground deployment to generate significant benefits, in particular to those able to meet minimum certification and equipment requirements. | |
| *Elements*<br>1. (Derived from 1.2) Certification for RPA to fly in all classes of airspace<br>2. (Derived from 1.2) Certification of communication requirements for command and control and ATC<br>3. (Derived from 1.2) Certification of pre-set automatic response for collision avoidance<br>4. (Derived from 1.2) Certified ABDAA algorithm<br>5. (Derived from 1.2) Aerodrome procedures for RPA | |

| *Module Designation*<br>**B3-TBO**<br>Begins page 349 | *Thread - Module Name*<br>Trajectory Based Operations - Full 4D trajectory-based operations |
|---|---|
| | *Performance Improvement Area*<br>4: Efficient Flight Paths |
| *Summary Description*<br>The development of advanced concepts and technologies, supporting four dimensional trajectories (latitude, longitude, altitude, time) and velocity to enhance global ATM decision-making. A key emphasis is on integrating all flight information to obtain the most accurate trajectory model for ground automation. | |
| *Operating Environment/Phases of Flight*<br>En-route/cruise, terminal area, traffic flow management, descent | |
| *Applicability*<br>Applicable to air traffic flow planning, en-route operations, terminal operations (approach/departure), and arrival operations. Benefits accrue to both flows and individual aircraft. Aircraft equipage is assumed in the areas of: ADS-B IN/CDTI; data communication and advanced navigation capabilities. Requires good synchronization of airborne and ground deployment to generate significant benefits, in particular to those equipped. Benefit increases with size of equipped aircraft population in the area where the service are provided. | |
| *Elements*<br>1. (Derived from Element 1) Advanced aircraft capabilities to receive and display air-to-air and ground-to-air MET, aircraft and ATM information<br>2. (Derived from Element 2) Collaborative use of problem detection and resolution decision support tools by ATM and airspace users<br>3. (Derived from Element 3) ATFM updated based on continuous system capacity updates integrated with time-based metering | |

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