ICAO GANP PORTAL

ASBU ELEMENTS

AMET DAIM FICE SWIM B0 B1 B2 Concept Validation Standardization Ready for implementation Taxi-out Departure En-route Arrival Taxi-in Turn-around ATM planning Pre-tactical Tactical-Pre ops Strategical Post operations Tactical-During ops

☑ Functional Description | ☑ Enablers | ☑ Deployment Applicability | ☑ Performance Impact Assessment

AMET

AMET-B0/1	Meteorological observations products	Information

Main Purpose

Meteorological observations in support of flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning.

New Capabilities

Provision of observations of additional meteorological parameters/elements. More automated observations. Higher temporal and spatial resolution for lightning, radar and satellite information.

Description

This element represents the provision of meteorological observational products including:

- Automatic Weather Observation System (AWOS) information (including real-time exchange of wind and RVR data)
- Local reports (MET REPORT / SPECIAL)
- Aerodrome reports (METAR / SPECI)
- Lightning information
- Ground-based weather radar information
- Meteorological satellite imagery
- Aircraft meteorological report (ie. ADS-B, AIREP, AMDAR etc.)
- Vertical wind and temperature profiles
- Volcano Observatory Notice for Aviation (VONA)
- Wind shear alerts

Maturity Level

Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No

2. Does it imply processing of new information by the user? No

3. Does it imply the use of new equipment? Yes

4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-Pre ops | Tactical-During ops

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in

Turn-around

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-technology benefit	ASUR-B0/3 - Cooperative Surveillance Radar Downlink of Aircraft Parameters (SSR-DAPS)
Relation-technology benefit	COMS-B0/2 - ADS-C (FANS 1/A) for procedural airspace
Relation-technology need	COMI-B0/7 - ATS Message Handling System (AMHS)
Relation-technology benefit	COMI-B0/1 - Aircraft Communication Addressing and Reporting System (ACARS)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Regulatory provisions	National regulatory framework	National framework amendment for the provision of meteorological observations products	Amendment to national regulations to include changes to the provision of quality-assured meteorological observation products to support flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning. References: • Annex 3 - Meteorological Service for International Air Navigation • WMO No.49 Vol II - Technical Regulations - Basic Documents No. 2, Volume II – Meteorological Service for International Air Navigation • WMO No.49 Vol IV - Technical Regulations - Basic Documents No. 2, Volume IV – Quality Management • Doc. 4444 - Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)	CAA	2013

Operational procedures	Information exchange	Procedures for the provision of meteorological observations products	Procedures for changes to the provision of quality-assured meteorological observation products, including additional meteorological parameters and higher spatial and temporal resolution observations. References: • WMO No.8 - Guide to Meteorological Instruments and Methods of Observation • WMO No.306 - Manual on Codes – International Codes • WMO No.731 – Guide to Meteorological Observing and Information Distribution Systems for Aviation Weather Services • WMO No.732 - Guide to Practices for Meteorological Offices Serving Aviation • WMO No.782 – Aerodrome Reports and Forecasts • WMO No.1100 - Guide to the Implementation of a Quality Management System for National Meteorological and Hydrological Services • Doc. 7488 – Manual of the ICAO Standard Atmosphere • Doc. 8896 - Manual of Aeronautical Meteorological Practice • Doc. 9328 - Manual of Runway Visual Range Observing and Reporting Practices • Doc 9837 - Manual on Automatic Meteorological Observing Systems at Aerodromes	ANSP MET Information Service Provider	2013
Airborne system capability	Aircraft system	Transmission of meteorological observations data from aircraft	Onboard sensors and communication means for the measurement and transmission of meteorological data by: ACAR, Mode-S, ADS-B & ADS-C.	Aircraft manufacturer	2013
Ground system infrastructure	Information exchange	Automated systems and infrastructure to support the provision of meteorological observations products	Meteorological instrumentation, IT systems and communications infrastructure for the measurement, storage, display and transmission (including AFS) of meteorological observations products. References: • WMO No.8 - Guide to Meteorological Instruments and Methods of Observation • Annex 10 - Aeronautical Telecommunications	Airport operator ANSP MET Information Service Provider	2013
Training	-	Training requirements for the provision of meteorological observations products	Training for meteorological personnel and aviation industry stakeholders on meteorological observations products. References: • WMO No. 1083 – Guide to the Implementation of Education and Training Standards in Meteorology and Hydrology • WMO No.1205 – Guide to Competency	Airport operator ANSP CAA Aircraft operator MET Information Service Provider	2013

AMET-B0/2	Meteorological forecast and warning products	Information

Main Purpose: Meteorological forecasts, advisories and warnings in support of flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning.

New Capabilities: Improved visualisation of meteorological forecast products. Greater resolution (spatial and temporal) of gridded WAFS information (e.g. wind, temperature, icing, turbulence, CB clouds).

Description: This element represents the provision of meteorological forecast (including advisory and warning) products including:

- World Area Forecast System (WAFS) gridded products
- Significant Weather (SIGWX)
- Low-level Area Forecast (GAMET)
- Aerodrome Forecast (TAF)
- Trend Forecast (TREND)
- Take-off Forecast
- Tropical Cyclone Advisory (TCA)
- Volcanic Ash Advisory (VAA)
- AIRMET
- SIGMET
- Aerodrome Warning
- Wind Shear Warning

Maturity Level: Ready for implementation

Human Factor Considerations:

1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? No
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Pre-tactical | Tactical-Pre ops | Tactical-During ops

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in | Turn-around

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	AMET-B0/1 - Meteorological observations products

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year

Regulatory provisions	National regulatory framework	National framework amendment for the provision of meteorological forecast products and warnings	Amendment to national regulations to include changes to the provision of quality-assured meteorological forecast and warning products to support flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning. References: • Annex 3 - Meteorological Service for International Air Navigation • WMO No.49 Vol II - Technical Regulations - Basic Documents No. 2, Volume II – Meteorological Service for International Air Navigation • WMO No.49 Vol IV - Technical Regulations - Basic Documents No. 2, Volume IV – Quality Management • Doc. 4444 - Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)	CAA	2013
Operational procedures	Information exchange	Procedures for the provision of Meteorological forecast products and warnings	Procedures for changes to the provision of quality-assured meteorological forecast and warning products, including improved visualisation and higher spatial and temporal resolution of gridded products. References: • WMO No.306 - Manual on Codes – International Codes • WMO No.732 - Guide to Practices for Meteorological Offices Serving Aviation • WMO No.782 – Aerodrome Reports and Forecasts • WMO No.1100 - Guide to the Implementation of a Quality Management System for National Meteorological and Hydrological Services • Doc. 7488 – Manual of the ICAO Standard Atmosphere • Doc. 8896 - Manual of Aeronautical Meteorological Practice • Doc. 9691 - Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds • Doc. 9766 - Handbook on the International Airways Volcano Watch (IAVW) • Regional SIGMET Guides	ANSP MET Information Service Provider	2013
Training	-	Training requirements for the provision of meteorological forecast products and warnings	Training for meteorological personnel and aviation industry stakeholders on meteorological forecast and warning products. References: • WMO No. 1083 – Guide to the Implementation of Education and Training Standards in Meteorology and Hydrology • WMO No.1205 – Guide to Competency	Airport operator ANSP CAA Aircraft operator MET Information Service Provider	2013

Ground system infrastructure	Information exchange	Systems and infrastructure to support the provision of meteorological forecast and warning products	IT systems and communications infrastructure for the storage, forecasting, display and transmission (including AFS) of meteorological forecast and warning products. References: • Doc. 8896 - Manual of Aeronautical Meteorological Practice	MET Information Service Provider	2013

AMET-B0/4 Dissemination of meteorological products Information

Main Purpose

Dissemination of meteorological products in support of flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning

New Capabilities

Commencement of the exchange of meteorological information using the ICAO Meteorological Information Exchange Model (IWXXM), being the conversion of Traditional Alphanumeric Code (TAC), using an IWXXM schema, into XML/GML.

Description

This element represents the dissemination of meteorological products using a variety of formats and means.

Formats include:

- TAC
- Gridded
- Graphical (i.e., PNG format)
- BUFR code
- IWXXM (in XML/GML)

Dissemination means includes aeronautical fixed service (AFTN with increasing use of AMHS), and via secure internet services (ie. WIFS/SADIS).

Maturity Level

Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No

2. Does it imply processing of new information by the user? Yes

3. Does it imply the use of new equipment? Yes

4. Does it imply a change to levels of automation? No

PLANNING LAYERS

Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in | Turn-around

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element

Relation-operational need	AMET-B0/1 - Meteorological observations products
Relation-operational need	AMET-B0/2 - Meteorological forecast and warning products
Relation-technology need	COMI-B0/7 - ATS Message Handling System (AMHS)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Regulatory provisions	National regulatory framework	National framework amendment for meteorological information exchange	Amendment to national regulations to include changes to the dissemination of meteorological products in support of flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning. References: • Annex 3 - Meteorological Service for International Air Navigation • WMO No.49 Vol II - Technical Regulations - Basic Documents No. 2, Volume II – Meteorological Service for International Air Navigation • Annex 10 – Aeronautical Telecommunications • Annex 15 - Aeronautical Information Services	CAA	2013
Operational procedures	Information exchange	Procedures for meteorological information exchange	Procedures for changes to the dissemination of meteorological products, including the exchange of meteorological information using the ICAO Meteorological Information Exchange Model (IWXXM). References: • Doc. 8896 - Manual of Aeronautical Meteorological Practice • Doc. 9377 – Manual on the Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services • Doc. 9855 - Guidelines on the use of the Public Internet for Aeronautical Applications • Doc. 9880 - Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols • Doc. 9896 – Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocol • Doc. 10003 - Manual on the Digital Exchange of Aeronautical Meteorological Information • ICAO Guidelines for the Implementation of OPMET Data Exchange using IWXXM • Regional OPMET Interface Control Documents • Regional OPMET Bulletin Exchange Handbooks	ANSP MET Information Service Provider	2013

Ground system infrastructure	Information exchange	Communications infrastructure for meteorological information exchange	Ground system infrastructure and dissemination systems for meteorological products, including message switching systems and the roll-out of the Aeronautical Message Handling System (AMHS) to replace the Aeronautical Fixed Telecommunications Network (AFTN). References: • Doc. 9880 - Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols • Doc. 9896 – Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocol; • Regional OPMET Interface Control Documents • Regional OPMET Bulletin Exchange Handbooks	ANSP MET Information Service Provider	2013
Training	-	Training for meteorological information exchange	Training for meteorological and aviation IT personnel, including NOC/ROC/RODB/IROG personnel on the exchange of meteorological products. References: • Regional OPMET Interface Control Documents • Regional OPMET Bulletin Exchange Handbooks	ANSP MET Information Service Provider	2013

Information exchange model	Meteorological information	ICAO Meteorological Information Exchange Model (IWXXM) V1-V2	ICAO Meteorological Information Exchange Model (IWXXM) schema used to enable the provision meteorological information in XML/GML form. Version 1.1 supported Annex 3 amendment 76 (2013). Version 2.1 supported Annex 3 amendment 77 (2016). References: • Doc. 10003 - Manual on the Digital Exchange of Aeronautical Meteorological Information • ICAO Guidelines for the Implementation of OPMET Data Exchange using IWXXM • WMO IWXXM Wiki: https://wiswiki.wmo.int/tiki-index.php?page=IWXXM&structure=WIS+up	ANSP MET Information Service Provider	2013

AMET-B1/1	Meteorological observations information	Information

Main Purpose

Meteorological observations information in support of automated decision processes or aids and performance based requirements, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision support.

New Capabilities

Commencement of change from product-centric to data-centric information. Commencement of space weather and sulphur dioxide (SO2) services. Enhanced hazardous weather services. Indroduction of new and enhanced space-based observations. Introduction of new observational information from both un-manned and manned aircraft (ie. observations from lidar).

Description

Meteorological observations will begin to transition from traditional alphanumeric code (TAC) form to data-centric information to better support the common understanding on the various operational constraints, capabilities and needs. The following SWIM-compliant observational parameters and phenomena will begin to be made available to users and will include:

- Wind speed and direction (aerodrome) including gusts
- Wind speed and direction from departure to Top of Climb (TOC) and then Top of Descent (TOD) to landing
- Wind speed and direction en-route
- Air temperature and dew point temperature (aerodrome)
- Air temperature and dew point temperature (or equivalent, i.e. humidity) from departure to TOC and then TOD to landing (including the following derived outputs: freezing level, lower tropospheric temperature inversions)
- Air temperature and dew point temperature (or equivalent) en-route
- Pressure (aerodrome) (i.e. QNH/QFE)
- Visibility (aerodrome) (horizontal, slant, vertical), Runway visual range (RVR)
- Cloud type (of operational significance)
- Cloud coverage, bases, tops and layers
- Thunderstorms, Lightning, Convection (TCU & CB)
- Precipitation (ie. drizzle, rain, freezing rain, snow, hail)
- Weather (ie. dust storm, sand storm, funnel cloud, squall, smoke, haze, mist, fog)
- Icing, including airframe and engine
- Liquid Water Content, Iced Water Content

- Turbulence, Mountain waves, Wind shear
- Fronts
- Radioactive clouds, Toxic chemicals
- Tropical cyclones
- Volcanic ash
- Sulphur dioxide (SO2) and other hazardous gases
- Aerodrome surface (runway) temperature, state
- Sea temperature, state and wave height (seaports)
- Space weather events
- Tsunami, Flood

Characteristics of the meteorological information include:

- Time (ie. observation time)
- Units of measurement
- Resolution (spatial)
- Geo Location (2D/3D/4D context, point, line or polyhedron)
- Movement
- Severity, Accumulation, Intensity
- Range (Max. – Min.)
- Variations
- Data sample period
- Auto or Human (Observed, Measured or Calculated)
- Amendment / Correction
- Operational Status
- Source
- Thresholds
- Format (TAC, Gridded, Graphical, IWXXM)
- Data quality flag
- Runway identification or location identifier
- Effects/impact on aviation systems (i.e. communications, navigation & surveillance systems)
- Radiation (exposure)

An increase in the use of performance measures (via compliance, availability and regularity indices) of meteorological observations.

Maturity Level

Standardization

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? No

2. Does it imply processing of new information by the user? Yes

3. Does it imply the use of new equipment? Yes

4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-Pre ops | Tactical-During ops

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in | Turn-around

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element

Evolution	AMET-B0/1 - Meteorological observations products
Relation-technology benefit	COMS-B1/2 - PBCS approved ADS-C (FANS 1/A+) for procedural airspace
Relation-technology need	COMI-B0/7 - ATS Message Handling System (AMHS)
Relation-technology need	COMI-B0/1 - Aircraft Communication Addressing and Reporting System (ACARS)
Relation-technology need	ASUR-B0/3 - Cooperative Surveillance Radar Downlink of Aircraft Parameters (SSR-DAPS)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Regulatory provisions	National regulatory framework	National framework amendment for the provision of meteorological observations information	Amendment of national regulations to include the provision of quality-assured meteorological observations information in support of automated decision processes or aids and performance based requirements, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision support. References: • Annex 3 - Meteorological Service for International Air Navigation • WMO No.49 Vol II - Technical Regulations - Basic Documents No. 2, Volume II – Meteorological Service for International Air Navigation • WMO No.49 Vol IV - Technical Regulations - Basic Documents No. 2, Volume IV – Quality Management • Procedures for Air Navigation Services – Meteorology (PANS-MET) – being developed • Doc. 4444 - Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)	CAA	2019

Operational procedures	Information exchange	Procedures for the provision of meteorological observations information	Procedures for changes to the provision of quality-assured meteorological observations information, including space weather. References: • WMO No.8 - Guide to Meteorological Instruments and Methods of Observation • WMO No.306 - Manual on Codes – International Codes • WMO No.731 – Guide to Meteorological Observing and Information Distribution Systems for Aviation Weather Services • WMO No.732 - Guide to Practices for Meteorological Offices Serving Aviation • WMO No.782 – Aerodrome Reports and Forecasts • WMO No.1100 - Guide to the Implementation of a Quality Management System for National Meteorological and Hydrological Services • Doc. 7488 – Manual of the ICAO Standard Atmosphere • Doc. 8896 - Manual of Aeronautical Meteorological Practice • Doc. 9328 - Manual of Runway Visual Range Observing and Reporting Practices • Doc 9837 - Manual on Automatic Meteorological Observing Systems at Aerodromes • Doc. 10100 – Manual on Space Weather Information in Support of Air Navigation	ANSP MET Information Service Provider	2019
Airborne system capability	Aircraft system	Transmission of meteorological observations information from aircraft	Onboard sensors and communication means for the measurement and transmission of meteorological information by: ACAR, Mode-S, ADS-B & ADS-C	Aircraft manufacturer	2019
Ground system infrastructure	Information exchange	Automated systems and infrastructure to support the provision of meteorological observations information	Meteorological instrumentation, IT systems and communications infrastructure for the measurement, storage, display and transmission (including AFS) of meteorological observations information. References: • WMO No.8 - Guide to Meteorological Instruments and Methods of Observation • Annex 10 - Aeronautical Telecommunications	Airport operator ANSP MET Information Service Provider	2019
Training	-	Training requirements for meteorological observations information	Training for meteorological personnel and aviation industry stakeholders on meteorological observations information. References: • WMO No. 1083 – Guide to the Implementation of Education and Training Standards in Meteorology and Hydrology • WMO No.1205 – Guide to Competency	Airport operator ANSP CAA Aircraft operator MET Information Service Provider	2019

AMET-B1/2	Meteorological forecast and warning information	Information

Main Purpose

Meteorological forecast and warning information for automated support for decision processes or aids and performance based requirements, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision processes.

New Capabilities

Commencement of change from product-centric to data-centric information. Commencement of space weather and sulphur dioxide (SO2) services. Enhanced hazardous weather services. First steps in the provision of probabilistic information derived from ensemble prediction systems.

Description

Meteorological forecasts and warnings will begin to transition from traditional alphanumeric code (TAC) form to data-centric information to better support the common understanding on the various operational constraints, capabilities and needs. The following SWIM-compliant forecast parameters and phenomena will begin to be made available to users and will include:

- Wind speed and direction (aerodrome) including gusts and operationally significant wind shifts
- Air temperature and dew point temperature (aerodrome)
- Upper level:
  - Wind (speed and direction), including departure to Top of Climb (TOC) and then Top of Descent (TOD) to landing
  - Air temperature and dew point temperature or equivalent (i.e. humidity), including height of freezing level and lower tropospheric temperature inversions
- Flight level and temperature of tropopause
- Geopotential altitude for flight levels
- Pressure (aerodrome) (i.e. QNH, QFE)
- Visibility (aerodrome), Runway visual range (RVR)
- Cloud type (of operational significance)
- Cloud coverage, bases, tops and layers
- Thunderstorms, Lightning, Convection (TCU & CB)
- Precipitation (ie. drizzle, rain, freezing rain, snow, hail)
- Weather (ie. dust storm, sand storm, funnel cloud, squall, smoke, haze, mist, fog)
- Icing (airframe and engine),
- Liquid Water Content, Iced Water Content
- Turbulence, Mountain waves, Wind shear
- Fronts
- Radioactive clouds, Toxic chemicals
- Tropical cyclones
- Volcanic ash
- Sulphur dioxide (SO2) and other hazardous gases
- Aerodrome surface (runway) temperature, state
- Sea temperature, state and wave height (seaports)
- Space weather events
- Tsunami, Flood

Characteristics of the meteorological information include:

- Time (ie. issue time, validity, commencement/cessation, lead time)
- Units of measurement
- Resolution (temporal & spatial)
- Geo Location (2D/3D/4D context, point, line or polyhedron)
- Movement

- Severity, Accumulation, Intensity
- Range (Max. – Min.)
- Variations
- Probability of occurrence
- Confidence/Uncertainty of forecast
- Reliability
- Data sample period
- Auto
- Change indicator/period
- Amendment / Correction
- Operational Status
- Source
- Thresholds
- Format (TAC, Gridded, Graphical, IWXXM)
- Data quality flag
- Runway identification or location identifier
- Effects/impact on aviation systems (i.e. communications, navigation & surveillance systems)
- Radiation (exposure)

Human-readable meteorological advisory and warning products start to be derived from the meteorological information/data to better suit user needs and can be based on user defined thresholds. Meteorological information to be used to assess impact.

Verification of quality (accuracy) of forecast parameters. An increased use performance measures (via compliance, availability and regularity indices) of forecast parameters.

Maturity Level: Standardization

Human Factor Considerations:

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Pre-tactical | Tactical-Pre ops | Tactical-During ops

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in | Turn-around

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	AMET-B0/2 - Meteorological forecast and warning products
Relation-operational need	AMET-B1/1 - Meteorological observations information

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year

Regulatory provisions	National regulatory framework	National framework amendment for the provision of meteorological forecast and warnings information	Amendment to national regulations to include changes to the provision of meteorological forecast and warning information in support of automated decision processes or aids and performance based requirements, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision support. References: • Annex 3 - Meteorological Service for International Air Navigation • WMO No.49 Vol II - Technical Regulations - Basic Documents No. 2, Volume II – Meteorological Service for International Air Navigation • WMO No.49 Vol IV - Technical Regulations - Basic Documents No. 2, Volume IV – Quality Management • Procedures for Air Navigation Services – Meteorology (PANS-MET) – being developed • Doc. 4444 - Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)	CAA	2019
Operational procedures	Information exchange	Procedures for the provision of meteorological forecast and warnings information	Procedures for changes to the provision of quality-assured meteorological forecast and warning information, including commencement of the change from product-centric to data-centric information, space weather, enhanced hazardous weather services and the provision of probabilistic information derived from ensemble prediction systems. References: • WMO No.306 - Manual on Codes – International Codes • WMO No.732 - Guide to Practices for Meteorological Offices Serving Aviation • WMO No.782 – Aerodrome Reports and Forecasts • WMO No.1100 - Guide to the Implementation of a Quality Management System for National Meteorological and Hydrological Services • Doc. 7488 – Manual of the ICAO Standard Atmosphere • Doc. 8896 - Manual of Aeronautical Meteorological Practice • Doc. 9691 - Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds • Doc. 9766 - Handbook on the International Airways Volcano Watch (IAVW) • Doc. 10100 – Manual on Space Weather Information in Support of Air Navigation • Regional SIGMET Guides	ANSP MET Information Service Provider	2019

Training	-	Training requirements for Meteorological forecast and warning information	Training for meteorological personnel and aviation industry stakeholders on meteorological forecast and warning information. References: • WMO No. 1083 – Guide to the Implementation of Education and Training Standards in Meteorology and Hydrology • WMO No.1205 – Guide to Competency	Airport operator ANSP CAA Aircraft operator MET Information Service Provider	2019
Ground system infrastructure	Information exchange	Systems and infrastructure to support the provision of meteorological forecast and warning information	IT systems and communications infrastructure for the storage, forecasting, display and transmission (including AFS) of meteorological forecast and warning information. References: • Doc. 8896 - Manual of Aeronautical Meteorological Practice	MET Information Service Provider	2019

AMET-B1/4	Dissemination of meteorological information	Information

Main Purpose

Dissemination of meteorological information in support of automated decision process or aids, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision support.

New Capabilities

Meteorological information in ICAO Meteorological Information Exchange Model (IWXXM) form starts to replace traditional alphanumeric code (TAC) products. Human-readable products will start to be derived from the IWXXM information (rather than the other way around). The introduction of web services allows for progressive replacement of fixed line dissemination systems.

Description

This element represents the dissemination of meteorological products using a variety of formats, including:

- Tailored products (human-readable)
- Impact-translated products
- Gridded
- Graphical (PNG and BUFR to be phased out)
- ICAO Meteorological Information Exchange Model (IWXXM) format
- Traditional alphanumeric code (TAC) – being phased out

Dissemination means include aeronautical fixed service (ie. AMHS) and via secure internet services (ie. WIFS/SADIS). Commencement of SWIM-compliant web service capability to access the exact meteorological information required by users (in terms of geographical coverage, resolution etc).

Maturity Level

Standardization

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in | Turn-around

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	AMET-B0/4 - Dissemination of meteorological products
Relation-operational need	AMET-B1/1 - Meteorological observations information
Relation-operational need	AMET-B1/2 - Meteorological forecast and warning information
Relation-technology need	COMI-B0/7 - ATS Message Handling System (AMHS)
Relation-information need	DAIM-B1/1 - Provision of quality-assured aeronautical data and information
Relation-information need	DAIM-B1/2 - Provision of digital Aeronautical Information Publication (AIP) data sets

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year

Operational procedures	Information exchange	Procedures for the dissemination of meteorological information	Procedures for changes to the dissemination of meteorological information, including the exchange of meteorological information using the latest version of the ICAO Meteorological Information Exchange Model (IWXXM). References: • Doc. 8896 - Manual of Aeronautical Meteorological Practice • Doc. 9377 – Manual on the Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services • Doc. 9855 - Guidelines on the use of the Public Internet for Aeronautical Applications • Doc. 9880 - Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols • Doc. 9896 – Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocol • Doc. 10003 - Manual on the Digital Exchange of Aeronautical Meteorological Information • Doc. 10039 - Manual on System Wide Information Management (SWIM) Concept • ICAO Guidelines for the Implementation of OPMET Data Exchange using IWXXM • WMO No.731 – Guide to Meteorological Observing and Information Distribution Systems for Aviation Weather Services • Regional OPMET Interface Control Documents • Regional OPMET Bulletin Exchange Handbooks	ANSP MET Information Service Provider	2019
Ground system infrastructure	Information exchange	Communication infrastructure for meteorological information exchange	Ground system infrastructure and dissemination systems for meteorological information, including the implementation of the Aeronautical Message Handling System (AMHS). References: • Doc. 9880 - Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols • Doc. 9896 – Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocol; • Regional OPMET Interface Control Documents • Regional OPMET Bulletin Exchange Handbooks	ANSP MET Information Service Provider	2019

Information exchange model	Meteorological information	ICAO Meteorological Information Exchange Model (IWXXM) V3	ICAO Meteorological Information Exchange Model (IWXXM) schema used to enable the provision meteorological information in XML/GML form. Version 3 supporting Annex 3 amendment 78 (2018). References: • Doc. 10003 - Manual on the Digital Exchange of Aeronautical Meteorological Information • ICAO Guidelines for the Implementation of OPMET Data Exchange using IWXXM • WMO IWXXM Wiki: https://wiswiki.wmo.int/tiki-index.php?page=IWXXM&structure=WIS+up	ANSP MET Information Service Provider	2019
Training	-	Training for the dissemination of meteorological information	Training for meteorological and aviation IT personnel, including NOC/ROC/RODB/IROG personnel on the exchange of meteorological information. References: • Doc. 10003 - Manual on the Digital Exchange of Aeronautical Meteorological Information • ICAO Guidelines for the Implementation of OPMET Data Exchange using IWXXM • Regional OPMET Interface Control Documents • Regional OPMET Bulletin Exchange Handbooks	ANSP MET Information Service Provider	2019
Regulatory provisions	National regulatory framework	National framework amendment for the dissemination of meteorological information	Amendment to national regulations to include changes to the dissemination of meteorological information in support of automated decision process or aids, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision support. References: • Annex 3 - Meteorological Service for International Air Navigation • WMO No.49 Vol II - Technical Regulations - Basic Documents No. 2, Volume II – Meteorological Service for International Air Navigation • WMO No.49 Vol IV - Technical Regulations - Basic Documents No. 2, Volume IV – Quality Management • Procedures for Air Navigation Services – Meteorology (PANS-MET) – being developed • Annex 10 – Aeronautical Telecommunications • Annex 15 - Aeronautical Information Services	CAA	2019

AMET-B2/1	Meteorological observations information	Information

Main Purpose	Integrated meteorological observations in support of enhanced ATM and airport decision-making processes, particularly in the near-term.
New Capabilities	Further development of space weather and radioactive material services. Further development of services for terminal areas. Implementation of a data-centric information set. Higher spatial and temporal resolution of meteorological observations. Automated user-defined observation products derived from meteorological information in ICAO Meteorological Information Exchange Model (IWXXM) form.
Description	This module builds on the meteorological information services defined in AMET-B1. Full MET-ATM integration will ensure that meteorological information is included in the logic of a decision process and the impact of the meteorological conditions on the operations are automatically derived, understood and taken into account. Increased situational awareness to support tactical in-flight avoidance of hazardous meteorological conditions. Recognising that space weather affecting the earth's surface or atmosphere pose a hazard to communications and navigation systems and may also pose a radiation risk to flight crew members and passengers, this module builds on AMET-B1 for space weather information services in support of safe and efficient international air navigation, particularly in the area of regional services. Considering the impact of adverse meteorological conditions on high traffic density terminal areas around major aerodromes and air traffic management operations within those areas as well as the increasing requirements by airspace users to be able to optimise their flight profile, this module acknowledges the need to provide meteorological information services with the accuracy, resolution and frequency to support ATM operations within those areas. Meteorological observations will increasingly include performance measurement (via compliance, availability and regularity indices). Aircraft equipage is assumed in the area of meteorological information display capabilities, such as EFBs.
Maturity Level	Validation
Human Factor Considerations	1. Does it imply a change in task by a user or affected others? Yes 2. Does it imply processing of new information by the user? Yes 3. Does it imply the use of new equipment? Yes 4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-Pre ops | Tactical-During ops

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in | Turn-around

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	AMET-B1/1 - Meteorological observations information
Relation-technology benefit	ASUR-B2/1 - Evolution of ADS-B and Mode S

Relation-technology option	COMS-B2/2 - PBCS Approved ADS-C (B2) for domestic and procedural airspace
Relation-technology option	SWIM-B2/4 - Air/Ground SWIM for non-safety critical information
Relation-technology need	SWIM-B2/1 - Information service provision

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Regulatory provisions	National regulatory framework	National framework amendment for the provision of meteorological observations information in a SWIM environment	Amendment of national regulations to include the provision of integrated meteorological observations information in a SWIM environment in support of enhanced operational ground and air decision-making processes, particularly in the planning phase and near-term. References: • Annex 3 - Meteorological Service for International Air Navigation • WMO No.49 Vol II - Technical Regulations - Basic Documents No. 2, Volume II – Meteorological Service for International Air Navigation • WMO No.49 Vol IV - Technical Regulations - Basic Documents No. 2, Volume IV – Quality Management • Procedures for Air Navigation Services – Meteorology (PANS-MET) – being developed • Doc. 4444 - Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)	CAA	2025

Operational procedures	Information exchange	Procedures for the provision of meteorological observations information in a SWIM environment	Procedures for changes to the provision of integrated meteorological observations information in a SWIM environment, including enhanced terminal area, space weather, sulphur dioxide (SO2) and radioactive material services. References: • WMO No.8 - Guide to Meteorological Instruments and Methods of Observation • WMO No.306 - Manual on Codes – International Codes • WMO No.731 – Guide to Meteorological Observing and Information Distribution Systems for Aviation Weather Services • WMO No.732 - Guide to Practices for Meteorological Offices Serving Aviation • WMO No.782 – Aerodrome Reports and Forecasts • WMO No.1100 - Guide to the Implementation of a Quality Management System for National Meteorological and Hydrological Services • Doc. 7488 – Manual of the ICAO Standard Atmosphere • Doc. 8896 - Manual of Aeronautical Meteorological Practice • Doc. 9328 - Manual of Runway Visual Range Observing and Reporting Practices • Doc 9837 - Manual on Automatic Meteorological Observing Systems at Aerodromes • Doc. 10100 – Manual on Space Weather Information in Support of Air Navigation	ANSP MET Information Service Provider	2025
Airborne system capability	Aircraft system	Transmission of meteorological observations information from aircraft for a SWIM environment	On-board sensors and communication means for the measurement and transmission of meteorological information by: ACAR, Mode-S, ADS-B & C.	Aircraft manufacturer	2025
Ground system infrastructure	Information exchange	Automated systems and infrastructure to support the provision of meteorological observations information over SWIM	Meteorological instrumentation, IT systems and communications infrastructure for the measurement, storage, display and transmission of meteorological observations information to support ground and air decision-making processes in a SWIM environment References: • WMO No.8 - Guide to Meteorological Instruments and Methods of Observation • Annex 10 - Aeronautical Telecommunications	Airport operator ANSP MET Information Service Provider	2025

Training	-	Training requirements for meteorological observations information over SWIM	Training for meteorological personnel and aviation industry stakeholders on meteorological observations information in a SWIM environment. References: • WMO No. 1083 – Guide to the Implementation of Education and Training Standards in Meteorology and Hydrology • WMO No.1205 – Guide to Competency	Airport operator ANSP CAA Aircraft operator MET Information Service Provider	2025

AMET-B2/2 Meteorological forecast and warning information Information

Main Purpose

Integrated meteorological forecast and warning information in support of enhanced operational ground and air decision-making processes, particularly in the near-term.

New Capabilities

Further development of space weather and radioactive material services. Further development of forecast and warning services for terminal areas. Phenomena-based meteorological information is no longer constrained by Flight Information Regions (FIRs). Implementation of a data-centric information set. Higher spatial and temporal resolution of meteorological forecasts and warnings. Automated user-defined forecast and warning products derived from meteorological information in ICAO Meteorological Information Exchange Model (IWXXM) form. Further development of probabilistic information derived from ensemble prediction systems.

Description

This module builds on the meteorological forecast and warning services defined in AMET-B1. Full MET-ATM integration will ensure that meteorological information is included in the logic of a decision process and the impact of the meteorological conditions on the operations are automatically derived, understood and taken into account. Support for 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. Specifically, the addition of probabilistic forecasts will provide decision makers with an assessment of the likelihood of some meteorological phenomena/parameters exceeding a defined magnitude (or threshold) at a particular time and place. The probabilistic element further helps decision makers apply their own operational constraints (i.e. business rules) to determine the risk to their operations.

Recognising that space weather affecting the earth's surface or atmosphere pose a hazard to communications and navigation systems and may also pose a radiation risk to flight crew members and passengers, this module builds on AMET-B1 for space weather information services in support of safe and efficient international air navigation, particularly in the area of regional services.

Considering the impact of adverse meteorological conditions on high traffic density terminal areas around major aerodromes and air traffic management operations within those areas as well as the increasing requirements by airspace users to be able to optimise their flight profile, this module acknowledges the need to provide meteorological information services with the accuracy, resolution and frequency to support ATM operations within those areas.

A significant evolution is planned for volcanic ash information. Next generation volcanic ash cloud forecasts will be fully implemented, which will provide both deterministic and probabilistic forecasts for contamination levels that will allow decision makers to use, taking into account their risk management practices and the quantitative exposures allowed by the engine manufacturers. Specifically, the addition of probabilistic forecasts will provide decision makers with an assessment of the likelihood of the volcanic ash exceeding a defined magnitude (or threshold) at a particular time and place. The probabilistic element further helps decision makers apply their own operational constraints (i.e. business rules) to determine the risk to their operations.

Enhanced global MET forecasts will be provided under the World Area Forecast System (WAFS), which will include higher resolution and probabilistic information. Enhanced higher resolution regional MET forecasts will also be provided. Forecast services for the terminal area will be further enhances with the accuracy, resolution and frequency to support ATM operations within those areas. This enhanced global, regional and terminal area information will be integrated into flight planning, flight management and ATM decision support systems, including systems for air traffic control around and at airports.

Meteorological forecast and warning parameters and phenomena will include performance measurement (via compliance, availability and regularity indices) of some meteorological observations. Greater use of the probability of occurrence of meteorological phenomena and the level of confidence/uncertainty of the forecast will enable better risk management.

Human-readable products can be derived from the meteorological information to suit specific user needs. Meteorological advisories and warnings are derived from forecast data and based on user-defined thresholds.

Maturity Level

Validation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Pre-tactical | Tactical-Pre ops | Tactical-During ops

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in | Turn-around

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	AMET-B1/2 - Meteorological forecast and warning information
Relation-operational need	AMET-B2/1 - Meteorological observations information

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Regulatory provisions	National regulatory framework	National framework amendment for the provision of meteorological forecast and warnings information in a SWIM environment	Amendment of national regulations to include the provision of integrated meteorological forecast and warning information in a SWIM environment, in support of enhanced operational ground and air decision-making processes, particularly in the planning phase and near-term. References: • Annex 3 - Meteorological Service for International Air Navigation • WMO No.49 Vol II - Technical Regulations - Basic Documents No. 2, Volume II – Meteorological Service for International Air Navigation • WMO No.49 Vol IV - Technical Regulations - Basic Documents No. 2, Volume IV – Quality Management • Procedures for Air Navigation Services – Meteorology (PANS-MET) – being developed • Doc. 4444 - Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)	CAA	2025

Operational procedures	Information exchange	Procedures for the provision of meteorological forecast and warnings information in a SWIM environment	Procedures for changes to the provision of integrated meteorological forecast and warning information in a SWIM environment, including enhanced terminal area, space weather, sulphur dioxide (SO2) and radioactive material services. References: • WMO No.306 - Manual on Codes – International Codes • WMO No.732 - Guide to Practices for Meteorological Offices Serving Aviation • WMO No.782 – Aerodrome Reports and Forecasts • WMO No.1100 - Guide to the Implementation of a Quality Management System for National Meteorological and Hydrological Services • Doc. 7488 – Manual of the ICAO Standard Atmosphere • Doc. 8896 - Manual of Aeronautical Meteorological Practice • Doc. 9691 - Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds • Doc. 9766 - Handbook on the International Airways Volcano Watch (IAVW) • Doc. 10100 – Manual on Space Weather Information in Support of Air Navigation • Regional SIGMET Guides	ANSP MET Information Service Provider	2025
Training	-	Training requirements for Meteorological forecast and warnings information in a SWIM environment	Training for meteorological personnel and aviation industry stakeholders on meteorological forecast and warning information in a SWIM environment. References: • WMO No. 1083 – Guide to the Implementation of Education and Training Standards in Meteorology and Hydrology • WMO No.1205 – Guide to Competency	Airport operator ANSP CAA Aircraft operator MET Information Service Provider	2025
Ground system infrastructure	Information exchange	Systems and infrastructure to support the provision of meteorological forecast and warning information in a SWIM environment	IT systems and communications infrastructure for the storage, forecasting, display and transmission of meteorological forecast and warning information in a SWIM environment. References: • Doc. 8896 - Manual of Aeronautical Meteorological Practice	MET Information Service Provider	2025

AMET-B2/4	Meteorological information service in SWIM	Information

Main Purpose

Integrated meteorological information service in the SWIM environment in support of enhanced operational ground and air decision-making processes, particularly in the planning phase and near-term.

New Capabilities

Implementation of a data-centric meteorological information service, integrated into the System Wide Information Management (SWIM) environment. User-defined products derived from meteorological information in ICAO Meteorological Information Exchange Model (IWXXM) form. Wider use of secure web services and decommissioning of fixed line and satellite dissemination systems. Commencement of the use of business-to-business services that allows integration of meteorological information into ATM systems. Increased use of air-to-air datalink for transmission of upper air meteorological observation in near real-time.

Description

The establishment of standards for global exchange of the MET information within the SWIM environment.

This element represents the integration of meteorological information into the SWIM environment. Wider use of MET-SWIM services will support flexible airspace management, airborne re-routing, improved situational awareness, collaborative decision-making, including in terminal areas and at airports, dynamically optimized flight trajectory planning, ATM impact conversion and ATM decision support, hazard avoidance.

SWIM-compliant meteorological information to be more readily exchanged with the aircraft to improve operational awareness and decision making using air/ground data connectivity and aircraft on-board systems.

MET-SWIM information services will support request/reply or publish/subscribe access mechanisms and will provide quality & timely information to users in a range of formats to best enable their optimal decision making.

Maturity Level

Validation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes

2. Does it imply processing of new information by the user? Yes

3. Does it imply the use of new equipment? Yes

4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in | Turn-around

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	AMET-B1/1 - Meteorological observations information
Relation-operational need	AMET-B2/1 - Meteorological observations information
Relation-operational need	AMET-B2/2 - Meteorological forecast and warning information
Relation-information need	DAIM-B2/1 - Dissemination of aeronautical information in a SWIM environment

Relation-operational need	SWIM-B2/1 - Information service provision
Relation-operational need	SWIM-B2/2 - Information service consumption
Relation-operational need	SWIM-B2/3 - SWIM registry
Relation-operational benefit	SWIM-B2/4 - Air/Ground SWIM for non-safety critical information
Relation-operational benefit	SWIM-B2/5 - Global SWIM processes
Relation-operational need	AMET-B2/3 - Climatological and historical meteorological information

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Regulatory provisions	National regulatory framework	National framework amendment for the provision of meteorological information service in SWIM	Amendment to national regulations to include changes to the dissemination of meteorological information in support of enhanced operational ground and air decision-making processes, particularly in the planning phase and near-term. References: • Annex 3 - Meteorological Service for International Air Navigation • WMO No.49 Vol II - Technical Regulations - Basic Documents No. 2, Volume II – Meteorological Service for International Air Navigation • WMO No.49 Vol IV - Technical Regulations - Basic Documents No. 2, Volume IV – Quality Management • Procedures for Air Navigation Services – Meteorology (PANS-MET) – being developed • Annex 10 – Aeronautical Telecommunications • Annex 15 - Aeronautical Information Services	CAA	2025

Operational procedures	Information exchange	Procedures for the provision of meteorological information service in SWIM	Procedures for changes to the dissemination of meteorological information, including the exchange of meteorological information using the latest version of the ICAO Meteorological Information Exchange Model (IWXXM) and the introduction of web services. References: • Doc. 8896 - Manual of Aeronautical Meteorological Practice • Doc. 9377 – Manual on the Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services • Doc. 9855 - Guidelines on the use of the Public Internet for Aeronautical Applications • Doc. 9880 - Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols • Doc. 9896 – Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocol • Doc. 10003 - Manual on the Digital Exchange of Aeronautical Meteorological Information • Doc. 10039 - Manual on System Wide Information Management (SWIM) Concept • ICAO Guidelines for the Implementation of OPMET Data Exchange using IWXXM • WMO No.731 – Guide to Meteorological Observing and Information Distribution Systems for Aviation Weather Services • Regional OPMET Interface Control Documents • Regional OPMET Bulletin Exchange Handbooks	ANSP MET Information Service Provider	2025
Ground system infrastructure	Information exchange	Communication infrastructure for meteorological information exchange in SWIM	Ground system infrastructure and dissemination systems for meteorological information within a SWIM environment. References: • Regional OPMET Interface Control Documents • Regional OPMET Bulletin Exchange Handbooks	ANSP MET Information Service Provider	2025

Information exchange model	Meteorological information	ICAO Meteorological Information Exchange Model (IWXXM) Vxx	ICAO Meteorological Information Exchange Model (IWXXM) schema used to enable the provision meteorological information in XML/GML form. References: • Doc. 10003 - Manual on the Digital Exchange of Aeronautical Meteorological Information • ICAO Guidelines for the Implementation of OPMET Data Exchange using IWXXM • WMO IWXXM Wiki: https://wiswiki.wmo.int/tiki-index.php?page=IWXXM&structure=WIS+up	ANSP MET Information Service Provider	2025
Training	-	Training for the provision of a Meteorological information service	Training for meteorological and aviation IT personnel, including NOC/ROC/RODB/IROG and SWIM services personnel, on the exchange of meteorological information in a SWIM environment. References: • Doc. 10003 - Manual on the Digital Exchange of Aeronautical Meteorological Information • Doc. 10039 - Manual on System Wide Information Management (SWIM) Concept • ICAO Guidelines for the Implementation of OPMET Data Exchange using IWXXM • Regional OPMET Interface Control Documents • Regional OPMET Bulletin Exchange Handbooks	ANSP MET Information Service Provider	2025

DAIM

DAIM-B1/1	Provision of quality-assured aeronautical data and Information information
Main Purpose	The main purpose of this element is to ensure that aeronautical data and information comply with quality standards in order to meet the needs of airspace users and support the safety of flight operations.
New Capabilities	Provision of high quality aeronautical data and information; consistent interpretation and timely exchange of aeronautical data and information; and, automatic management, processing, verification, usage and exchange of aeronautical data and information.

Description

This element ensures that processes, procedures and systems are improved to allow for an enhanced quality of aeronautical information products and services. This element includes:

1. Implementation of quality management systems to ensure that aeronautical data and information comply with the required standards.
2. Use of common reference systems (spatial – WGS84 and temporal- AIRAC) to facilitate consistent interpretation of aeronautical data and information and facilitate their timely exchange.
3. Full move into an automated data-centric environment so that the management, processing, verification, usage and exchange can be done in a structured, automatic manner and human intervention is reduced.
4. Aeronautical data and information is of high quality if it is aggregated and provided by authoritative sources. This requires to properly control relationships along the whole data chain from the origination to the distribution to the next intended user (formal arrangements with data originators, neighbouring States, data and information service providers and others).

Maturity Level

Standardization

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? No
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Strategical | Pre-tactical

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in

DEPENDENCIES AND RELATIONS

There are currently no dependencies.

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Information exchange	Procedures for the provision of aeronautical information services in an AIM environment	ANSPs should define in an AIM Manual of operations the procedures to be followed for the provision of quality assured aeronautical information. Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management ICAO Doc 8126 - Aeronautical Information Services	ANSP	2018

Operational procedures	Quality	Procedures for the application of a quality management system to the AIM processes.	ANSPs should define in a Quality Manual the procedures to be followed to apply a quality management system to the AIM processes. Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management Doc 9839 - Manual on the Quality Management System for Aeronautical Information Services	ANSP	2018
Ground system infrastructure	Information exchange	Automated aeronautical information management systems and infrastructure.	Automated systems and infrastructure to support the collection, processing, distribution and quality control of the aeronautical information products and services.	ANSP	2018
Training	-	Training requirements for the provision of quality-assured aeronautical data and information	Training for AIS/AIM personnel	ANSP	2018
Regulatory provisions	National regulatory framework	National framework for the provision of quality assured aeronautical data and information	Development of State Regulatory framework to support the provision of quality-assured aeronautical data and information. Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management	CAA	2018
Regulatory provisions	Formal arrangements	Formal arrangements for data quality assurance	Formal arrangements between ANSP and the aeronautical data originators to ensure data quality. Reference ICAO documents: Aeronautical Data Catalogue (PANS – Aeronautical Information Management, Appendix 1)	ANSP CAA	2018

DAIM-B1/2	Provision of digital Aeronautical Information Publication (AIP) data sets	Information

Main Purpose	To make available digital AIP data and information in an interoperable manner and mutually-understood manner.
New Capabilities	Provision of digital AIP data sets. This will facilitate the exchange of aeronautical information that becomes easy to be integrated and filtered, thus increasing cost effectiveness and efficiency.

Description

The need for interoperable exchange of AIP data and information requires providing them in digital form and complying with digital data exchange requirements. This element consists in the replacement of existing sections of the AIP by digital AIP data sets. Therefore, this element supports the migration to a data-centric environment where aeronautical data and information (AIP) will be provided in a structured and digital form through the use of information exchange models (e.g. AIXM).

Maturity Level

Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes

2. Does it imply processing of new information by the user? No

3. Does it imply the use of new equipment? Yes

4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Strategical | Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	DAIM-B1/1 - Provision of quality-assured aeronautical data and information

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Information exchange	Procedures for the provision of digital AIP data set	Updated AIM Manual of operations to include information about the provisions of digital AIP data sets. Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS - Aeronautical Information Management Doc 8126 - Aeronautical Information Services	ANSP	2018
Information exchange model	Aeronautical Information	Aeronautical Information Exchange Model (AIXM) v 5.1	The objective of the Aeronautical Information Exchange Model (AIXM) is to enable the provision in digital format of the aeronautical information that is in the scope of Aeronautical Information Services (AIS). Reference material: AIXM Confluence site/AIS Manual Volume 4	ANSP	2018

Ground system infrastructure	Information exchange	Automated systems and infrastructure to support the provision of digital AIP data sets using AIXM	Automated systems and infrastructure to support the processing and distribution of the digital Aeronautical Information Publication (AIP) data sets.	ANSP	2018
Ground system infrastructure	Information exchange	Airspace user systems to be updated to leverage the benefits of digital AIP data sets using AIXM.	Automated systems and infrastructure for the users to make use of the digital Aeronautical Information Publication (AIP) data sets.	Airspace user	2018
Training	-	Training requirements for the provision of digital AIP data sets	Training for AIS/AIM personnel, Airspace users	ANSP Airspace user	2018
Regulatory provisions	National regulatory framework	National framework for the provision of digital Aeronautical Information Publication (AIP) data sets	Development of State Regulatory framework to support the provision of digital Aeronautical Information Publication (AIP) data sets Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management Doc 8126 – Aeronautical Information Services	CAA	2018

DAIM-B1/3	Provision of digital terrain data sets	Information

Main Purpose	To make available digital terrain data and information in an interoperable manner and mutually-understood manner.
New Capabilities	Provision of terrain data as digital data sets. This will facilitate the exchange of terrain data that becomes easy to integrate and easily filtered, thus increasing cost effectiveness and efficiency.
Description	The need for interoperable exchange of terrain data requires providing the data in digital form and complying with digital data exchange requirements. This element consists in the replacement of existing terrain data by digital terrain data sets. Therefore, this element supports the migration to a data-centric environment where terrain data will be provided in a digital form and in a structured way.
Maturity Level	Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? No
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Strategical | Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	DAIM-B1/1 - Provision of quality-assured aeronautical data and information

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Information exchange	Procedures for the provision of digital terrain data set	Updated AIM Manual of operations to include information about the provisions of digital terrain data sets. ICAO reference documents : Annex 15 - Aeronautical Information Services PANS- Aeronautical Information Management Doc 8126 - Aeronautical Information Services	ANSP	2018
Ground system infrastructure	Information exchange	Automated systems and infrastructure to support the provision of digital terrain data sets using AIXM	Automated systems and infrastructure to support the processing and distribution of the digital terrain data sets.	ANSP	2018
Ground system infrastructure	Information exchange	Airspace user systems to be updated to leverage the benefits of digital terrain data sets using AIXM.	Automated systems and infrastructure for the users to make use of the digital terrain data sets.	Airspace user	2018
Training	-	Training requirements for the provision of digital terrain data sets	Training for AIS/AIM personnel, Airspace users	ANSP Airspace user	2018

Regulatory provisions	National regulatory framework	National framework for the provision of digital terrain data sets	Development of State Regulatory framework to support the provision of digital terrain data sets Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management Doc 8126 – Aeronautical Information Services	CAA	2018

DAIM-B1/4 Provision of digital obstacle data sets Information

Main Purpose To make available digital obstacle data in an interoperable and mutually-understood manner.

New Capabilities Provision of obstacle data as digital data sets. This will facilitate the exchange of obstacle data that becomes easy to integrate and easily filtered, thus increasing cost effectiveness and efficiency.

Description The need for interoperable exchange of obstacle data requires providing the data in digital form and complying with digital data exchange requirements. This element consists in the replacement of existing obstacle data by digital obstacle data sets. Therefore, this element supports the migration to a data centric environment where obstacle data will be provided in a structured and digital form through the use through the use of information exchange models (e.g. AIXM).

Maturity Level Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? No
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Strategical | Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	DAIM-B1/1 - Provision of quality-assured aeronautical data and information

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year

Information exchange model	Aeronautical Information	Aeronautical Information Exchange Model (AIXM) v 5.1	The objective of the Aeronautical Information Exchange Model (AIXM) is to enable the provision in digital format of the aeronautical information that is in the scope of Aeronautical Information Services (AIS). Reference material: AIXM Confluence site/AIS Manual Volume 4	ANSP	2018
Operational procedures	Information exchange	Procedures for the provision of digital obstacle data set	Updated AIM Manual of operations to include information about the provisions of digital obstacle data sets. Reference ICAO document: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management Doc 8126 – Aeronautical Information Services	ANSP	2018
Ground system infrastructure	Information exchange	Automated systems and infrastructure to support the provision of digital obstacle data sets using AIXM	Automated systems and infrastructure to support the processing and distribution of the digital obstacle data sets.	ANSP	2018
Ground system infrastructure	Information exchange	Airspace user systems to be updated to leverage the benefits of digital obstacle data sets using AIXM.	Automated systems and infrastructure for the users to make use of the digital obstacle data sets.	Airspace user	2018
Training	-	Training requirements for the provision of digital obstacle data sets	Training for AIS/AIM personnel, Airspace users	ANSP Airspace user	2018
Regulatory provisions	National regulatory framework	National framework for the provision of digital obstacle data sets	Development of State Regulatory framework to support the provision of digital obstacles data sets Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management Doc 8126 – Aeronautical Information Services	CAA	2018

DAIM-B1/5 Provision of digital aerodrome mapping data sets Information

Main Purpose: To make available digital aerodrome mapping data and information in an interoperable and mutually-understood manner.

New Capabilities: Provision of aerodrome mapping data as digital data sets. This will facilitate the exchange of aerodrome mapping data that becomes easy to integrate and easily filtered, thus increasing cost effectiveness and efficiency.

Description: The need for interoperable exchange of aerodrome mapping data requires providing the data in digital form and complying with digital data exchange requirements. This element consists in the replacement of existing aerodrome mapping data by digital aerodrome mapping data sets. Therefore, this element supports the migration to a data centric environment where aerodrome mapping data will be provided in a structured and digital form through the use through the use of information exchange models (e.g. AIXM).

Maturity Level: Ready for implementation

Human Factor Considerations:

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? No
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Strategical | Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	DAIM-B1/1 - Provision of quality-assured aeronautical data and information

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Information exchange model	Aeronautical Information	Aeronautical Information Exchange Model (AIXM) v 5.1	The objective of the Aeronautical Information Exchange Model (AIXM) is to enable the provision in digital format of the aeronautical information that is in the scope of Aeronautical Information Services (AIS). Reference material: AIXM Confluence site/AIS Manual Volume 4	ANSP	2018

Operational procedures	Information exchange	Procedures for the provision of digital aerodrome mapping data set	Updated AIM Manual of operations to include information about the provisions of digital aerodrome mapping data sets. Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management Doc 8126 – Aeronautical Information Services	ANSP	2018
Ground system infrastructure	Information exchange	Automated systems and infrastructure to support the provision of digital aerodrome mapping data sets using AIXM	Automated systems and infrastructure to support the processing and distribution of the digital aerodrome mapping data sets.	ANSP	2018
Ground system infrastructure	Information exchange	Airspace user systems to be updated to leverage the benefits of digital aerodrome mapping data sets using AIXM.	Automated systems and infrastructure for the users to make use of the digital aerodrome mapping data sets.	Airspace user	2018
Training	-	Training requirements for the provision of digital aerodrome mapping data sets	Training for AIS/AIM personnel, Airspace users	ANSP Airspace user	2018
Regulatory provisions	National regulatory framework	National framework for the provision of digital aerodrome mapping data sets	Development of State Regulatory framework to support the provision of digital aerodrome mapping data sets Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management Doc 8126 – Aeronautical Information Services	CAA	2019

DAIM-B1/6	Provision of digital instrument flight procedure data sets	Information
Main Purpose	To make available digital instrument flight procedure data in an interoperable and mutually-understood manner.	

New Capabilities: Provision of instrument flight procedure data as digital data sets; and, compliance with the navigation specifications, consistency in design, coding and operation of performance-based navigation (PBN) procedures to avoid differences in the aircraft behaviour in response to the coded path terminators by the use specific criteria for coding instrument flight procedures. This will facilitate the exchange of instrument flight procedure data that becomes easy to integrate and easily filtered, thus increasing cost effectiveness and efficiency.

Description: The need for interoperable exchange of instrument flight procedure data requires providing the data in digital form and complying with digital data exchange requirements. This element consists in the replacement of existing instrument flight procedure data by digital instrument flight procedure data sets. In addition, it includes consistent coding of procedures to match the procedure design intent and ensure more repeatable flight paths. Applying new rules for coding Instrument flight procedures will limit the number of allowable path terminators for PBN procedures in compliance with the PBN Navigation Specifications. Therefore, this element supports the migration to a data centric environment where instrument flight procedure data will be provided in a structured and digital form through the use of information exchange models (e.g. AIXM).

Maturity Level: Ready for implementation

Human Factor Considerations:

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? No
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Strategical | Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Departure | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	DAIM-B1/1 - Provision of quality-assured aeronautical data and information

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Information exchange model	Aeronautical Information	Aeronautical Information Exchange Model (AIXM) v 5.1	The objective of the Aeronautical Information Exchange Model (AIXM) is to enable the provision in digital format of the aeronautical information that is in the scope of Aeronautical Information Services (AIS). Reference material: AIXM Confluence site/AIS Manual Volume 4	ANSP	2018

Operational procedures	Information exchange	Procedures for the provision of digital instrument flight procedures data set	Updated AIM Manual of operations to include information about the provisions of digital instrument flight procedure data sets. Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management Doc 8126 – Aeronautical Information Services	ANSP	2018
Ground system infrastructure	Information exchange	Automated systems and infrastructure to support the provision of digital instrument flight procedures data sets using AIXM	Automated systems and infrastructure to support the processing and distribution of the digital instrument flight procedures data sets.	ANSP	2018
Ground system infrastructure	Information exchange	Airspace user systems to be updated to leverage the benefits of digital instrument flight procedure data sets using AIXM.	Automated systems and infrastructure for the users to make use of the digital instrument flight procedures data sets.	Airspace user	2018
Training	-	Training requirements for the provision of digital instrument flight procedure data sets	Training for AIS/AIM personnel, Airspace users	ANSP Airspace user	2018
Regulatory provisions	National regulatory framework	National framework for the provision of digital instrument flight procedures sets	Development of State Regulatory framework to support the provision of digital instrument flight procedures data sets Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management Doc 8126 – Aeronautical Information Services	CAA	2018

DAIM-B1/7	NOTAM improvements	Information
Main Purpose	To provide timely and relevant information about status and condition of the ANS infrastructure to the next intended users via NOTAM.	

New Capabilities | Identification of clear operational conditions to determine when a NOTAM shall or shall not be originated, thus ensuring that the information provided meets the needs of the users; provision of digital NOTAMs to enhance the quality of the information provided and allow the graphical representation and better filtering of information to assist operators in retrieving the relevant information.

Description | In order to meet the operational needs of the users, it is essential to provide information that is timely and fit for purpose. This can be done by refining the criteria to ensure that the users receive the right information. This element consists in the identification of clear operational conditions under which a NOTAM shall or shall not be originated and replacement of paper NOTAMs by a digital version through the use of information exchange models (e.g. AIXM).

Maturity Level | Ready for implementation

Human Factor Considerations | 1. Does it imply a change in task by a user or affected others? Yes

2. Does it imply processing of new information by the user? No

3. Does it imply the use of new equipment? Yes

4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	DAIM-B1/1 - Provision of quality-assured aeronautical data and information
Relation-information need	DAIM-B1/2 - Provision of digital Aeronautical Information Publication (AIP) data sets
Relation-information need	DAIM-B1/4 - Provision of digital obstacle data sets
Relation-information need	DAIM-B1/5 - Provision of digital aerodrome mapping data sets
Relation-information need	DAIM-B1/6 - Provision of digital instrument flight procedure data sets

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Information exchange model	Aeronautical Information	Aeronautical Information Exchange Model (AIXM) v 5.1	The objective of the Aeronautical Information Exchange Model (AIXM) is to enable the provision in digital format of the aeronautical information that is in the scope of Aeronautical Information Services (AIS). Reference material: AIXM Confluence site/AIS Manual Volume 4	ANSP	2018

Operational procedures	Information exchange	Procedures for the provision of an enhanced NOTAM service	Updated AIM Manual of Operations to include information about the provisions of NOTAM. Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management Doc 8126 – Aeronautical Information Services	ANSP	2019
Ground system infrastructure	Information exchange	Automated systems and infrastructure to support the provision of NOTAM using AIXM.	Automated systems and infrastructure to support the processing and distribution of NOTAM	ANSP	2019
Ground system infrastructure	Information exchange	Airspace user systems need to be updated to leverage the benefits of digital NOTAM using AIXM.	Automated systems and infrastructure for the users to make use of NOTAM	Airspace user	2019
Training	-	Training requirements for the provision of enhanced NOTAM	Training for AIS/AIM personnel, Airspace users	ANSP Airspace user	2019
Regulatory provisions	National regulatory framework	National framework for the provision of NOTAM	Development of State Regulatory framework to support the provision of NOTAM Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management Doc 8126 – Aeronautical Information Services	CAA	2018

DAIM-B2/1	Dissemination of aeronautical information in a SWIM environment	Information

Main Purpose: Integrated aeronautical information service in a SWIM environment in support of enhanced operational ground and air decision-making processes for all phases of flight.

New Capabilities: Implementation of a data-centric AIM, integrated into the System Wide Information Management (SWIM) environment; user-defined products derived from aeronautical information in a standardized Information Exchange Model (e.g. AIXM) that can be provided alone or integrated with other information domains (e.g. Meteorological or FF-ICE information); wider use of secure web services and starts the decommissioning of current distribution mechanism; commencement of the use of business-to-business services that allows integration of aeronautical information into ATM systems.

Description

This element represents the full integration of aeronautical information into the SWIM environment. The use of AIM SWIM services will allow the user to access relevant and mutually understood aeronautical information in an interoperable manner. This will include the ability not only to communicate and exchange aeronautical information but also to interpret it in a meaningful manner.

AIM-SWIM information services will support request/reply or publish/subscribe access mechanisms and will provide quality & timely information to users in a range of formats to best enable their optimal decision making. AIM-SWIM information services will also include web-services supporting the graphical representation of aeronautical information in a geo-referenced environment.

Maturity Level

Validation

Human Factor Considerations

PLANNING LAYERS

Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	DAIM-B1/2 - Provision of digital Aeronautical Information Publication (AIP) data sets
Evolution	DAIM-B1/3 - Provision of digital terrain data sets
Evolution	DAIM-B1/4 - Provision of digital obstacle data sets
Evolution	DAIM-B1/5 - Provision of digital aerodrome mapping data sets
Evolution	DAIM-B1/6 - Provision of digital instrument flight procedure data sets
Relation-information need	DAIM-B2/3 - Aeronautical information to support higher airspace operations
Relation-information need	DAIM-B2/4 - Aeronautical information requirements tailored to UTM
Relation-operational need	SWIM-B2/1 - Information service provision
Relation-operational need	SWIM-B2/2 - Information service consumption
Relation-operational need	SWIM-B2/3 - SWIM registry
Relation-operational need	DAIM-B2/2 - Daily Airspace Management information to support flight and flow

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year

Information exchange model	Aeronautical Information	Aeronautical Information Exchange Model (AIXM) v 5.1	The objective of the Aeronautical Information Exchange Model (AIXM) is to enable the provision in digital format of the aeronautical information that is in the scope of Aeronautical Information Services (AIS). Reference material: AIXM Confluence site/AIS Manual Volume 4	ANSP	2018
Ground system infrastructure	Information exchange	Automated systems and infrastructure to support the provision of aeronautical information over SWIM	Automated systems and infrastructure for the dissemination of aeronautical information in a SWIM environment.	ANSP	2025
Ground system infrastructure	Information exchange	Airspace user systems to be updated to subscribe or access the aeronautical information services over SWIM	Automated systems and infrastructure for the users to subscribe or access the aeronautical information in a SWIM environment.	Airspace user	2025
Training	-	Training requirements for the provision of aeronautical information over SWIM	Training for AIS/AIM personnel	ANSP	2025
Information exchange model	Aeronautical Information	Aeronautical Information Exchange Model (AIXM) v 5.x	The objective of the Aeronautical Information Exchange Model (AIXM) is to enable the provision in digital format of the aeronautical information that is in the scope of Aeronautical Information Services (AIS). Reference material: AIXM Confluence site/AIS Manual Volume 4	ANSP	2025

DAIM-B2/2	Daily Airspace Management information to support flight and flow	Information

Main Purpose To establish common practices and data formats for daily airspace management initiatives continuously updated as events take place for flight and flow planning and execution.

New Capabilities: Daily Airspace Management operational changes are packaged and made accessible for use in all local and regional flight and flow operations.

Description: Airspace Management, in daily operations, will continuously adjust airspace status, adjust airspace volumes (e.g. advanced flexible use of airspace) and add temporary airspace initiatives. This element mirrors the modernization efforts ongoing for scheduled AIP modifications with global best practices for packaging and making this information available for dissemination to improve local and regional flight planning in keeping with the flight and flow initiatives engendered in Block 2 FICE and NOPS. This best practice DAIM service enable by SWIM will ensure that information regarding status airspace configurations (Fixes, FIR Boundaries, static zones etc…) and information regarding airspace evolution (reroutings, sector configurations, airspace use plan and updated airspace use plan, airspace reservations, route restrictions and availability, dynamic zones etc.) will be available in formats that support NOPS and FICE automation.

Maturity Level: Validation

Human Factor Considerations:

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? No
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Departure | En-route | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	DAIM-B2/1 - Dissemination of aeronautical information in a SWIM environment
Relation-information need	FRTO-B0/1 - Direct routing (DCT)
Relation-information need	FRTO-B0/2 - Airspace planning and Flexible Use of Airspace (FUA)
Relation-information need	FRTO-B0/3 - Pre-validated and coordinated ATS routes to support flight and flow
Relation-information need	FRTO-B1/1 - Free Route Airspace (FRA)
Relation-information need	FRTO-B1/2 - Required Navigation Performance (RNP) routes
Relation-information need	FRTO-B1/3 - Advanced Flexible Use of Airspace (FUA) and management of real time airspace data
Relation-information need	FRTO-B1/4 - Dynamic sectorization
Relation-information need	FRTO-B2/1 - Local components of integrated ATFM and ATC Planning function (INAP)
Relation-information need	FRTO-B2/2 - Local components of Dynamic Airspace Configurations (DAC)

Relation-information need	FRTO-B2/3 - Large Scale Cross Border Free Route Airspace (FRA)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Information exchange	Operational procedures for aeronautical information requirements to support network operations	New procedures will be required to produce and distribute the new aeronautical information in support of network operations. Updated AIM Manual of operations to address the requirements for aeronautical information to support network operations. Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS- Aeronautical Information Management Doc 8126 - Aeronautical Information Services	ATM network function	2025
Ground system infrastructure	Information exchange	Automated systems and infrastructure to include aeronautical information requirements to support network operations	Update to the national aeronautical data management system, including systems supporting data collection, verification and distribution. For instance, automated functions should be introduced to generate the airspace usage plan information service.	ATM network function	2025
Training	-	Training requirements for aeronautical information requirements regarding network operations	For personnel managing the ATM information and for their users if the interfaces and access conditions change.	ATM network function	2025
Information exchange model	Aeronautical Information	Aeronautical Information Exchange Model (AIXM) v 5.x	The objective of the Aeronautical Information Exchange Model (AIXM) is to enable the provision in digital format of the aeronautical information that is in the scope of Aeronautical Information Services (AIS). Reference material: AIXM Confluence site/AIS Manual Volume 4	ANSP	2025

DAIM-B2/3	Aeronautical information to support higher airspace operations	Information

Main Purpose: To provide higher airspace management information in an airspace service that is complementary to standard AIS.

New Capabilities: Higher airspace definitions and status are packaged and made accessible to operators flying in the airspace.

Description: Long endurance and near space tourism operators' space crafts are subject to all applicable AIS. In addition, there may be a need to manage operations in the airspace by changing the status of volumes of airspace solely related to these operators. Since this information is applicable only to these operators, there is limited value in including this as information in ATM airspace management. A complementary, separate service is desired.

Maturity Level: Validation

Human Factor Considerations:

1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? No
4. Does it imply a change to levels of automation? No

PLANNING LAYERS

Strategical | Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

En-route

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	DAIM-B1/2 - Provision of digital Aeronautical Information Publication (AIP) data sets

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Information exchange	Operational procedures to support higher airspace operations	Rules to describe higher airspace information. Updated AIM Manual of operations to include information about the requirements for aeronautical information in higher airspace. Standards and guidance material: ICAO Annex 15 - Aeronautical Information Services PANS-AIM ICAO Doc 7383 - Aeronautical Information Services Provided by States	ANSP	2025

Ground system infrastructure	Information exchange	Automated systems and infrastructure to include aeronautical information requirements to support higher airspace operations	Update to the national aeronautical data management system, including data collection, verification and distribution.	ANSP ATM network function	2025
Training	-	Training requirements for aeronautical information requirements regarding higher airspace operations.	Training for AIS/AIM personnel	ANSP	2025
Information exchange model	Aeronautical Information	Aeronautical Information Exchange Model (AIXM) v 5.x	The objective of the Aeronautical Information Exchange Model (AIXM) is to enable the provision in digital format of the aeronautical information that is in the scope of Aeronautical Information Services (AIS). Reference material: AIXM Confluence site/AIS Manual Volume 4	ANSP	2025

DAIM-B2/4	Aeronautical information requirements tailored to UTM	Information

Main Purpose

To provide low altitude airspace management information in a UAS Traffic Management (UTM) service that is complementary to standard AIS.

New Capabilities

UTM airspace definitions and status are packaged and made accessible to UAS operators flying in UTM.

Description

UAS flying in UTM are subject to all applicable AIS.

In addition, UTM will manage UAS in the airspace by changing the status of volumes of airspace solely related to UAS operations. For example, the publishing of maps where UAS may operate near airports in class B, or locations where state operations are occurring for which UAS need to stay clear.

Given the manner in which UAS operations occur it is likely that the operator must be in continuous contact with the network to access this information.

Since the volume of such airspace management information would overwhelm ATM airspace management, a complementary, separate service is desired.

Maturity Level	Validation
Human Factor Considerations	1. Does it imply a change in task by a user or affected others? No 2. Does it imply processing of new information by the user? Yes 3. Does it imply the use of new equipment? No 4. Does it imply a change to levels of automation? No

PLANNING LAYERS

Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	DAIM-B1/2 - Provision of digital Aeronautical Information Publication (AIP) data sets

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Information exchange	Operational procedures for aeronautical information requirements to support UTM	New procedures will be required to produce and distribute the AIP data for UTM users. Updated AIM Manual of operations to address the requirements for aeronautical information in low-altitude. Standards and guidance material: ICAO Annex 15 - Aeronautical Information Services PANS-AIM ICAO Doc 7383 - Aeronautical Information Services Provided by States	ANSP	2025
Ground system infrastructure	Information exchange	Automated systems and infrastructure to include aeronautical information requirements to support UTM	Automated systems and infrastructure to include aeronautical information requirements to support provision of digital AIM data for UTM users.	ANSP	2025
Airborne system capability	Information exchange	UAS logic to make use of the AIM information	Automated systems and infrastructure for UAS to make use of the AIM information.	Airspace user	2025

Training	-	Training requirements for aeronautical information requirements regarding UTM	Training for AIS/AIM personnel	ANSP	2025
Information exchange model	Aeronautical Information	Aeronautical Information Exchange Model (AIXM) v 5.x	The objective of the Aeronautical Information Exchange Model (AIXM) is to enable the provision in digital format of the aeronautical information that is in the scope of Aeronautical Information Services (AIS). Reference material: AIXM Confluence site/AIS Manual Volume 4	ANSP	2025

DAIM-B2/5	NOTAM replacement	Information

Main Purpose: To introduce a more efficient mechanism to exchange aeronautical information that is currently provided by the NOTAM system.

New Capabilities: Airspace user will be allowed to tailor the AIM updates to their operational needs as well as subscribe to airspace constraint alerts so that changes to any constraint are immediately available.

Description: This element consists in the establishment of an information service through SWIM that serves as a replacement for the information currently provided by NOTAMs. The replacement of the current NOTAM system by this information service is expected to solve identified deficiencies such as NOTAM proliferation or the operational irrelevance of the information provided.

Maturity Level: Standardization

Human Factor Considerations:

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? No
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in | Turn-around

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	DAIM-B1/7 - NOTAM improvements

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Information exchange	Operational procedures to produce and distribute the new "NOTAM"	Updated AIM Manual of operations to include information about the new "NOTAM". Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management Doc 8126 – Aeronautical Information Services	ANSP	2025
Ground system infrastructure	Information exchange	Automated systems and infrastructure to support the provision new "NOTAM"	Automated systems and infrastructure to support the provision of dynamic AIM updates including data collection, verification and distribution.	ANSP	2025
Ground system infrastructure	Information exchange	Airspace user systems need to be updated to take advantage of the new “NOTAM”	Automated systems and infrastructure for the users to make use of the new “NOTAM”.	Airspace user	2025
Training	-	Training requirements for the provision of new "NOTAM"	Training for AIS/AIM personnel	ANSP	2025
Regulatory provisions	National regulatory framework	National framework for the provision of the new “NOTAM”	Development of State Regulatory framework to support the provision of the new “NOTAM” Reference ICAO documents: Annex 15 - Aeronautical Information Services PANS – Aeronautical Information Management Doc 8126 – Aeronautical Information Services	CAA	2025

FICE

FICE-B0/1	Automated basic inter facility data exchange (AIDC)	Information

Main Purpose: To improve the efficiency of coordination and tranfer of control between ATS units.

New Capabilities: Replacement of voice communication between ATS units by automatic message exchange.

Description: This element represents a first automation step in the evolution of the coordination and transfer of control between neighbouring ATS units to guarantee that all related and necessary flight information will be available to the other unit as per agreement.

Maturity Level: Ready for implementation

Human Factor Considerations:

1. Does it imply a change in task by a user or affected others? No
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-Pre ops | Tactical-During ops

OPERATIONS

Departure | En-route | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-technology benefit	COMI-B0/7 - ATS Message Handling System (AMHS)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Regulatory provisions	SMS	Apply SMS	Apply Safety Management System in accordance with the national requirements and guidance.	ANSP	2013
Ground system infrastructure	Flight and Flow information	HMI and FDPS	Upgrade the ground system to support the composition, exchange and processing of messages.	ANSP	2013
Operational procedures	Flight and flow information	Procedures for AIDC	Procedures for message composition and exchange. References: PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services and regional interface control (ICD) documents.	ANSP	2013
Ground system infrastructure	Flight and Flow information	Interconnectivity	Connectivity between ATSU systems through IP, AMHS, etc.	ANSP	2013
Training	Flight and Flow information	Training requirements for AIDC	Training for ATCO and CNS staff regarding AIDC.	ANSP	2013

Regulatory provisions	National regulatory framework	National regulatory framework amendment for the use of AIDC	If applicable, CAA may need to amend the national regulatory provisions on the use of AIDC. References: PANS-ATM (ICAO Doc 4444) and Regional Interface Control (ICD) documents.	CAA	2013

FICE-B2/5	Notification Service	Information

Main Purpose: To allow a service provider or operator to notify other parties of the departure or arrival of a flight.

New Capabilities: Allow the complete transition of the existing ATS messages to FIXM.

Description: The service provider or operator sends a message to other parties upon departure or arrival of a flight based on local agreement.

Maturity Level: Validation

Human Factor Considerations:

1. Does it imply a change in task by a user or affected others? Yes

2. Does it imply processing of new information by the user? Yes

It is a new method and people have to learn the new method.

3. Does it imply the use of new equipment? No

4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Departure | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	SWIM-B2/1 - Information service provision
Relation-operational need	SWIM-B2/2 - Information service consumption
Relation-operational need	SWIM-B2/3 - SWIM registry
Relation-operational need	FICE-B2/2 - Filing Service

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Information exchange model	Flight and flow information	Flight Information Exchange Model (FIXM) Version 4.2.0	References: PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services and ICAO Doc 9965- FF-ICE Manual 2nd Edition.	ANSP ATM network function	2019

Ground system infrastructure	Flight and Flow information	Capability to process FFICE data exchange	Upgrade the ground system to process FF-ICE data exchange using FIXM and including assignment/recognition of GUFI. References: PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services and ICAO Doc 9965- FF-ICE Manual 2nd Edition.	ANSP Airspace user	2024
Regulatory provisions	SMS	Apply SMS	Apply Safety Management System in accordance with the national requirements and guidance.	ANSP	2013
Operational procedures	Flight and flow information	Procedures for FF-ICE Notification Service	Procedures for provision of FF-ICE Notification Service.	ANSP	2024
Training	Flight and Flow information	Training requirements for notification service	Training requirements for flight data staff and dispatch regarding the notification service.	Airport operator ANSP Airspace user	2024
Regulatory provisions	National regulatory framework	National regulatory framework amendment for the provision and use of FF-ICE Notification Service	If applicable, CAA may need to amend the national regulatory provisions to allow the provision and use of FF-ICE Notification Service. Reference PANS-ATM (Doc 4444) and (Doc 9965, 2nd Edition).	CAA	2022

FICE-B2/7 Flight information management service for higher airspace operations

Information

Main Purpose

Higher airspace operations will have a different multi-national flavour worldwide. The FF-ICE capabilities support a strategic collaborative flight planning environment.

New Capabilities

- Trajectory operations based on the flight business/mission needs
- High level of accuracy in the strategic planning of flight business/mission intent
- Based on community flight planning rules, an operator will generate business trajectory and publically share via SWIM.
- Updates of the intended trajectory will be provided if intended trajectory deviates from the agreed trajectory

Description

A joint multi-national capability to support operations at these altitudes provides for strategic separation based on shared intent. Vehicles at these altitudes exhibit the widest range of operational conditions. They share in common the ability to provide long-term precise intent which allows for flight planning that support strategic conflict management. This ability to share long term intent as well as the lower number of participants allows this operational capability to be a shared as opposed to a centralized command and control state or regional based function.

Maturity Level

Validation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes

2. Does it imply processing of new information by the user? Yes

3. Does it imply the use of new equipment? Yes

4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Strategical | Pre-tactical | Tactical-Pre ops | Tactical-During ops

OPERATIONS

Departure | En-route | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	SWIM-B2/3 - SWIM registry
Relation-operational need	SWIM-B2/1 - Information service provision
Relation-operational need	SWIM-B2/2 - Information service consumption
Relation-information need	DAIM-B2/3 - Aeronautical information to support higher airspace operations

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Information exchange model	Flight and flow information	Flight Information Exchange Model (FIXM) Version 4.2.0	References: PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services and ICAO Doc 9965- FF-ICE Manual 2nd Edition.	ANSP, ATM network function	2019
Regulatory provisions	SMS	Apply SMS	Apply Safety Management System in accordance with the national requirements and guidance.	ANSP	2013
Operational procedures	Flight and flow information	Procedures for message composition and exchange	PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services	ANSP	2018

Ground system infrastructure	Flight and Flow information	Capability to support the assignment/recognition of GUFI	PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services	ANSP Airspace user	2018
Ground system infrastructure	Flight and Flow information	FDP system able to process FIXM	PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services	ANSP	2018
Ground system infrastructure	Flight and Flow information	FDP system that accesses AMET and DAIM information via SWIM services.	PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services	ANSP Airspace user	2018
Ground system infrastructure	Flight and Flow information	FDP System that exposes the flight information to global community via SWIM services.	PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services	ANSP	2018
Ground system infrastructure	Flight and Flow information	Capability to provide and use FF-ICE Filing Service	Upgrade to the ground system to provide and use FF-ICE Filing Service (e.g. send and process FF-ICE filed flight plans and constraints). Reference: PANS-ATM (Doc 4444) and FF-ICE Manual (Doc 9965, 2nd Edition).	ANSP Airspace user	2024
Training	Flight and Flow information	Training requirements for flight management service for higher airspace operations	Training for flight data staff and dispatch regarding the flight management service of higher airspace operations.	ANSP	2018

FICE-B2/8	Flight information management service for low-altitude operations	Information

Main Purpose

Operators at the lowest altitudes, outside of manned flight terminal operations, have unique shared operating environment to support beyond visual line of sight operations.

New Capabilities

- Operators provide intent before operating
- UTM flight trajectory requirements and exchanges (Block 1)
- A community network of intent sharing is in place to improve safe operations

Description

The large number of operations occurring in what has been traditionally a visual flight regime extends well beyond the capability from a CNS, automation and controllers to manage as a traditional IFR environment. From a flight planning management perspective these operations require the operators to share intent before flying so that they strategically de-conflict, provides for the exchange models to support these operations, and a flight management system that complements this shared environment.

Maturity Level

Validation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Pre-tactical | Tactical-Pre ops | Tactical-During ops

OPERATIONS

Departure | En-route | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	SWIM-B2/3 - SWIM registry
Relation-operational need	SWIM-B2/1 - Information service provision
Relation-operational need	SWIM-B2/2 - Information service consumption
Relation-information need	DAIM-B2/4 - Aeronautical information requirements tailored to UTM

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Information exchange model	Flight and flow information	Flight Information Exchange Model (FIXM) Version 4.2.0	References: PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services and ICAO Doc 9965- FF-ICE Manual 2nd Edition.	ANSP ATM network function	2019
Regulatory provisions	SMS	Apply SMS	Apply Safety Management System in accordance with the national requirements and guidance.	ANSP	2013
Operational procedures	Flight and flow information	Procedures for message composition and exchange	PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services	ANSP	2018

Ground system infrastructure	Flight and Flow information	Capability to support the assignment/recognition of GUFI	PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services	ANSP Airspace user	2018
Ground system infrastructure	Flight and Flow information	FDP system able to process FIXM	PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services	ANSP	2018
Ground system infrastructure	Flight and Flow information	FDP system that accesses AMET and DAIM information via SWIM services.	PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services	ANSP Airspace user	2018
Ground system infrastructure	Flight and Flow information	FDP System that exposes the flight information to global community via SWIM services.	PANS-ATM ICAO Doc 4444 - Procedures for Air Navigation Services	ANSP	2018
Training	Flight and Flow information	Training requirements for low-altitude unmanned aircraft operations	Training for flight data staff and dispatch regarding the flight management service low-altitude unmanned aircraft operations.	ANSP	2018

FICE-B2/9 Flight information management support for inflight re-planning Information

Main Purpose

To enable aircraft operators and service providers (ATFM functions) to coordinate the re-optimization of flights based upon changing circumstances. Trajectory changes are limited to those occurring beyond an operationally-appropriate horizon. Service providers (ATFM functions) provide full constraint evaluation on proposed changes.

New Capabilities

- Collaborative planning via flight information exchange applications available between traffic management and airspace users.
- Synchronization process to align trajectories for shared planning.
- Information standards and protocols for sharing network operations objectives and information exchanges supporting collaborative in-flight re-planning. Information models allow for consistent, integrated flight, flow and constraint information.
- Operator constraints that the ATM service provider can consider when re-planning.

Description

Globally consistent processes and information exchanges are applied to support collaborative inflight re-planning between the AU and ASPs, integrating applicable RSEQ and NOPS planning processes. Information exchange models (e.g., MET, Aeronautical, Flow and Flight) support the application of consistent methods for evaluation of expected impacts on flows and individual flights as circumstances change. Automated applications employ these methods in support of in-flight re-planning. The flight is cleared to the new flight plan by ATC as appropriate.

Maturity Level

Validation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

Tactical-During ops

OPERATIONS

Taxi-out | Departure | En-route | Arrival

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	FICE-B0/1 - Automated basic inter facility data exchange (AIDC)
Relation-operational need	FICE-B2/1 - Planning Service
Relation-operational need	FICE-B2/2 - Filing Service
Relation-operational need	FICE-B2/3 - Trial Service
Relation-operational need	FICE-B2/4 - Flight Data Request Service
Relation-operational need	FICE-B2/5 - Notification Service
Relation-operational need	FICE-B2/6 - Publication Service
Relation-benefit	AMET-B2/1 - Meteorological observations information
Relation-information need	AMET-B2/2 - Meteorological forecast and warning information
Relation-benefit	AMET-B2/4 - Meteorological information service in SWIM
Relation-operational need	SWIM-B2/1 - Information service provision
Relation-operational need	SWIM-B2/2 - Information service consumption
Relation-operational need	SWIM-B2/3 - SWIM registry
Relation-information benefit	SWIM-B2/4 - Air/Ground SWIM for non-safety critical information
Relation-information need	DAIM-B2/1 - Dissemination of aeronautical information in a SWIM environment
Relation-information need	DAIM-B2/2 - Daily Airspace Management information to support flight and flow

Relation-information need	DAIM-B2/5 - NOTAM replacement

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Regulatory provisions	SMS	Apply SMS	Apply Safety Management System in accordance with the national requirements and guidance.	ANSP	2013
Operational procedures	Flight and flow information	Procedures to coordinate re-optimization of flight	Procedures for flight plan evaluation, submission and clearance delivery while in-flight. Reference: PANS-ATM (Doc 4444) and FF-ICE Manual (Doc 9965, 3rd Edition)	ANSP	2025
Airborne system capability	Flight and Flow information	Flight deck communication capability	Upgrade the ground system to allow the participation of the flight deck in replanning (e.g., A/G with FOC or A/G SWIM as applicable). References: TBD	Airspace user	2025
Ground system infrastructure	Flight and Flow information	Automated capability to coordinate re-optimization of flights	Upgrade the ground system to provide applicable constraints and operational acceptability of a proposed change to a flight plan for an active flight. References: TBD	ANSP	2025
Ground system infrastructure	Flight and Flow information	Synchronization of trajectory information	Upgrade of the gorund system to enable the synchronization of trajectory information suitable for RSEQ and NOPS planning. References: TBD	ANSP	2025
Ground system infrastructure	Flight and Flow information	Provision of updated plan to ATCO position	Upgrade of the ground system to enable the provision of updated flight plan to ATCO position for clearance delivery. References: TBD	ANSP	2025
Training	Flight and Flow information	Training requirements for inflight re-planning	Training for flight data staff, dispatch, ATCOs, flight crew, AIS staff and ATM/ASM staff regarding inflight re-planning.	ANSP Airspace user	2025
Ground system infrastructure	Flight and Flow information	Enhance flight planning capability	Upgrade of the ground systems to allow the update and exchange flight plans and process constraints received. References: TBD	Airspace user	2025
Information exchange model	Flight and flow information	Flight Information Exchange Model (FIXM) Version x.x.x	Reference: PANS-ATM (Doc 4444) and FF-ICE Manual (Doc 9965, 3rd Edition)	ANSP ATM network function	2023

SWIM

SWIM-B2/1	Information service provision	Information

Main Purpose

To define the requirements for an information service provider to make aviation-related information available as an information service.

New Capabilities

Once an information service is created by an information service provider, it can be discovered by the ATM community through its service overview made available via a registry. The service overview includes metadata specifying the characteristics of the provided information service including the means by which the service is accessed by the authorized users.

SWIM Information services typically apply publish/subscribe or request/reply message exchange patterns. SWIM information services facilitate integration with automation systems.

Description

The service overview is the means for the information service provider to publicize the characteristics of an information service. Based on the service characteristics provided, potential information service consumers can evaluate whether or not to use that information service. The service overview includes, for example, a description of the information, the exchange format, the service performance, and the access rules. The service overview should be exposed preferably via a registry and available to all stakeholders, while the access to the information service may only be granted to authorized users.

An information service provider can provide information falling into one of the traditional information domains (i.e., AIM, FF-ICE, MET or surveillance), or any other information deemed appropriate.

Information service providers have to have a quality management system in place to ensure the quality of the information and the quality of the information service provided.

State aviation entities involved in civil-military cooperation and coordination –ground centres or aircraft– will be able to act as SWIM information service provider.

Maturity Level

Validation

Human Factor Considerations

PLANNING LAYERS

ATM planning | Strategical | Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in | Turn-around

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational benefit	SWIM-B2/5 - Global SWIM processes
Relation-operational benefit	SWIM-B2/3 - SWIM registry
Relation-technology need	COMI-B1/1 - Ground-Ground Aeronautical Telecommunication Network/Internet Protocol Suite (ATN/IPS)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Information exchange	Procedures for how to publish and access a service overview	Reference guidance: ICAO Doc 10039 - Future Manual on System Wide Information Management (SWIM) Vol II	ATM SWIM service provider	2021
Operational procedures	Information exchange	Procedures for defining the content of a service overview and how an information service can be discovered via a registry.	Standards and procedures: Future ICAO PANS-IM	Information service provider	2021
Operational procedures	Information exchange	Procedures for quality management system	Procedures for quality management system to ensure the quality of the information services. Reference guidance material: ICAO Doc 10039 Future Manual on System Wide Information Management (SWIM) Vol II	Information service provider	2021
Ground system infrastructure	Information exchange	Automated systems capable to provide information over an IP network following the required message exchange patterns.	Automated systems capable to exchange information: - Over IP network (OSI Layer 1 to 5) Standards and guidance material: ICAO Annex 10 - Aeronautical Telecommunications Vol III -Rules to access an IP network ICAO Doc 10039 - Future Manual on System Wide Information Management (SWIM) Vol II - Following exchange patterns required to support the service provision (e.g. publish/subscribe or request/reply) (OSI Layer 7) Guidance material: ICAO Doc 10039 - Future Manual on System Wide Information Management (SWIM) Vol II	Information service provider	2021
Ground system infrastructure	Information exchange	Automated systems with logon and authentication mechanisms	OSI Layer 5 Guidance material: ICAO Doc 10039 - Future Manual on system wide information management (SWIM)	ATM SWIM service provider	2021

Information exchange model	-	Information exchange models	Information exchange models such as FIXM, AIXM, IWXXM,... These exchange models are to be selected by the information service providers depending on the domain of the information to be provided.	Airport operator ANSP Airspace user	2018
Training	-	Training requirements for information service provision.	Training on how to define, develop and provide information services.	Information service provider ATM SWIM service provider	2021

SWIM-B2/2	Information service consumption	Information

Main Purpose

To define the requirements for an information service consumer to discover and access aviation-related information provided via information services.

New Capabilities

An information service consumer has access to a registry to discover available information services. A registry's search and filter capability helps an information service consumer discover an information service appropriate to their specific needs. The information service consumer needs to implement publish/subscribe and request/reply message exchange patterns over an internet protocol-based communication infrastructure in order to consume information services.

Description

An information service consumer makes use of a registry to discover available information services. A registry contains a listing of service overviews which provide details about the information services. The information service consumer makes use of the registry's search and filter capability to identify and select the information service appropriate to their specific needs (e.g. quality of service requirements).

Once an information service is selected, assuming that the information service consumer is authorized to access it, the information service consumer obtains the access point information and implements one of the available message exchange patterns to obtain the information. The information (e.g. AIM, FF-ICE or MET) can be readily consumed by automation systems.

State aviation entities involved in civil-military cooperation and coordination –ground centres or aircraft– will be able to act as SWIM information service consumers.

Maturity Level

Validation

Human Factor Considerations

PLANNING LAYERS

ATM planning | Strategical | Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in | Turn-around

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Relation-operational need	SWIM-B2/1 - Information service provision
Relation-operational benefit	SWIM-B2/3 - SWIM registry
Relation-technology need	COMI-B1/1 - Ground-Ground Aeronautical Telecommunication Network/Internet Protocol Suite (ATN/IPS)
Relation-operational benefit	SWIM-B2/5 - Global SWIM processes

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Information exchange model	-	Information exchange models	Information exchange models such as FIXM, AIXM, IWXXM,... These exchange models are to be selected by the information service providers depending on the domain of the information to be provided.	Airport operator ANSP Airspace user	2018
Operational procedures	Information exchange	Procedures to access registry and information services	Procedures to be followed to access the registry and how to access information services as defined in the service overview. Guidance material: ICAO Doc 10039 - Future Manual on System Wide Information Management.	Information service consumer	2021
Ground system infrastructure	Information exchange	Automated systems capable to consume information over an IP network following required message exchange patterns	Automated systems capable to exchange information: - Over IP network (OSI Layer 1 to 5) Standards and guidance material: ICAO Annex 10 - Aeronautical Telecommunications Vol III -Rules to access an IP network ICAO Doc 10039 - Future Manual on System Wide Information Management (SWIM) Vol II - Following exchange patterns required to support the service provision (e.g. publish/subscribe or request/reply) (OSI Layer 7) Guidance material: ICAO Doc 10039 - Future Manual on System Wide Information Management (SWIM) Vol II	Information service consumer	2021
Ground system infrastructure	Information exchange	Automated systems capable of accessing a registry	Guidance material: ICAO 10039 - Future Manual on System Wide Information Management (SWIM) Vol II	Information service consumer	2021

SWIM-B2/3	SWIM registry	Information

Main Purpose

A registry is a means for the information service producer to publicize and for an information service consumer to discover information services within a SWIM environment.

New Capabilities

A registry contains a listing of service overviews. It has a search and filter capability to identify and select information services, permits managing service overviews, and provides user access control mechanism.

Description

The registry is a means to link information providers with information consumers and thereby facilitates the exchange of information. The main purpose of a registry is to enable discoverability by making available a service overview describing information services in a structured and searchable format.

The registry permits an information service provider to enter and update a service overview, has a search and filter capability, and provides controlled user access. In addition, it facilitates service lifecycle management, including versioning of an information service. A registry can be provided at State, regional or multi-national levels.

State aviation entities involved in civil-military cooperation and coordination –ground centres or aircraft– will be enabled to access the SWIM registry.

Maturity Level

Ready for implementation

Human Factor Considerations

1. Does it imply a change in task by a user or affected others? Yes
2. Does it imply processing of new information by the user? Yes
3. Does it imply the use of new equipment? Yes
4. Does it imply a change to levels of automation? Yes

PLANNING LAYERS

ATM planning | Strategical | Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in | Turn-around

DEPENDENCIES AND RELATIONS

There are currently no dependencies.

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Ground system infrastructure	Information exchange	*Automated system capable of operating and managing a registry	Guidance Material: ICAO Doc 10039 - Future Manual on System Wide Information Management (SWIM) Vol II	SWIM Registry Manager	2021

Operational procedures	Information exchange	Procedures to populate the registry	Procedures to publish the service overview of an information service in the registry. Reference: Guidance material: ICAO 10039 - Future Manual on System Wide Information Management (SWIM) Vol II	SWIM Registry Manager	2021
Operational procedures	Information exchange	Procedure for registry management	Provisions addressing registry management and content. Reference: PANS-IM	SWIM Registry Manager	2021
Operational procedures	Information exchange	Procedures to find the registry	Procedures for publishing the reference to the registry that contain service overviews of the information services provided. Reference: ICAO Doc 10039 - Future Manual on System Wide Information Management (SWIM) Vol II	SWIM Registry Manager	2021
Training	-	Training requirements for SWIM registry	Training on how to set up and operate a registry for the SWIM registry manager.	SWIM Registry Manager	2021

SWIM-B2/4	Air/Ground SWIM for non-safety critical information	Information

Main Purpose

Exchange of non-safety critical information with the aircraft to improve operational awareness and efficiency.

New Capabilities

Air/Ground (A/G) SWIM leverages inflight internet connectivity (e.g., broadband) capabilities, along with the air navigation service provider's ground SWIM infrastructure, to enable information exchange with the aircraft.

Description

A/G SWIM will enable airspace users, specifically flight crew, to make information available to the air navigation service provider (ANSP), including reroute preferences and air reports / airspace conditions. A/G SWIM will also allow the flight crew to have access to more information in a timely manner. In an A/G SWIM environment, the management and use of information on-board the aircraft is expanded.

A/G SWIM expands information exchange between the aircraft (including its automation systems) and ANSPs without the constraints imposed by voice communications. A/G SWIM requires flight deck applications like electronic flight bags (EFBs) or other devices to be enabled for the exchange of information. Flight deck application access to SWIM will allow the flight crew to obtain, for example, airspace constraint information and flow restrictions to assist them in re-planning their flights, provide them with information that supports negotiation with ATFM, or enable coordination of flight plan updates initiated by an airline operations center.

State aircraft will have access to A/G SWIM to obtain and share information needed for their operations –especially when operating in civil controlled airspace–, while giving due regard for military information security aspects.

Maturity Level Validation

Human Factor Considerations

PLANNING LAYERS

Tactical-Pre ops | Tactical-During ops

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in | Turn-around

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	SWIM-B2/1 - Information service provision
Evolution	SWIM-B2/2 - Information service consumption
Relation-technology need	COMI-B1/1 - Ground-Ground Aeronautical Telecommunication Network/Internet Protocol Suite (ATN/IPS)
Relation-technology need	COMI-B2/3 - Links meeting requirements for non-safety critical communication

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Information exchange	Procedures to access registry and information services	Procedures to be followed to access the registry and how to access information services as defined in the service overview. Guidance material: ICAO Doc 10039 - Future Manual on System Wide Information Management.	Information service consumer	2021
Ground system infrastructure	Information exchange	Automated systems capable to consume information over an IP network following required message exchange patterns	Automated systems capable to exchange information: - Over IP network (OSI Layer 1 to 5) Standards and guidance material: ICAO Annex 10 - Aeronautical Telecommunications Vol III -Rules to access an IP network ICAO Doc 10039 - Future Manual on System Wide Information Management (SWIM) Vol II - Following exchange patterns required to support the service provision (e.g. publish/subscribe or request/reply) (OSI Layer 7) Guidance material: ICAO Doc 10039 - Future Manual on System Wide Information Management (SWIM) Vol II	Information service consumer	2021

Operational procedures	Information exchange	Procedures for the exchange of non-safety critical information with the aircraft	Procedures to be followed for the exchange of non-safety critical information with the aircraft. Reference: ICAO Doc 10039 - Future Manual on System Wide Information Management (SWIM) Vol II	Airspace user	2025
Airborne system capability	Information exchange	Airborne SWIM capability for exchanging non-safety critical information	Onboard systems capable of exchanging non-safety critical information (e.g. EFB).	Airspace user	2025
Ground system infrastructure	Information exchange	G/G SWIM communications between ANSP and airspace user to exchange non-safety critical information	G/G SWIM communications between ANSP and airspace user to exchange non-safety critical information.	ANSP Airspace user	2025

SWIM-B2/5	Global SWIM processes	Information

Main Purpose

SWIM governance helps establish global access to aviation-related information by connecting information service providers and consumers within a global interoperability framework.

New Capabilities

SWIM governance comprises a set of standards, policies and processes in support of, for example, rights of usage of information, quality of service aspects and trust. Within a global interoperability framework, registries will be inter-connected to provide a single access point for information services.

Description

SWIM governance comprises a set of standards, policies and processes to ensure that globally interoperable information services are provided by reliable and trusted information service providers and accessed by authorized consumers. SWIM governance helps establish confidence by addressing topics such as rights of usage and aspects related to quality of service.

The establishment of SWIM governance entails activities which can be applied at different levels (e.g., national, regional, global and organizational). These activities include establishment of a common set of standards, policies and processes for information, information services and technical infrastructure; interconnection of registries; definition and establishment of governance structures; promotion of interoperability within a global framework; definition of common processes to be followed; and definition of the transition to a SWIM environment through national or regional arrangements. The interconnection of registries will provide information consumers with a single access point at a global level to all available information services.

SWIM governance considers and supports involvement of State aviation authorities, with the aim of increasing civil-military cooperation and coordination functions in SWIM, while giving due regard for military information security aspects.

Maturity Level

Validation

Human Factor Considerations	1. Does it imply a change in task by a user or affected others? No 2. Does it imply processing of new information by the user? No 3. Does it imply the use of new equipment? No 4. Does it imply a change to levels of automation? No

PLANNING LAYERS

ATM planning | Strategical | Pre-tactical | Tactical-Pre ops | Tactical-During ops | Post operations

OPERATIONS

Taxi-out | Departure | En-route | Arrival | Taxi-in | Turn-around

DEPENDENCIES AND RELATIONS

Type of Dependencies	ASBU Element
Evolution	SWIM-B2/1 - Information service provision
Evolution	SWIM-B2/2 - Information service consumption
Evolution	SWIM-B2/3 - SWIM registry
Relation-technology need	COMI-B1/1 - Ground-Ground Aeronautical Telecommunication Network/Internet Protocol Suite (ATN/IPS)

ENABLERS

Enabler Category	Enabler Type	Enabler Name	Description / References	Stakeholders	Year
Operational procedures	Information exchange	Procedure to provide access to SWIM information consumers	Provide SWIM information consumers a single access point. Reference: Future version of ICAO Doc 10039 - Future Manual on System Wide Information Management (SWIM) Vol II.	ATM SWIM service consumer	2025
Ground system infrastructure	Information exchange	Interconnection of SWIM registries	Standards and procedures needed to interconnect registries at a local and/or regional level to form a single access point for information service consumers. Reference: Future version of ICAO Doc 10039 - Future Manual on System Wide Information Management (SWIM) Vol II.	ATM SWIM service provider SWIM Registry Manager	2025
Regulatory provisions	National regulatory framework	National Regulatory framework amendment to address SWIM governance	Standards, policy and procedures needed for SWIM governance.	CAA	2021