

Awareness workshop on the Roadmap of Aeronautical Meteorological (MET) Information in System-Wide Management (SWIM) – English Session

(Virtual, 20 March 2024)

Agenda Item 1: Update on the ASBU AMET elements applicable to the Region

DP 1.1 – Update on the ASBU elements applicable to the region in MET

(Presented by the Secretariat)

SUMMARY	
<p>This paper provides an update on the ASBU applicable elements as approved by APRG25 Meeting.</p> <p>Action by the Meeting is provided in paragraph 3</p>	
<p>REFERENCES</p> <ul style="list-style-type: none"> ▪ APIRG/24 Meeting Report ▪ APIRG/25 Meeting Report ▪ The AFI eANP Volume III 	
<i>Strategic Objectives</i>	<i>A – Safety, B – Air Navigation Capacity and Efficiency</i>

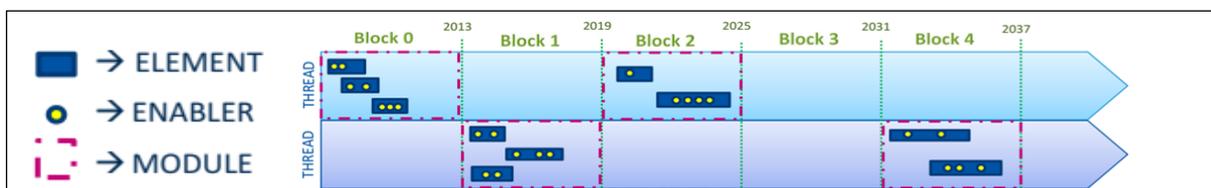
1 INTRODUCTION

1.1 The Twenty-fifth meeting of the AFI Planning and Implementation Regional Group (APIRG/25), held in Kigali, Rwanda from 7 to 11 November 2024 took Decision APIRG/25 Decision 25/10 adopting the identified ASBU Elements applicable to the region in AOP, ATM, SAR, CNS, MET and AIM and Decision 25/13 aligning the APIRG Projects references to the 6th Edition of the GANP provisions applicable to the region.

1.2 This paper provides an update on the ASBU as applicable in the MET area.

2 DISCUSSIONS

2.1. With regard to the ASBU framework, the current version of GANP is **element-oriented**, unlike the 5th version which was **module-oriented**.



- 2.2. The **ASBU Threads**: **Key feature areas of the air navigation system where improvements are needed** in order to achieve the vision outlined in the Global ATM Operational Concept
- 2.3. The ASBU Threads are being categorized in **3 groups**:
- **Operational threads**: ACDM, APTA, NOPS...
 - **Information threads**: SWIM, AMET, DAIM, FICE, ...
 - **Technology threads**: COMS, COMI, NAVS, ASUR, ...
- 2.4. An **ASBU Block** is the **end date of a six years' timeframe** that defines **a deadline for an element to be available for implementation**. *This implies, that the element and all the enablers associated to it, need to be available for implementation by the ASBU block year.*
- 2.5. **ASBU Element** is a **specific change** in operations designed to improve the performance of the air navigation system under specified operational conditions.
- 2.6. **ASBU Enablers** are the components that **enable the implementation of the element and include the standards, procedures, training, technology, etc., required to implement an element**.
- 2.7. The **purpose of enablers** is to identify the **stakeholders** involved in the implementation of an ASBU element and any necessary requirements to ensure effective implementation. Some enablers may be elements of other threads.
- 2.8. The identification of the ASBU elements, as applicable in the region was based on the:
- 1) **Level of maturity of ASBU elements**: Ready for Implementation, Standardization, Validation, Concept, etc.
 - 2) **Provisions requiring implementing the identified elements**: RANP provisions, APIRG Con. & Dec., SARPs
- 2.9. The following elements were identified as applicable in the AFI region in MET area.

AMET-B0 Global, regional and local meteorological information to support flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning.

Element ID	Element Title
AMET-B0/1	Meteorological observations products
AMET-B0/2	Meteorological forecast and warning products
AMET-B0/3	Climatological and historical meteorological products
AMET-B0/4	Dissemination of meteorological products

AMET-B1 Meteorological information supporting automated decision process or aids, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision support.

Element ID	Element Title
AMET-B1/1	Meteorological observations information
AMET-B1/2	Meteorological forecast and warning information
AMET-B1/3	Climatological and historical meteorological information
AMET-B1/4	Dissemination of meteorological information

2.10. The **Appendix 1** to this paper provides **details on the applicable ASBU MET elements identified for the region.**

3 ACTION BY THE WORKSHOP

3.1. To review the ASBU MET elements provided in Appendix 1 for comments as needed.

Appendix 3E3 - Identified ASBU elements applicable to AFI region in MET Field

ASBU Modules	ASBU Elements	Purpose of elements	Maturity level	Applicable (Yes or No)	Rational of applicability	Enablers	Stakeholders
<i>AMET-B0 Global, regional, and local meteorological information to support flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning.</i>							
	AMET-B0/1 Meteorological observations products	Provides Meteorological observations in support of flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning	Ready for implementation	Yes	<ul style="list-style-type: none"> A3 Chap. 4: §4.1.5 requires that at aerodromes with runways intended for Category II and III instrument approach and landing operations, automated equipment for measuring or assessing, as appropriate, and for monitoring and remote indicating of surface wind, visibility, runway visual range, height of cloud base, air and dew-point temperatures and atmospheric pressure shall be installed to support approach and landing and take-off operations. Annex 3 Appx. 6: §6.2.5 requires that the wind shear alerts shall be disseminated from automated, ground-based, wind shear 	<ul style="list-style-type: none"> National framework amendment for the provision of meteorological observations products Procedures for the provision of meteorological observations products Transmission of meteorological observations data from aircraft Automated systems and infrastructure to support the provision of meteorological observations products 	<ul style="list-style-type: none"> CAA ANSP MET Service Provider Aircraft Manufacturer Airport Operator ANPS MET Service Provider

ASBU Modules	ASBU Elements	Purpose of elements	Maturity level	Applicable (Yes or No)	Rational of applicability	Enablers	Stakeholders
					remote-sensing or detection equipment in accordance with local arrangements to those concerned.	<ul style="list-style-type: none"> • Training requirements for the provision of meteorological observations products 	<ul style="list-style-type: none"> • CAA • ANSP • MET Service Provider • Airport Operator
	AMET-B0/2 Meteorological forecast and warning products	Provides Meteorological forecasts, advisories and warnings in support of flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning.	Ready for implementation	Yes	<ul style="list-style-type: none"> • Annex Chap. 3: §3.2 & Appendix 2: §1.2 require for the provision of the new gridded WAFS information (e.g. Wind, Temperature, Icing, Turbulence, CB clouds. 	<ul style="list-style-type: none"> • National framework amendment for the provision of meteorological forecast products and warnings 	<ul style="list-style-type: none"> • CAA
<ul style="list-style-type: none"> • Procedures for the provision of Meteorological forecast products and warnings 						<ul style="list-style-type: none"> • ANSP • MET Service Provider 	
<ul style="list-style-type: none"> • Training requirements for the provision of meteorological forecast products and warnings 						<ul style="list-style-type: none"> • CAA • ANSP • MET Service Provider • Airport Operator 	

ASBU Modules	ASBU Elements	Purpose of elements	Maturity level	Applicable (Yes or No)	Rational of applicability	Enablers	Stakeholders
						<ul style="list-style-type: none"> Systems and infrastructure to support the provision of meteorological forecast and warning products 	<ul style="list-style-type: none"> MET Service Provider
	AMET-B0/3 Climatological and historical meteorological products	Climatological products in support of the design and planning of infrastructure, flight routes and airspace management. Historical meteorological observations, forecasts, advisories and warnings in support of incident and accident investigations	Ready for implementation	Yes	<ul style="list-style-type: none"> Annex 3 Chap 8: §8.1.1 requiring for the provision of Aerodrome climatological information and historical meteorological products in support of the design and planning of infrastructure, flight routes and airspace management. 	<ul style="list-style-type: none"> National framework amendment for the provision of climatological meteorological information products 	<ul style="list-style-type: none"> CAA
<ul style="list-style-type: none"> Procedures for the provision of climatological meteorological information products 						<ul style="list-style-type: none"> ANSP MET Service Provider 	
<ul style="list-style-type: none"> Training requirements for the provision of climatological meteorological information products 						<ul style="list-style-type: none"> CAA ANSP MET Service Provider Airport Operator 	

ASBU Modules	ASBU Elements	Purpose of elements	Maturity level	Applicable (Yes or No)	Rational of applicability	Enablers	Stakeholders
						<ul style="list-style-type: none"> Systems and infrastructure to support the provision of climatological meteorological products 	<ul style="list-style-type: none"> MET Service Provider
	AMET-B0/4 Dissemination of meteorological products	Dissemination of meteorological products in support of flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning	Ready for implementation	Yes	<ul style="list-style-type: none"> The requirements for the dissemination of OPMET messages in both TAC and digital formats as of November 2020 prescribed by Annex 3 provisions (A3 App. 3: §2.1.3; App. 6: §1.1.6 & §1.2) 	<ul style="list-style-type: none"> National framework amendment for meteorological information exchange 	<ul style="list-style-type: none"> CAA
<ul style="list-style-type: none"> Procedures for meteorological information exchange 						<ul style="list-style-type: none"> ANSP MET Service Provider 	
<ul style="list-style-type: none"> Communications infrastructure for meteorological information exchange 						<ul style="list-style-type: none"> ANSP MET Service Provider 	
<ul style="list-style-type: none"> Training for meteorological information exchange 						<ul style="list-style-type: none"> ANSP MET Service Provider 	

ASBU Modules	ASBU Elements	Purpose of elements	Maturity level	Applicable (Yes or No)	Rational of applicability	Enablers	Stakeholders
						<ul style="list-style-type: none"> ICAO Meteorological Information Exchange Model (IWXXM) V1-V2 	<ul style="list-style-type: none"> ANSP MET Service Provider

ASBU Modules	ASBU Elements	Purpose of elements	Maturity level	Applicable (Yes or No)	Rational of applicability	Enablers	Stakeholders
AMET-B1 Meteorological information supporting automated decision process or aids, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision support	AMET-B1/1 Meteorological observations information	Provides Meteorological observations information in support of automated decision processes or aids and performance based requirements, involving meteorological information, meteorological information translation, ATM impact	Standardization	Yes	<ul style="list-style-type: none"> IWXXM format became a Standard for dissemination on 5 November 2020 with the applicability of Amendment 79 to Annex 3 for the following TAC products: SIGMET, AIRMET, METAR, SPECI, TREND, TAF, VAA, TCA and SWXA. 	<ul style="list-style-type: none"> National framework amendment for the provision of meteorological observations information Procedures for the provision of meteorological observations information 	<ul style="list-style-type: none"> CAA ANSP MET Service Provider

ASBU Modules	ASBU Elements	Purpose of elements	Maturity level	Applicable (Yes or No)	Rational of applicability	Enablers	Stakeholders
		conversion and ATM decision support.			<ul style="list-style-type: none"> • Significant weather (SIGWX) forecasts, is recommended for dissemination in IWXXM as of 4 November 2021 • Furthermore, the Conclusion 23/29 of APRG/23 Established a Regional Space Weather Project to assist States with the implementation of Space Weather requirements as per the provisions of Annex 3 to Chicago Convention. 	<ul style="list-style-type: none"> • Transmission of meteorological observations information from aircraft • Automated systems and infrastructure to support the provision of meteorological observations information • Training requirements for meteorological observations information 	<ul style="list-style-type: none"> • Aircraft Manufacturer • Airport Operator • ANSP • MET Service Provider • CAA • ANSP • MET Service Provider • Airport Operator
	AMET-B1/2 Meteorological forecast and warning information	Meteorological forecast and warning information for automated support for decision processes or aids and performance based requirements, involving	Standardization	Yes	<ul style="list-style-type: none"> • The above is applied 	<ul style="list-style-type: none"> • National framework amendment for the provision of meteorological forecast and warnings information 	<ul style="list-style-type: none"> • CAA

ASBU Modules	ASBU Elements	Purpose of elements	Maturity level	Applicable (Yes or No)	Rational of applicability	Enablers	Stakeholders
		meteorological information, meteorological information translation, ATM impact conversion and ATM decision processes				<ul style="list-style-type: none"> Procedures for the provision of meteorological forecast and warnings information 	<ul style="list-style-type: none"> ANSP MET Service Provider
						<ul style="list-style-type: none"> Training requirements for Meteorological forecast and warning information 	<ul style="list-style-type: none"> CAA ANSP MET Service Provider Airport Operator
						<ul style="list-style-type: none"> Systems and infrastructure to support the provision of meteorological forecast and warning information 	<ul style="list-style-type: none"> MET Service Provider
	AMET-B1/3 Climatological and historical meteorological information	Climatological information in support of the design and planning of infrastructure, flight routes and airspace management. Historical	Standardization	Yes	<ul style="list-style-type: none"> Enhanced climatological data/Information with their associated characteristics such as metadata; required to support the design and planning of 	<ul style="list-style-type: none"> National framework amendment for the provision of climatological meteorological information 	<ul style="list-style-type: none"> CAA

ASBU Modules	ASBU Elements	Purpose of elements	Maturity level	Applicable (Yes or No)	Rational of applicability	Enablers	Stakeholders
		meteorological observations, forecasts, advisories and warnings in support of incident and accident investigations.			infrastructure, flight routes and airspace management.	<ul style="list-style-type: none"> Procedures for the provision of climatological meteorological information 	<ul style="list-style-type: none"> ANSP MET Service Provider
						<ul style="list-style-type: none"> Training requirements for climatological meteorological information 	<ul style="list-style-type: none"> CAA ANSP MET Service Provider Airport Operator
						<ul style="list-style-type: none"> Systems and infrastructure to support the provision of climatological meteorological information 	<ul style="list-style-type: none"> MET Service Provider
	AMET-B1/4 Dissemination of meteorological information	Dissemination of meteorological information in support of automated decision process or aids, involving meteorological information, meteorological information translation, ATM impact	Standardization	Yes	<ul style="list-style-type: none"> As of 5 November 2020, States were required by Annex 3 to the Convention to implement IWXXM format for the international exchange of MET information. States, ROCs and RODBs in a position to do so will begin to 	<ul style="list-style-type: none"> National framework amendment for the dissemination of meteorological information 	<ul style="list-style-type: none"> CAA
						<ul style="list-style-type: none"> Procedures for the dissemination of meteorological information 	<ul style="list-style-type: none"> ANSP MET Service Provider

ASBU Modules	ASBU Elements	Purpose of elements	Maturity level	Applicable (Yes or No)	Rational of applicability	Enablers	Stakeholders
		conversion and ATM decision support.			<p>disseminate gridded and imagery products throughout Block 1.</p> <ul style="list-style-type: none"> • RODBs to implement TAC Request/Reply and IWXXM Request/Reply Procedures. 	<ul style="list-style-type: none"> • Communication infrastructure for meteorological information exchange 	<ul style="list-style-type: none"> • ANSP • MET Service Provider
						<ul style="list-style-type: none"> • Training for the dissemination of meteorological information 	<ul style="list-style-type: none"> • CAA • ANSP • MET Service Provider • Airport Operator
						<ul style="list-style-type: none"> • ICAO Meteorological Information Exchange Model (IWXXM) V3 	<ul style="list-style-type: none"> • ANSP • MET Service Provider

ASBU Threads & Elements for AMET-B0

Element	Title	Applicability	Performance Indicators - Meteorological products /information to be provided	Performance Indicators	Target dates
AMET B0/1*	Meteorological observations products	All states	<p>Indicator: Regional average implementation status of AMET-B0/1 Meteorological observations products</p> <p>Supporting Metrics: Number of States that provide the following Meteorological observations products, as required:</p> <ol style="list-style-type: none"> 1. Automatic Weather Observation System (AWOS) information (including real-time exchange of wind and RVR data) 2. Local reports (MET REPORT/SPECIAL) 3. Aerodrome reports (METAR/SPECI) 4. Lightning Information 5. Ground-based weather radar information. 6. Meteorological satellite imagery 7. Aircraft meteorological report (ie. ADS-B, AIREP, etc.) 8. Volcano Observatory Notice for Aviation (VONA) 9. Vertical wind and temperature profiles 10. Wind shear alerts 	80%	Dec 2024
AMET B0/2	Meteorological forecast and warning products	All states	<p>Indicator: Regional average implementation status of AMET-B0/2 Meteorological forecasts and warning products</p> <p>Supporting Metrics:</p> <p>Number of States that provides the following Meteorological forecast and warning products, as required:</p> <ol style="list-style-type: none"> 1. World Area Forecast System (WAFS) gridded products. 	80%	Dec 2024

Element	Title	Applicability	Performance Indicators - Meteorological products /information to be provided	Performance Indicators	Target dates
			<ol style="list-style-type: none"> 2. Significant Weather (SIGWX) 3. Aerodrome Forecast (TAF) 4. Trend Forecast (TREND) 5. Take-off Forecast 6. Tropical Cyclone Advisory (TCA) 7. Volcanic Ash Advisory (VAA) 8. AIRMET (if applicable) 9. SIGMET 10. Aerodrome Warning 11. Wind Shear Warning 		
AMET B0/3	Climatological and historical meteorological products	All states	<p>Indicator: Regional average implementation status of AMET-B0/3 Climatological and historical meteorological products</p> <p>Supporting Metric: Number of States that provide Climatological and historical meteorological products, as required</p> <ol style="list-style-type: none"> 1. Aerodrome climatological tables 2. Aerodrome climatological summaries 3. Historical meteorological products, as required. 	80%	Dec 2024
AMET B0/4			<p>Indicator: Regional average implementation status of AMET-B0/4 Dissemination of meteorological products</p> <p>Supporting Metric: Number of States that developed capability to start exchanging meteorological information using the formats and means as required</p> <ol style="list-style-type: none"> 1. TAC 2. Gridded data 3. Graphic 	80%	Dec 2024

Element	Title	Applicability	Performance Indicators - Meteorological products /information to be provided	Performance Indicators	Target dates
			<ul style="list-style-type: none"> 4. BUFR Code 5. IWXXM(XML/GML) 6. AMHS 7. WIFS/SADIS 		

AFI REGION ASBU Threads & Elements for AMET-B1 Module Monitoring Table

Element	Title	Applicability	Performance Indicators - Meteorological products /information to be provided	Performance Indicators	Target dates
AMET B1/1*	Meteorological observations information	All states	<p>Indicator: Regional average implementation status of AMET-B1/1 Meteorological observations information</p> <p>Supporting Metrics: Number of States that provide the following SWIM-compliant observational parameters and phenomena, as required:</p> <ul style="list-style-type: none"> 1. Wind speed and direction (aerodrome) including gusts 2. Wind speed and direction from departure to Top of Climb (TOC) and then Top of Descent (TOD) to landing 3. Wind speed and direction en-route 4. Air temperature and dew point temperature (aerodrome) 5. 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) 6. Air temperature and dew point temperature (or equivalent) en-route 7. Pressure (aerodrome) (i.e. QNH/QFE) 8. Visibility (aerodrome) (horizontal, slant, vertical), Runway visual range (RVR) 9. Cloud type (of operational significance) 10. Cloud coverage, bases, tops and layers 	80%	Dec 2024

Element	Title	Applicability	Performance Indicators - Meteorological products /information to be provided	Performance Indicators	Target dates
			<ul style="list-style-type: none"> 11. Thunderstorms, Lightning, Convection (TCU & CB) 12. Precipitation (ie. drizzle, rain, freezing rain, snow, hail) 13. Weather (i.e. dust storm, sandstorm, funnel cloud, squall, smoke, haze, mist, fog) 14. Icing 15. Liquid Water Content, Iced Water Content 16. Turbulence, Mountain waves, Wind shear 17. Fronts 18. Radioactive clouds, Toxic chemicals 19. Tropical cyclones 20. Volcanic ash 21. Sulphur dioxide (SO₂) and other hazardous gases 22. Aerodrome surface (runway) temperature/state 23. Sea temperature, state and wave height (seaports) 24. Space weather events 25. Tsunami, Flood 		
AMET B1/2*	Meteorological forecast and warning information	All states	<p>Indicator: Regional average implementation status of AMET-B1/2 Meteorological forecast and warning information</p> <p>Supporting Metrics: Number of States that provide the following SWIM-compliant observational parameters and phenomena, as required</p> <ul style="list-style-type: none"> 1. Wind speed and direction (aerodrome) including gusts and operationally significant wind shifts 2. Air temperature and dew point temperature (aerodrome) 3. Upper-level Wind (speed and direction), including departure to Top of 	80%	Dec 2024

Element	Title	Applicability	Performance Indicators - Meteorological products /information to be provided	Performance Indicators	Target dates
			<p>Climb (TOC) and then Top of Descent (TOD) to landing.</p> <ol style="list-style-type: none"> 4. Upper-level Air temperature and dew point temperature or equivalent (i.e. humidity), including height of freezing level and lower tropospheric temperature inversions. 5. Flight level and temperature of tropopause 6. Geopotential altitude for flight levels 7. Pressure (aerodrome) (i.e. QNH, QFE) 8. Visibility (aerodrome), Runway visual range (RVR) 9. Cloud type (of operational significance) 10. Cloud coverage, bases, tops and layers 11. Thunderstorms, Lightning, Convection (TCU & CB) 12. Precipitation (ie. drizzle, rain, freezing rain, snow, hail) 13. Weather (i.e. dust storm, sandstorm, funnel cloud, squall, smoke, haze, mist, fog) 14. Icing (airframe and engine), 15. Liquid Water Content, Iced Water Content 16. Turbulence, Mountain waves, Wind shear 17. Fronts 18. Radioactive clouds, Toxic chemicals 19. Tropical cyclones 20. Volcanic ash 21. Sulphur dioxide (SO₂) and other hazardous gases 22. Aerodrome surface (runway) temperature, state 		

Element	Title	Applicability	Performance Indicators - Meteorological products /information to be provided	Performance Indicators	Target dates
			23. Sea temperature, state and wave height (seaports) 24. Space weather events 25. Tsunami, Flood		
AMET B1/3	Climatological and historical meteorological information	All states	<p>Indicator: Regional average implementation status of AMET-B1/3 Climatological and historical meteorological information</p> <p>Supporting Metric: Number of States that provide Climatological information services¹, including the following climatology parameters and phenomena to users as required:</p> <ol style="list-style-type: none"> 1. En-route winds 2. Airport parameters (i.e., air and surface temperature, wind, precipitation, etc.) 3. Historical meteorological observations and climatological information characteristics (Metadata) 	80%	Dec 2024
AMET B1/4	Dissemination of meteorological information	All States	<p>Indicator: Regional average implementation status of AMET-B1/4 Dissemination of meteorological information</p> <p>Supporting Metric: Number of States that Disseminate the meteorological information, using the following formats and means, as required:</p> <ol style="list-style-type: none"> 1. Tailored products (human-readable) 2. Impact-translated products 3. Gridded 4. Graphical (PNG and BUFR to be phased out) 	80%	Dec 2024

¹ Characteristics of the climatological information will include:

- Averages (daily/monthly/yearly) over 10, 20, 30, 50 years
- Extremes over 1, 5, 10, 20, 30 years, since start of measurement

Element	Title	Applicability	Performance Indicators - Meteorological products /information to be provided	Performance Indicators	Target dates
			5. ICAO Meteorological Information Exchange Model (IWXXM) format 6. AMHS 7. WIFS/SADIS		