REPORT OF THE MET/SG FOR THE DEVELOPMENT OF AFI REGIONAL AIR NAVIGATION IMPLEMENTATION ACTION PLAN

1. Introduction

1.1 The ICAO Council approved the fourth edition of the Global Air Navigation Plan (GANP) on May 2013. The Council particularly called on every ICAO Planning and Implementation Regional Group (PIRG) to:

a) Develop regional action plans with priorities and targets;

b) Determine implementation and benefit indicators/metrics; and

c) Identify implementation challenges.

1.2 The ICAO Global PIRG and Regional Aviation Safety Groups (RASG) coordination meeting held in March 2013 as well as Recommendation 6/1 of the 12th Air Navigation Conference (AN-Conf/12) requires every PIRG to develop a Regional Air Navigation Implementation Action Plan, based on the Aviation System Block Upgrades (ASBU) methodology.

1.3 ASBU implementation is to be realized through tailored regional work programmes based on specific operational needs. This work programme will be designed first by identifying the operational characteristics of the homogeneous air traffic management (ATM) areas, major traffic flows and major international aerodromes. Analysis of this operational data will identify performance improvement opportunities and ASBU modules will then be evaluated to identify which of them best deliver the needed operational improvements. Once operational analysis and resulting implementations have been completed, the next step calls for air navigation performance monitoring through an established measurement and reporting strategy

1.4 The Nineteenth Meeting of APIRG (APIRG/19) will therefore focus on the development of the Air Navigation Implementation Action Plan for the AFI region, using a structured approach as called by the GANP.

1.5 To complete these tasks, the APIRG Secretary has urged all APIRG Sub-Groups to include this activity in their agenda in preparing APIRG/19 meeting. To this end, the MET/SG is therefore requested to provide a report to be submitted to APIRG/19 for the preparation of the MET related AFI Regional Air Navigation Implementation Action Plan. As requested by the APIRG Secretary, the said report shall be structured as follows:

1) Introduction,
2) Analysis of the current situation,
3) Identification of regional priorities and targets,
4) Determination of implementation and benefit indicators/metrics; and
5) Identification of implementation challenges.
6) Alignment with the ASBU.

1.6 ASBU blocks are defined as follows: Block0: modules available now in 2013, Block1: modules to be available in 2018, Block2: modules to be available in 2023, Block3: in 2028, etc..

1.7 As described in the AN-CONF/12 report, the Performance Improvement Area 2, *Globally Interoperable Systems and Data - Through Globally Interoperable System Wide Information Management*, has:

- ✓ three modules in Block0 (B0) including **B0-105** identified as "*the Improved Meteorological Information Module: Meteorological information supporting enhanced operational efficiency and safety*";
- ✓ four modules including **B1-105** identified as "*the Enhanced Operational Decisions through Integrated Meteorological Information (Planning and Near-term Service)";* and
- ✓ two modules including **B3-105** identified as "*the Enhanced Operational Decisions through Integrated Meteorological Information (Near-term and Immediate Service)".*

1.8 In the process of alignment the regional Air Navigation Plans (ANPs), the AN-Conf/12 agreed that PIRGs is focusing initially on implementing ASBU Block0 Modules and finalize the development of their ASBU aligned regional plans by May 2014. The ASBU module related to meteorological information supporting enhanced operational efficiency and safety is called ASBU B0-105 (or B0-AMET in the 4th edition of the GANP) as defined above.

1.9 **B0-AMET: Meteorological Information Supporting Enhanced Operational Efficiency and Safety**

1.9.1 Global, regional and local meteorological information provided by world area forecast centres, volcanic ash advisory centres, tropical cyclone advisory centres, aerodrome meteorological offices and meteorological watch offices in support of flexible airspace management, improved situational awareness and collaborative decision making, and dynamically-optimized flight trajectory planning. ASBU module B0-AMET covers the following items:

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

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

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

1.9.2 In addition, quality management for aeronautical meteorological services (QMS) shall be implemented for continuous assessment and monitoring of the above-mentioned ASBU module B0-AMET items for the provision of timely, reliable and accurate meteorological information to aviation users in an efficient manner.

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

1.10 Implementation of ASBU B0-AMET in the AFI region

1.10.1 The objective of the Global Air Navigation Plan related to aeronautical meteorology is to improve the availability of meteorological information in support of a seamless global ATM system among its components (Global Plan Initiative (GPI-19 – *Meteorological systems refers*). The strategy described in the Global Plan requires that the following developments be completed and implemented during the next few years:

a) immediate access to real-time, global OPMET information is required to assist ATM in tactical decision making for aircraft surveillance and flexible/dynamic aircraft routing, which will contribute to the optimization of the use of airspace. Such stringent requirements will

imply that most meteorological systems be automated and that meteorological service for international air navigation be provided in an integrated and comprehensive manner through global systems such as the WAFS, the IAVW and the ICAO tropical cyclone warning system;

b) enhancements to WAFS, IAVW and the ICAO tropical cyclone warning system to improve the accuracy, timeliness and usefulness of the forecasts issued will be required to facilitate the optimization of the use of airspace; and

c) increasing use of data link to downlink and uplink meteorological information (through such systems as ATIS and VOLMET) will assist in the automatic sequencing of aircraft on approach and will contribute to the maximization of capacity. The development of automated ground-based meteorological systems in support of operations in the terminal area will provide OPMET information (such as automated low-level wind shear alerts) and automated runway wake vortex reports. Exchange and monitoring of OPMET information through AFI Meteorological Bulletin Exchange (AMBEX), from the automated systems also assists in the timely provision of forecasts and warnings of hazardous meteorological phenomena. These forecasts and warnings, together with automated OPMET information, contribute to maximizing runway capacity.

2. Analysis of the Current Situation

2.1 AFI States provide an aeronautical meteorological service that has been gradually improving in recent years. However, to ensure the availability of accurate, reliable and comprehensive weather information, it is imperative that t all States have the necessary equipment, properly installed and/or maintained. In this respect it is essential that States have automated systems for data verification in accordance with the requirements set out in Annex 3. While quality management systems(QMS) implementation process, are still a challenge for most States, the process of the quality of meteorological data should be the structure of Block 0.

2.2 Likewise, the lack of compliance with ICAO and WMO standards and recommendations referred to personnel involved in MET units is a deficiency that should be corrected by the States of the Region.

2.3 To obtain a well-established QMS/MET in the region any effort by ICAO will be useless if there is no full commitment and performance of the senior management of the civil aviation administrations and providers of aeronautical meteorological services.

2.4 As a cross curricular subject to all these axes, there is a requirement by the World Meteorological Organization (WMO) for personnel competencies requirements.

2.5 The current implementation status of ASBU B0-AMET varies from one State to another; a well-documented survey results may provide useful information on the status of implementation in the region. However, based on an average status of implementation recorded from the ICAO Audit Reports and AFI files on the list of air navigation deficiencies in the MET field, the current situation for the AFI region can be summarized in the Table below;

ASBU B0-AMET elements		**Average Implementation Status in %**
1. WAFS, IAVW and Tropical Cyclone Watch		
1.1	SADIS (46 out of 54 States)	85%
1.2	SADIS 2G/FTP (41 out of 46 implementing SADIS)	89%
1.3	WIFS as back up to SADIS (36 over 46 registered)	76%
1.4	Volcano observatories (VO): (only 8 VO established out of 21 states	38%

	having active or dormant volcanoes)	
1.5	VAAC for the AFI Region (Toulouse)	100%
1.6	TCAC for the AF Region (La Reunion)	100%
	2. AD WRND, WS WRNG and Alerts	
2.1	Aerodrome warnings (AD WRNG): (average of 40 out of 54 main capital city International airports issuing AD WRNG))	74%
2.2	Wind shear warnings and alert (WS WRNG) (average of 5 out of 25 capital city International airports having WS issuing WS WRNG)	20%
	3. OPMET including SIGMET, VOLMET and ATIS	
3.1	METAR	95%
3.2	SPECI	80%
3.3	MET REPORT	85%
3.4	SPECIAL	80%
	TAF	100%
3.5	MWO (34 out of 35 States expected to establish a meteorological watch office (MWO) have done so)	97%
3.6	SIGMET (22 out of 35 MWO expected to issue SIGMET are issuing SIGMET)	62%
3.7	HF VOLMET (2 out of 2 aerodromes (Brazzaville and Antananarivo) expected to issue VOLMET are not doing so)	0%
3.8	VHF ATIS (12 out of 33 aerodromes expected to issue ATIS)	36
	AMBEX implementation by Regional OPMET Data Banks (RODB): (implementation status of AMEX by the 2 AFI RODB)	90%
	AMBEX implementation by Bulletin Compiling Centres (BCC): (8 out of 10 BCC are implementing AMBEX correctly)	80%
	AMBEX implementation by National OPMET Centres (NOC): (40 out of 54 NOC are implementing AMBEX correctly)	74%
	4. QMS/MET	
4.1	QMS for MET established (13 out of 54 States established QMS)	24%
4.2	QMS for MET certified (6 out of 54 States certified QMS)	11%

3. **Identification of regional priorities and targets**

3.1 Based on the current implementation status, elements under ASBU B0-AMET are prioritized to support the safety related highest priority in ASBU methodology, the development and implementation of Performance-based Navigation (PBN), Continuous Descent Operations (CDO), Continuous Climb Operations (CCO) and Runway Sequencing capabilities (AMAN/DMAN).

3.2 In this regard, the elements of the ASBU B0-AMET module in the AFI region are prioritized and given target dates as follow:

Identification of elementary Priority	**Elements of the ASBU B0-AMET module**	**Status of Implementation**	**Implementation Target date**
1	QMS for MET established (13 out of 54 States established QMS in December 2012)	24%	75% by December 2014
2	SADIS 2G/FTP (41 out of 46 implementing SADIS in December 2012)	89%	95% by December 2014

3	Wind shear warnings and alert (WS WRNG) (average of 5 out of 25 capital city International airports having WS issuing WS WRNG in December 2012)	20%	50% by December 2014
4	SIGMET (22 out of 35 MWO expected to issue SIGMET are issuing SIGMET in December 2012)	62%	80% by December 2014
5	SADIS (46 out of 54 States registered in December 2012)	90%	95% by December 2014
6	Aerodrome warnings (AD WRNG): (average of 40 out of 54 main capital city International airports issuing AD WRNG in December 2012)	74%	80% by December 2014
7	AMBEX implementation by Regional OPMET Data Banks (RODB): (implementation status of AMEX by the 2 AFI RODB in December 2012)	90%	97% by December 2014
8	AMBEX implementation by Bulletin Compiling Centres (BCC): (8 out of 10 BCC are implementing AMBEX correctly in December 2012)	80%	95% by December 2014
9	AMBEX implementation by National OPMET Centres (NOC): (40 out of 54 NOC are implementing AMBEX correctly in December 2012)	74%	90% by December 2014
10	SPECI (in December 2012)	80%	95% by December 2014
11	SPECIAL (in December 2012)	80%	95% by December 2014
12	METAR (in December 2012)	95%	98% by December 2014
13	MET REPORT (in December 2012)	85%	98% by December 2014
14	Volcano observatories (VO): (only 8 VO established out of 21 states having active or dormant volcanoes)	38%	45% by December 2014
15	VOLMET (2 out of 2 aerodromes (Brazzaville and Antananarivo) expected to issue VOLMET are not doing so)	0%	50% by December 2014
16	ATIS (12 out of 33 aerodromes expected to issue ATIS)	36%	50% by December 2014
17	MWO (34 out of 35 States expected to establish a meteorological watch office (MWO) have done so)	97%	100% by December 2014
18	WIFS as back up to SADIS (36 over 46 registered)	76%	100% by December 2014
19	QMS for MET certified (6 out of 54 States certified QMS)	11%	75% by December 2014
20	TAF	100%	No change
21	VAAC for the AFI Region (Toulouse)	100%	No change
22	TCAC for the AF Region (La Reunion)	100%	No change

3.3 From the above elementary priorities, the overall regional priorities and targets are defined for the AFI region:

3.3.1 AFI Regional Priorities and targets for B0-AMET

1. Establishment of QMS for MET by at least 75% of AFI States for the provision of timely, reliable and accurate meteorological information to aviation users in an efficient manner;
2. Implementation of aerodrome warnings, wind shear warnings/alerts and information on the state of runway (water thickness observations on the runway) by at least 50% of concerned AFI States to support runway safety;
3. Full implementation of the AMBEX scheme by at least 97% of AFI States for exchange of OPMET information worldwide;
4. Implementation of SIGMET by 100% of AFI MWOs;
5. Implementation of WAFS/IAVW/TCAC including updated SADIS by 100% of AFI States;
6. At least 80% of MET forecasters well-trained to support the ASBU methodology;
7. Implementation of volcano observatories by at least 45% of concerned AFI States to support the AFI volcanic ash contingency plan;
8. Implementation of the issuance and distribution of OPMET by 100% of AFI States; and
9. At least 75% operation of current HF VOLMET in Brazzaville and Antananarivo and at least 50% of concerned AFI States implemented VHF ATIS.

3.3.2 Module B1-AMET is *The Enhanced Operational Decisions through Integrated Meteorological Information (Planning and Near-term Service)* module which enables the reliable identification of solutions when forecast or observed meteorological conditions impact aerodromes or airspace. Full ATM-Meteorology integration is needed to ensure that: meteorological information is included in the logic of a decision process and the impact of the meteorological conditions (the constraints) are automatically calculated and taken into account. The decision time-horizons range from minutes, to several hours or days ahead of the ATM operation (this includes optimum flight profile planning and tactical in-flight avoidance of hazardous meteorological conditions) to typically enable near-term and planning (>20 minutes) type of decision making. This module also promotes the establishment of standards for global exchange of the information. This module builds, in particular, upon module B0-105, which detailed a sub-set of all available meteorological information that can be used to support enhanced operational efficiency and safety. Therefore, AFI Regional Priorities and targets for B1-AMET will include:

1. Full automation of ground-based meteorological systems in support of operations in the terminal area will provide OPMET information (such as automated low-level wind shear alerts) and automated runway wake vortex reports;
2. Full enhanced WAFS, IAVW and the ICAO tropical cyclone warning system to improve the accuracy, timeliness and usefulness of the forecasts issued will be required to facilitate the optimization of the use of airspace
3. Full implementation of datalink related communications with aircraft including VOLMET (D-VOLMET); D-ATIS, etc..; and
4. Full implementation of automated Exchange and monitoring of OPMET information through AFI Meteorological Bulletin Exchange (AMBEX), from the automated systems also assists in the timely provision of forecasts and warnings of hazardous meteorological phenomena.

4. Determination of implementation and benefit indicators/metrics

4.1 Metrics to determine the success of the module are proposed in the Manual on Global Performance of the Air Navigation System (Doc 9883) and in the AN-CF/12 report.

4.2 Based on Doc 9883 and priorities and targets determined above, the AFI ASBU B0-AMET implementation and benefit indicators/metrics, are determined in the Table below:

Key Performance Area (KPA)	implementation and benefit indicators/metrics
Capacity	Optimized usage of airspace capacity, thus achieving arrival and departure rates. **Metric**: ACC and big AFI aerodrome throughput.
Cost effectiveness	Optimized usage of airspace capacity, thus achieving arrival and departure rates. **Metric**: ACC and aerodrome throughput
Efficiency	Harmonized arriving air traffic (en-route to terminal area to aerodrome) and harmonized departing air traffic (aerodrome to terminal area to en-route) will translate to reduced arrival and departure holding times and thus reduced fuel burn. **Metric**: Fuel consumption and flight time punctuality
Environment	Reduced fuel burn through optimized departure and arrival profiling/scheduling. **Metric**: Fuel burn and emissions
Flexibility	Supports pre-tactical and tactical arrival and departure sequencing and thus dynamic air traffic scheduling. **Metric**: ACC and aerodrome throughput.
Global interoperability	Gate-to-gate seamless operations through common access to, and use of, the available WAFS, IAVW and tropical cyclone watch forecast information. **Metric**: ACC throughput.
Participation by the ATM community	Common understanding of operational constraints, capabilities and needs, based on expected (forecast) meteorological conditions. **Metric**: Collaborative decision making at the aerodrome and during all phases of flight.
Safety	Increased situational awareness and improved consistent and collaborative decision-making. **Metric**: Incident occurrences

5. Identification of implementation challenges

5.1 Meteorological challenges in routine operations often arise as a result of adverse and rapidly changing meteorological conditions. The proposed dynamic integration of ATM and meteorological (MET) information is expected to provide timely meteorological information to enable real-time identification, increased predictability and deployment of operationally effective ATM solutions to accommodate changing conditions, as well as facilitate tactical avoidance of hazardous meteorological conditions. Increasing use of airborne capabilities to detect and report meteorological parameters, and enhanced cockpit displays of meteorological information to enhance situational awareness, are additional elements of the strategy.

5.2 In this regard, challenges in the implementation challenges of ASBU B0-AMET in the AFI region include:

- ✓ Establishment of QMS for MET for the provision of timely, reliable and accurate meteorological information to aviation users in an efficient manner;
- ✓ Implementation of aerodrome warnings, wind shear warnings/alerts and water thickness observation on the runway to support runway safety;
- ✓ Full implementation of the AMBEX scheme for exchange of OPMET information worldwide;
- ✓ Implementation of SIGMET by all AFI MWOs;
- ✓ Full implementation of SADIS by all MET providers;
- ✓ Training of MET personnel;
- ✓ Implementation of volcano observatories where required to support the AFI volcanic ash contingency plan;

- ✓ Operation of current HF VOLMET and VHF ATIS; and

6. Alignment with the ASBU

6.1 Under ASBU Block 0 modules in the AFI Region, MET information contributes to Performance Improvement Area (PIA) 1 modules B0-75 and B0-80, and PIA 3 module B0-10.

6.2 From the challenges listed in para. 5.2 above, the following items are classified as being of high priority in implementing ASBU B0-AMET in the AFI region:

1) Establishment of QMS for MET for the provision of timely, reliable and accurate meteorological information to aviation users in an efficient manner;
2) Implementation of aerodrome warnings, wind shear warnings/alerts and water thickness observation on the runway to support runway safety;
3) Full implementation of the AMBEX scheme for exchange of OPMET information worldwide;
4) Implementation of SIGMET by all AFI MWOs;
5) Full implementation of SADIS by all MET providers;
6) Training of MET personnel;
7) Implementation of volcano observatories where required to support the AFI volcanic ash contingency plan; and
8) Operation of current HF VOLMET and VHF ATIS.