INTERNATIONAL CIVIL AVIATION ORGANIZATION

TWENTY FIFTH MEETING OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP (APANPIRG/25)

Kuala Lumpur, Malaysia, 8 – 11 September 2014

Agenda Item 3: Performance Framework for Regional air navigation planning and implementation

3.5 MET

REPORT ON THE EIGHTEENTH MEETING OF MET SUB-GROUP

(Presented by the Secretariat)

SUMMARY

This paper presents outcomes from the Eighteenth Meeting of the (APANPIRG) Meteorology Sub-group (MET SG/18), held in the ICAO Regional Sub-office, Beijing, China from 18 to 22 August 2014.

This paper relates to –

Strategic Objectives:
*A: **Safety** – Enhance global civil aviation safety*
*B: **Air Navigation Capacity and Efficiency** —Increase the capacity and improve the efficiency of the global aviation system*
*E: **Environmental Protection** — minimize the adverse environment effects of civil aviation activities.*

1. INTRODUCTION

1.1 The MET SG/18 meeting was attended by fifty-seven (57) experts from Australia; Bangladesh; Bhutan; Cambodia; China; Hong Kong, China; Macao, China; Democratic People's Republic of Korea; Indonesia; Japan; Malaysia; New Zealand; Philippines; Republic of Korea; Singapore; Thailand; United Kingdom; United States; Viet Nam; the IATA and ICAO.

1.2 A total of twenty-four (24) Working Papers (WP), twenty-eight (28) Information Papers (IP) and one (1) flimsy were considered by the meeting. The MET SG/18 meeting adopted four (4) Decisions for action by the group and secretariat, and formulated six (6) Draft Conclusions for consideration for adoption by APANPIRG.

1.3 A copy of the full report from the MET SG/18 meeting, and all supporting documentation, is available at: http://www.icao.int/APAC/Meetings/Pages/2014-METSG18.aspx.

1.4 A list of acronyms and abbreviations used in this paper is provided in **Section 4**.

2. DISCUSSION

APANPIRG Follow-up on AN-Conf/12 Recommendations

2.1 The MET SG/18 meeting noted that six (6) APAC States had submitted feedback on follow-up taken on the Air Navigation Conference (AN-Conf/12) Recommendation 4/7 – *ICAO aviation system block upgrades relating to meteorological information.*

MET/14

2.2 The MET SG/18 meeting reviewed outcomes from the ICAO Meteorology Divisional Meeting (MET/14), held in Montréal between 7 and 18 July 2014, which included twenty-nine (29) recommendations setting forth global objectives and implementation timelines, and directing the course of work for enhancing the provision of meteorological service to international air navigation for the next decade or more. A copy of the executive summary of MET/14 is included in the **Attachment A** to this paper and provides brief overviews on each of the MET/14 Recommendations.

2.3 The MET SG/18 meeting noted that MET/14 Recommendations included tasking appropriate ICAO expert groups to further develop the following services for international air navigation:

- Satellite Distribution System SADIS;
- World Area Forecast System (WAFS) Internet File Service (WIFS);
- International Airways Volcano Watch (IAVW);
- Information on space weather;
- Information on the release of radioactive material into the atmosphere;
- Regional advisory system for hazardous meteorological conditions;
- Meteorological service requirements and capabilities to support ASBU implementation;
- Meteorological information integration for trajectory-based operations (TBO); and
- Meteorological information in the future system-wide information management (SWIM) environment.

2.4 The MET SG/18 meeting noted that development of provisions and guidance related to the services listed above had previously been carried out by designated ICAO global groups (WAFSOPSG, SADISOPSG, IAVWOPSG, METWSG, AMOFSG and MARIE-PT) and that, subject to review and consideration of the MET/14 recommendations by the ANC and the ICAO Council, a decision may occur over the coming few months on the establishment of a new MET Panel and the restructuring/repurposing of the MET-related expert groups to continue the global development work *(Note: with respect to the regional advisory system for hazardous meteorological conditions, this is also discussed under 2.35 and, with respect to information on space weather, this is also discussed under 2.52).*

2.5 In view of the discussion above, the MET SG/18 meeting anticipated that the ANC and ICAO Council would endorse appropriate actions – based around the outcomes of MET/14 – to foster the ongoing and future development of global provisions for the relevant aeronautical meteorological services, which would in turn guide the necessary regional objectives and implementation timelines.

WAFSOPSG/8

2.6 The MET SG/18 meeting noted that follow-up action to the Eighth Meeting of the World Area Forecast System Operations Group (WAFSOPSG/8), held in Bangkok, Thailand, from 2 to 5 September 2013, in Conclusion 8/2, included amendments to the APAC Air Navigation Plan, Volume I, Basic ANP and Volume II, FASID (Doc 9673), which rightly referred to the Secure SADIS FTP and WIFS Internet-based service and the SADIS 2G and former ISCS G2 satellite footprints, and additionally eliminated the reference to "trial forecasts" of cumulonimbus clouds, icing and turbulence for the world area forecast system (WAFS) gridded data.

2.7 The MET SG/18 meeting noted that WAFSOPSG/8 Conclusion 8/9 resulted in the update of guidance for handling WAFS SIGWX correction messages on the WAFSOPSG website *(Note: this related to the first part of MET SG/17 Decision 17/1, concerning follow-up on APANPIRG Conclusion 21/46, which is also discussed under 2.13).*

2.8 The MET SG/18 meeting also noted that the WAFSOPSG/8 meeting reported that SIGWX chart verification results are currently not available, mainly due to the limited availability of observational data required to perform adequate verification and unresolved challenges in the comparison of the simplified 'object' representations of the phenomena on SIGWX charts with the more complex nature of actual SIGWX phenomena *(Note: this related to the second part of MET SG/17 Decision 17/1, concerning follow-up on APANPIRG Conclusion 22/42, which is also discussed under 2.13).*

SADISOPSG/18 and SADISOPSG/19

2.9 The MET SG/18 meeting noted that follow-up action to the Eighteenth and Nineteenth Meetings of the Satellite Distribution System Operations Group (SADISOPSG/18 and SADISOPSG/19), held in Dakar, Senegal, from 29 to 31 May 2013 and London, United Kingdom, from 27 to 29 May 2014, included the distribution of State letters by the Regional Office to update the list of SADIS operational focal points, improve the availability of OPMET information on SADIS and review the requirements for OPMET information from non-AOP aerodromes in the APAC region.

IAVWOPSG/8

2.10 The MET SG/18 meeting noted that follow-up action to the Eighth Meeting of the International Airways Volcano Watch Operations Group (IAVWOPSG/8), held in Melbourne, Australia, from 17 to 20 February 2014 included, in Conclusion 8/2, a proposal to update the APAC FASID Table MET 3B and FASID Chart MET 2 to realign the area of responsibility of the VAACs with current requirements, and, in Decision 8/10, endorsement of the operational use of the standardized international volcano database as provided by the Smithsonian Institution.

2.11 The MET SG/18 meeting acknowledged that the roadmap developed and endorsed by the IAVWOPSG/8, in Decision 8/15, for the IAVW in support of international air navigation was subsequently adopted in the MET/14 meeting, in Recommendation 2/6, as a basis on which to further develop the requirements for the IAVW.

METWSG/5

2.12 The MET SG/18 meeting noted that follow-up action to the Fifth Meeting of the Meteorological Warnings Study Group (METWSG/5), held in Montréal, Canada, from 20 to 21 June 2013, included, in Action Agreed 5/4, the provision of a new regional SIGMET guide template to assist in the issuance or updating of regional SIGMET guides in the ICAO Regions *(Note: this is also discussed under 2.54).*

MET SG/17

2.13 The MET SG/18 meeting noted that follow-up action to the Seventeenth Meeting of the Meteorology Sub-Group (MET SG/17), held in Bangkok, Thailand, from 13 to 16 May 2013, included, in Decision 17/1, the submission of a paper to the WAFSOPSG/8 meeting (IP/7) by Hong Kong, China providing background information on WAFS administrative messages and verification of SIGWX charts to facilitate the WAFSOPSG follow-up on APANPIRG Conclusions 21/46 and 22/42 *(Note: the relevant WAFSOPSG/8 outcomes are also discussed under 2.7 and 2.8)* and, in Decision 17/4, the update of contact details for approving officials for WIFS accounts (State letter Ref.: T 4/9.5:AP124/13 refers) *(Note: this is also discussed under 2.60).*

2.14 In view of the discussion above, the MET SG/18 meeting adopted Decision 18/1 in which the follow-up action on the MET SG/17 decisions be considered closed.

APANPIRG/24

2.15 The MET SG/18 meeting reviewed the status of follow-up on MET-related APANPIRG/24 Conclusions and Decisions, details of which are included in the APANPIRG/25 WP/3 *(Note: the status of other outstanding MET-related APANPIRG Conclusions and Decisions are included in APANPIRG/25 WP/4).*

2.16 With respect to APANPIRG Conclusion 24/51, concerning the investigation and assessment of the feasibility of bilateral agreements for the provision of SIGMET services as a corrective action towards resolution of air navigation deficiencies listed in the MET field *(Note: this is also discussed under 2.26.9)*, and APANPIRG Decision 24/52, concerning a survey on the level of implementation of competency assessment, qualifications and training for meteorological personnel, the MET SG/18 meeting considered that follow-up action was still in progress.

2.17 In view of the discussion above, the MET SG/18 meeting formulated the following draft Conclusion:

Draft Conclusion (MET SG 18/2) – Follow-up to APANPIRG/24 Decisions and Conclusions

That, except for APANPIRG Conclusion 24/51 and Decision 24/52, the follow-up action on the MET-related APANPIRG/24 decisions and conclusions be considered completed.

ATM/SG/2

2.18 The MET SG/18 meeting noted that outcomes from the Second Meeting of the Air Traffic Management Sub-Group (ATM/SG/2), held in Hong Kong, China from 4 to 8 August 2014, included formulation of a draft Conclusion (ATM/SG/2/8) inviting the ICAO to provide guidance on airport operations procedures in thunderstorm conditions.

2.19 The MET SG/18 meeting also noted that the ATM/SG/2 meeting recognised the importance of planning the development of volcanic ash exercises in the APAC Region to minimise

the adverse effect on ATM of any volcanic activity *(Note: this is also discussed under 2.26.3 and 2.43-2.46)*.

50th DGCA Conference

2.20 The MET SG/18 meeting noted the importance of proper planning and implementation of meteorological facilities and services as a key enabler supporting a number of the action items from the 50th DGCA Conference that concern ATM capability development and innovation, A-CDM and ATFM, the transition from AIS to AIM, and the APAC Seamless ATM Plan.

ANRF, Seamless ATM Plan and regional priorities

2.21 The MET SG/18 meeting agreed that seminars and information sharing activities in support of seamless ATM planning (as required in accordance with the APANPIRG Decision 24/56) would assist with the coordination and input to be provided to the APAC Seamless ATM plan through the MET-related contributory bodies to APANPIRG.

2.22 The MET SG/18 meeting considered that, due to the need for further information concerning the intent of and level of detail required in the ANRF with respect to the MET input, a draft ANRF for ASBU Module B0-AMET, which is provided in the **Attachment B** to this paper, was not mature enough to be considered a final draft, but agreed that it should be forwarded to the APANPIRG, including the caveat that it was not yet mature, and requested the secretariat to coordinate further within the ICAO (in the RO, headquarters and other regions) in order to progress the work done.

2.23 The MET SG/18 meeting reviewed the regional priorities, targets and indicators developed by the Chairpersons of the Sub-Groups in accordance with the APANPIRG Conclusion 24/2 and noted that B0-AMET was not included in the initial list of priority ASBU modules selected for the APAC region.

New ANP template

2.24 The MET SG/18 meeting reviewed the new ANP template developed by the eANP WG and the proposal to develop a new APAC regional ANP based on the template and noted that the secretariat would coordinate a work plan for populating/developing the MET parts with a target date of mid-2015 for agreement on the content of a new APAC regional ANP.

Air navigation deficiencies in the MET field

2.25 The MET SG/18 meeting reviewed the list of twenty (20) MET deficiencies in the APANPIRG database; details are included in the APANPIRG/25 WP/11 (Appendix D).

2.26 The MET SG/18 meeting noted that in several cases no progress had been reported to the Regional Office on corrective actions taken by States. In particular, the MET SG/18 meeting noted lack of progress with respect to thirteen (13) MET deficiencies listed in the APANPIRG database.

2.26.1 Solomon Islands is expected to address outstanding issues related to calibration and verification of meteorological observation systems and proper/secure transmission of information to help rectify **AP-MET-01** concerning the provision of aerodrome meteorological observations and reports.

2.26.2 New Zealand advised that Kiribati has requested New Zealand to assist with the supply of a new meteorological observing system and was considering the funding options for the meteorology program, which would assist with rectification of **AP-MET-02** concerning the provision

of aerodrome meteorological observations and reports and **AP-MET-18** concerning the provision of briefing and flight documentation.

2.26.3 Future volcanic ash exercises in the APAC region would provide the opportunity to build capacity to help rectify **AP-MET-08** and **AP-MET-07** concerning the provision of SIGMET for volcanic ash in Papua New Guinea and the Philippines and **AP-MET-04** concerning the reporting of information on volcanic eruptions to civil aviation units in Papua New Guinea *(Note: this is also discussed under 2.19 and 2.43-2.46).*

2.26.4 Papua New Guinea did not participate in the 2013 SIGMET tests, which indicated lack of progress towards rectifying **AP-MET-08** and **AP-MET-22** concerning the provision of SIGMET information (for volcanic ash and other phenomena).

2.26.5 Recent analysis of the Papua New Guinea National Weather Service (conducted by Papua New Guinea, Australia and the ICAO) produced a number of recommendations for Papua New Guinea including actions that would strengthen services and help with the rectification of the MET deficiencies.

2.26.6 Lao PDR was not entirely successful in its participation in the 2013 SIGMET tests, which indicated that further progress is required for rectification of **AP-MET-12** concerning the provision of SIGMET information.

2.26.7 Solomon Islands and Nauru had not provided updates with respect to the implementation of WIFS as a corrective action towards **AP-MET-19** and **AP-MET-20** concerning the provision of briefing and flight documentation *(Note: this is also discussed under 2.33.6)* and Nauru had not provided updates with respect to the procurement and installation of an automatic weather observation system as a corrective action towards **AP-MET-21** concerning the provision of aerodrome meteorological observations.

2.26.8 An arrangement for the issuance of SIGMET on behalf of the Solomon Islands and Nauru by Papua New Guinea has not been successful towards rectifying **AP-MET-23** and **AP-MET-24** concerning the provision of SIGMET information.

2.26.9 In view of the discussion above, the MET SG/18 meeting noted that APANPIRG/24 had adopted Conclusion 24/51 to further investigate and assess the feasibility of bilateral agreements for the provision of SIGMET services as a corrective action towards resolution of air navigation deficiencies listed in the MET field. Conclusion 24/51 was intended to promote effective bilateral agreements, where necessary, as a solution, particularly where agreements adopted in the past do not currently provide an effective solution *(Note: this is also discussed under 2.16)*;

2.27 The MET SG/18 meeting was pleased to note updates provided by States on progress towards rectifying seven (7) MET deficiencies listed in the APANPIRG database.

2.27.1 Indonesia has submitted in writing an official report to the Regional Office (August 2014) providing details of the corrective action taken with respect to **AP-MET-03** concerning the provision of information on volcanic activity and **AP-MET-06** concerning the provision of SIGMET for volcanic ash.

2.27.2 Cambodia was expected to address specific training necessary for personnel to provide the WAFS products for flight documentation in order to address **AP-MET-09** concerning the provision of service for operators and flight crew members and the provision of WAFS products for flight documentation in Cambodia.

2.27.3 Cambodia has arranged for the issuance of SIGMET on its behalf by China and this has been successful in addressing part of **AP-MET-11** concerning the provision of SIGMET, while the part on establishment of a MWO is yet to be addressed.

2.27.4 Nepal has informed the Regional Office of progress towards rectifying **AP-MET-14** concerning the provision of SIGMET information, therefore the MET SG/18 meeting envisaged that Nepal will submit in writing an official report to the Regional Office providing details of the corrective action taken.

2.27.5 DPR Korea would obtain assistance from the ROBEX WG to resolve the communication issues that affected issuance of test SIGMET in 2013 and then DPR Korea would submit an official report in writing to the Regional Office providing details of the corrective action taken to rectify **AP-MET-16** concerning the establishment of a MWO and provision of SIGMET. Validation of the corrective action would necessarily require SIGMET monitoring to confirm receipt at required offices.

2.27.6 Tonga has submitted an official report in writing to the Regional Office (10 May 2013) advising that a MoU has been implemented between the appropriate authorities to help resolve **AP-MET-17** concerning the provision of volcanic activity information to ATS units, meteorological watch offices (MWO) and volcanic ash advisory centres (VAAC). New Zealand confirmed that VAAC Wellington would assist the secretariat in the validation of the corrective action.

2.28 With respect to the progress reported above, in particular concerning the relatively advanced nature of corrective actions against **AP-MET-03** and **AP-MET-06** in Indonesia, **AP-MET-17** in Tonga, **AP-MET-16** in DPR Korea and **AP-MET-14** in Nepal, the MET SG/18 meeting noted that, in accordance with the APANPIRG procedures, the Regional Office will endeavour to validate the corrective actions submitted by States in writing in official reports to the Regional Office and report to APANPIRG for review and possible removal of the MET deficiencies concerned from the open list of air navigation deficiencies.

2.29 In addition to the listed air navigation deficiencies in the MET field, the MET SG/18 meeting noted that, in view of the challenges noted previously with respect to the provision of OPMET information in Bhutan (ROBEX WG/11 agreed action 11/1 refers), details of OPMET provision were expected to be provided by Bhutan, but had still not been addressed. In view of the importance of follow-up on this matter, the MET SG/18 meeting invited the secretariat to remind Bhutan of ICAO's request for verification of the status of implementation of OPMET information in Bhutan to meet the requirements for international air navigation.

2.30 The MET SG/18 meeting reviewed OPMET data deficiencies identified and reported by the IATA and noted that most errors related to coding of time/date groups in OPMET messages and these could be eliminated or minimized through proper validation processes by the suppliers of the information before the messages are disseminated.

2.31 In view of the discussion above, the MET SG/18 meeting was pleased to note that the United States offered to make special software available, on request, to other States as a potential solution to the OPMET deficiencies in relation to coding errors in TAF identified by the IATA.

2.32 Furthermore, in view of the information provided by the IATA, the MET SG/18 meeting formulated the following draft conclusion:

Draft Conclusion (MET SG 18/4) - Improvement of OPMET data format

That, ICAO urges States to:

a) Ensure full implementation of the applicable Standards and Recommended Practices in Annex 3 with respect to the format of OPMET information; and

b) Establish and implement necessary systems to provide for the quality management of the OPMET information, which should include verification, validation and monitoring to assure that the OPMET information complies with the stated requirements.

Notes:

1) IATA requested States to ensure the percentage of OPMET issued with formatting errors should be limited to less than 3%; and

2) all OPMET provided should be made available to the SADIS and WIFS gateways in accordance with provisions in FASID Table MET 2A and the Regional SIGMET Guide.

WAFS

2.33 The MET SG/18 meeting reviewed WAFS-related updates provided by the WAFS Provider States (United Kingdom and United States), SADIS Provider State (United Kingdom), WIFS Provider State (United States), the WAFS TF chairman and Hong Kong, China, and noted the following:

2.33.1 With respect to the additional flight level (FL410) introduced for WAFS gridded forecasts, there were no changes to the horizontal grid resolution of the forecasts (i.e., 1.25 degrees x 1.25 degrees);

2.33.2 With respect to implementation of re-issuance of SIGWX and GRIB2 data for reason of corruption or error (but not amendment), implementation would be delayed until November 2014 and a 'test' account would be available for users as soon as possible;

2.33.3 With respect to discrepancies noted by users in WAFS products, the WAFC Provider States encouraged users to notify the WAFCs preferably in real-time concerning significant discrepancies (WAFS Service Reference Document refers); issues of a more generic nature should be raised directly with the WAFS TF or WAFSOPSG;

2.33.4 With respect to the results of the survey on the operational use of WAFS and WAFS training needs in the APAC region, the WAFS TF would be expected to develop appropriate follow-up actions;

2.33.5 With respect to verification of WAFS forecasts, in order to make better use of available verification data, the WAFC Provider States invited user States with raw data, where possible, to forward it on to the WAFCs to perform verification and invited the user States to work collaboratively with the WAFCs regarding verification; and

2.33.6 With respect to the provision of WIFS, the MET SG/18 meeting invited the secretariat to seek updated information on States' requirements to obtain WAFS data using the WIFS in order for the WIFS Provider State to continue to manage the service efficiently and effectively *(Note: this is also discussed under 2.26.7).*

Regional hazardous weather advisory system

2.34 The MET SG/18 meeting reviewed information provided by Japan and China concerning developments related to the concept of a regional hazardous weather advisory system.

2.35 In view of the action proposed by MET/14 in Recommendation 2/9 – *Implementation of a regional advisory system for select en-route hazardous meteorological conditions*, the MET SG/18 meeting noted that the proposed new MET Panel (i.e., if a decision is taken by the ANC to establish a MET Panel) and/or an expert group will develop the global provisions required to foster the establishment and implementation of a regional advisory system *(Note: this is also discussed under 2.3-2.4)*.

2.36 The MET SG/18 meeting was of the view that, while it would be premature to formulate definitive regional action on matters which still have to be fully worked out at the global level and that care should be taken in developing any actions when the global standards and provisions are yet to be determined, preparatory actions could be developed at the regional level with respect to advisory information for hazardous meteorological conditions, which would necessarily be subject to the outcomes of the ANC review of the MET/14 Recommendation 2/9 and would need to be in-line with any subsequent global developments.

2.37 In view of the discussion above, and the urgent need to address the safety issues related to non-issuance of SIGMET by some States within the APAC region, the MET SG/18 meeting formulated the following draft conclusion:

Draft conclusion (MET SG 18/6) – Initiatives to reduce deficiencies in SIGMET information

That, the Meteorological Hazards Task Force (MET/H TF) of the MET SG, investigate options and implement viable solutions to reduce SIGMET deficiencies in the APAC Region as a matter of urgency.

OPMET monitoring

2.38 The MET SG/18 meeting reviewed results of OPMET data monitoring for the APAC region presented by IATA on the availability of OPMET in SADIS and WIFS and noted that, in some cases, more than one TAF was valid at an aerodrome – which was not in conformance with ICAO provisions (Annex 3, 6.2.7 refers) – and that Australia was leading an investigation on the cause and a potential solution.

2.39 With respect to the OPMET monitoring results presented by the IATA, the MET SG/18 meeting formulated the following draft conclusion:

Draft Conclusion (MET SG 18/7) - Improvement of OPMET data availability for AOP aerodromes, and for non-AOP aerodromes listed in FASID Table MET 2A

That, the ICAO be invited to urge APAC States to:

a) continue efforts to improve the availability of OPMET data for AOP aerodromes, and for non-AOP aerodromes listed in FASID Table MET 2A;

b) ensure all OPMET data for AOP[1] aerodromes, and for non-AOP[2] aerodromes listed in FASID Table MET 2A, is distributed to SADIS and WIFS Provider States via RODBs; and

c) ensure only one type[3] of TAF is issued and transmitted from aerodromes.

Notes:

[1], [2] IATA's requirements with respect to availability of OPMET (METAR and TAF) are 95% [90%] for all required AOP [non-AOP] aerodromes; and

[3] IATA's requirements with respect to the period of availability and validity of TAF are F - Full: OPMET data as listed issued for the aerodrome all through the 24-hour period, and T - Requirement for 18/24-hour validity aerodrome forecasts in TAF code, i.e., FT, only.

2.40 The MET SG/18 meeting noted that the WIFS Provider State had acknowledged differences in availability of OPMET in WIFS compared with SADIS (as reported by the IATA) and would coordinate with concerned stakeholders to resolve any outstanding issues.

Digital exchange of OPMET

2.41 The MET SG/18 meeting reviewed background to the ROBEX WG/12 agreed action 12/2 – *Capacity building to foster the implementation of digital exchange*, and noted the importance of this activity and any other significant activity that the ICAO may conduct to help the APAC region prepare for the global developments in digital information exchange.

2.42 The MET SG/18 meeting also noted that some APAC States may face significant challenges in meeting the envisaged implementation milestones for digital exchange of meteorological information in 2019 and, therefore, it would be useful to monitor the implementation of the AMHS, which would provide a platform for exchange of meteorological information in a digital form.

Volcanic ash exercises

2.43 The MET SG/18 meeting noted positive outcomes from the volcanic ash exercise (VOLKAM14) conducted in Kamchatka in the far east of the Russian Federation in 2014 and that Japan proposed the conduct of similar exercise/s in the APAC region and that Indonesia indicated its preparedness to participate in such exercises *(Note: this is also discussed under 2.19 and 2.26.3)*.

2.44 The MET SG/18 meeting supported the proposal by Japan and considered the guidance provided in the ICAO Doc 9766 – *Handbook on the IAVW* (Appendix F – *Guidance for conducting volcanic ash exercises in ICAO regions*) as the appropriate basis on which to plan volcanic ash exercises.

2.45 With respect to the aforementioned guidance, the MET SG/18 meeting noted that a volcanic ash exercises steering group may be established by the PIRG to coordinate all aspects of the organization and conduct of the exercises. The steering group should have representatives from, as a minimum, the VAACs concerned, ANSPs, airspace users and regulators, but could also include representation from volcano observatories, MWOs, ACCs, NOFs and airline operations. In any case, a quorum comprising VAAC, ANSP, IATA (airspace users), CAA (regulators) and ICAO would be required initially to form an APAC volcanic ash exercises steering group.

2.46 To support the proposal by Japan (to conduct volcanic ash exercise/s in the APAC region), the MET SG/18 meeting formulated the following draft conclusion:

Draft conclusion (MET SG 18/8) – Establishment of a volcanic ash exercises steering group in the APAC region

That, the ICAO, in consultation with the MET/H TF, ROBEX WG, MET/R TF, MET SG, RACP/TF and ATM/SG as appropriate, be invited to establish a steering group comprising appropriate experts representing key stakeholders to organize and conduct volcanic ash exercises in the APAC region. The terms of reference, including composition of the group, should be based on Appendix F to the Handbook on the International Airways Volcano Watch (Doc 9766).

*Note: A preliminary/draft terms of reference is provided in the **Attachment C** to this paper (to be improved in due course through consultation among the key stakeholders).*

ATM-tailored meteorological information

2.47 The MET SG/18 meeting noted developments in Japan on ATM-tailored meteorological information for approach control areas, which may suit the type of advanced weather information required to support the improvements described in the ASBU block 1 Module B1-AMET.

Qualification and competencies of meteorological personnel

2.48 The MET SG/18 meeting noted training activity for QMS auditors provided by Australia to south-west Pacific States and congratulated Australia for its efforts in this area, but also noted the lack of necessary support from relevant authorities in some States for the implementation of ICAO Annex 3 provisions for QMS and that a lack of implementation of cost-recovery systems with respect to aeronautical meteorological services in a number of States would be a significant contributing factor to this situation.

2.49 The MET SG/18 meeting also noted developments with respect to Australia's competency assessment program for aviation forecasters and that, in addition to the aeronautical meteorological forecaster and observer competency assessment guidance information that is available at the WMO CAeM website (http://www.caem.wmo.int/moodle/), Australia would also make its policy documentation concerning aeronautical meteorological forecaster and observer competencies available to States via the Bureau of Meteorology website (www.bom.gov.au). Furthermore, the MET SG/18 meeting was encouraged by Australia's offer to provide direct guidance and assistance to States on a bilateral basis if requested with respect to implementation of an aeronautical meteorological forecaster competency programme.

2.50 In view of the discussions, and noting that the WMO requirements for aeronautical observer competencies became applicable in December 2013, the MET SG/18 meeting agreed that detailed implementation guidance would be useful for APAC States implementing aeronautical meteorological personnel competency programmes.

Meteorological satellites

2.51 The MET SG/18 meeting noted updates to the geostationary meteorological satellites and satellite imagery provided by Japan that would represent a significant step-advance in the capabilities for remote sensing applications, including the detection of volcanic eruptions, and that some States are preparing systems and coordinating on development of new applications to take advantage of the enhanced satellite capabilities.

Space weather information

2.52 The MET SG/18 meeting noted developments in the United States and China with respect to the provision of information on space weather to support air navigation in their respective States. However, the MET SG/18 meeting also recalled that the MET/14 meeting agreed the initial provisions for information on space weather, involving the establishment of space weather centres, was not yet mature enough for inclusion in Amendment 77 to Annex 3 and MET/14 Recommendation 2/7 – *Development of provisions for information concerning space weather*, recommended that an appropriate ICAO expert group should work towards enabling space weather services for aviation by developing Annex 3 provisions for inclusion in 2018 *(Note: this is also discussed under 2.3-2.4)*.

2.53 With respect to the discussion above, the MET SG/18 meeting encouraged the IAVWOPSG members, including the United States and China, to continue working towards enabling space weather services for aviation and contributing to future developments with respect to the global objectives, provisions and implementation timelines for the provision of space weather service to international air navigation.

Regional guidance material

2.54 The MET SG/18 meeting noted that the Regional SIGMET Guide template, provided by the METWSG, was being adapted for use in the APAC region *(Note: this is also discussed under 2.12)*. Noting that issues concerning consistency of procedures and other suggestions provided by States would be taken into account, the MET SG/18 meeting considered that a consolidated final draft could be promulgated by way of State letter in due course for final comments from States before adoption and publishing as the Fifth Edition of the APAC Regional SIGMET Guide.

2.55 The MET SG/18 meeting also noted that required updates were in progress for the APAC ROBEX Handbook and the APAC OPMET Data Banks Interface Control Document.

MET/ATM seminar

2.56 The MET SG/18 meeting noted the proposal for the next MET/ATM seminar in the APAC region (MET/R TF/3 Decision 3/8 refers) and was pleased to receive an offer from Japan to host an APAC MET/ATM seminar in Tokyo in 2015, which would provide the MET and ATM communities the opportunity to share ideas and experience on developments in MET to support ATM operations and to provide States the opportunity to review first-hand the newly established MET/ATM collaboration in the terminal area around Tokyo International Airport *(Note: this is also discussed under 2.61)*.

2.57 In view of the discussion above, the MET SG/18 meeting noted that the secretariat would continue to liaise with Japan to develop the proposal for the next MET/ATM Seminar, including finalizing the dates and a draft programme and seeking collaboration with the World Meteorological Organization (WMO), and formulated the following draft conclusion:

Draft conclusion (MET SG 18/9) – APAC MET/ATM seminar

That, the ICAO and Japan be invited to conduct a MET/ATM seminar in Tokyo, Japan in 2015 in coordination with the WMO and with necessary coordination between MET and ATM groups within ICAO.

Future work programme

2.58 The MET SG/18 meeting reviewed and updated the future work program of the MET SG as provided in the subject/tasks list in the MET field in the **Attachment D** to this paper.

Contact details for MET-related issues

2.59 The MET SG/18 meeting noted that lists of contact details required by the Regional Office for liaison on MET-related issues need to be kept correct and up-to-date.

2.60 With respect to the list of designated WIFS approving officials, the MET SG/18 meeting recalled that new accounts cannot be established and existing accounts cannot be changed if the WIFS Provider State is unable to contact the appropriate approving official and, therefore, invited the secretariat to obtain necessary updates to contact details of WIFS approving officials *(Note: this is also discussed under 2.13).*

Next meeting

2.61 The MET SG/18 meeting determined that the next meeting of the group (MET SG/19) should be scheduled if possible after the proposed MET/ATM seminar *(Note: this is also discussed under 2.56-2.57)* and during the period June-July 2015. Dates would need to be coordinated carefully to avoid conflict with related ICAO groups and other relevant international meetings, but opportunities should be considered for parallel or back-to-back arrangements with related meetings that could facilitate attendance by members and promote cooperation and coordination among the MET and air navigation communities.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) adopt the draft conclusions under 2.17, 2.32, 2.37, 2.39, 2.46 and 2.57; and

c) discuss any relevant matters as appropriate.

4. ACRONYMS AND ABBREVIATIONS USED IN THE PAPER

ACC	Area control centre
A-CDM	Airport collaborative decision making
AIM	Aeronautical information management
AIS	Aeronautical information service
AMHS	ATS message handling system
AMOFSG	Aerodrome Meteorological Observation and Forecast Study Group
ANC	Air Navigation Council
AN-Conf/12	Twelfth Air Navigation Conference (Montréal, 16 to 17 November 2012)
ANP	Air navigation plan
ANRF	Air navigation reporting form
ANSP	Air navigation service provider
AOP	Aerodrome operational planning
APAC	Asia and Pacific
APANPIRG	APAC Air Navigation Planning and Implementation Regional Group
ASBU	Aviation System Block Upgrades
ATFM	Air traffic flow management
ATM	Air traffic management
ATS	Air traffic services
B0-AMET	Block zero – advanced meteorological information (refers to the ASBU methodology)
B1-AMET	Block one – advanced meteorological information (refers to the ASBU methodology)
CAA	Civil aviation authority
CAeM	Commission for Aeronautical Meteorology (of the WMO)

DGCA	Director General of Civil Aviation
eANP	Electronic air navigation plan
eANP WG	eANP Working Group
FASID	Facilities and Services Implementation Document
GRIB2	GRIdded Binary edition 2 (code form standardized by the WMO)
IATA	International Air Transport Association
IAVW	International Airways Volcano Watch
IAVWOPSG	International Airways Volcano Watch Operations Group
ICAO	International Civil Aviation Organization
MARIE-PT	Meteorological Aeronautical Requirements and Information Exchange Project Team
MET	Aeronautical meteorology (or aeronautical meteorological information)
MET SG/17	Meteorology Sub-Group (of APANPIRG), Seventeenth Meeting
MET/14	Meteorology Divisional Meeting, 2014
MET/H TF	Meteorological Hazards Task Force (of MET SG)
MET/R TF	Meteorological Requirements Task Force (of MET SG)
METWSG	Meteorological Warnings Study Group, Fifth Meeting
MoU	Memorandum of understanding
MWO	Meteorological watch office
NOF	NOTAM Office
NOTAM	Notice to Airmen
OPMET	Operational meteorological information
PIRG	Planning and Implementation Regional Group (ICAO)
ROBEX	Regional OPMET Bulletin Exchange
ROBEX WG	ROBEX Working Group (of MET SG)
RODB	Regional OPMET Data Bank
SADIS	Satellite Distribution System for Information Relating to Air Navigation
SADISOPSG	Satellite Distribution System Operations Group
SIGMET	Information concerning en-route weather phenomena (ICAO Annex 3 refers)
SIGWX	Global forecasts of significant weather phenomena (ICAO Annex 3 refers)
TAF	Aerodrome forecast issued in code form (ICAO Annex 3 refers)
VAAC	Volcanic ash advisory centre
WAFC	World area forecast centre
WAFS	World area forecast system
WAFS TF	WAFS Task Force (of MET SG)
WAFSOPSG	World Area Forecast System Operations Group
WIFS	WAFS Internet File Service
WMO	World Meteorological Organization

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Meteorology (MET) Divisional Meeting
(2014)

(7 to 18 July 2014, Montréal, Canada)

EXECUTIVE SUMMARY

1. INTRODUCTION

1.1 The Meteorology (MET) Divisional Meeting of 2014 (MET/14), conjoint with the 15th Session of the World Meteorological Organization (WMO) Commission for Aeronautical Meteorology (CAeM) was held at the Headquarters of the International Civil Aviation Organization (ICAO) in Montreal, 7 to 18 July 2014. The meeting was attended by 308 participants from 95 States and 7 international organizations (the Agency for Air Navigation Safety in Africa and Madagascar (ASECNA) the Civil Air Navigation Services Organisation (CANSO) the European Union (EU), the European Organisation for the Safety of Air Navigation (EUROCONTROL), the International Air Transport Association (IATA), the International Federation of Air Line Pilots' Associations (IFALPA), and the WMO).

1.2 The Secretary of the meeting was Mr. G. Brock, Chief, Meteorology Section, ICAO assisted by Mr. D. Ivanov, Chief, Aeronautical Meteorology Division, WMO. Mr. Brock and Mr. Ivanov were assisted by Mr. R. Romero, Mr. N. Halsey, Mr. G. Vega, Mr. A. B. Okossi, Mr. V. Ahago, Mr. P. Dunda and Mr. J. Armoa as agenda item Secretaries. Other officers of the ICAO Secretariat provided advice to the meeting, as required.

1.3 The following officers were elected at the first Plenary meeting to serve both the Plenary and the MET Committee:

Chairman: Mr. P. Lechner (New Zealand)

First Vice-Chairman: Mr. W. Maynard (Canada)

Second Vice-Chairman: Mr. D. Egere (Nigeria)

2. SUPPORTING THE "ONE SKY" CONCEPT THROUGH THE ENHANCEMENT OF METEOROLOGICAL SERVICE FOR INTERNATIONAL AIR NAVIGATION

2.1 The meeting was apprised of a new (fourth) edition of ICAO's Global Air Navigation Plan (GANP) (Doc 9750) together with a companion new edition of the ICAO's Global Aviation Safety Plan (GASP) (Doc 10004), which had been approved by the ICAO Council and endorsed by the 38th Session of the ICAO Assembly in 2013. To meet the global need for airspace interoperability while maintaining its focus on safety, the meeting noted that, under the concept of "One Sky" for international air navigation, the Organization had initiated an aviation system block upgrade (ASBU) methodology as part of the GANP in order to develop a set of air traffic management (ATM) solutions or upgrades, take advantage of existing equipage, establish a transition plan, and enable global interoperability.

2.2 To ensure that the MET-specific ASBU modules were understood in the context of their relationships and interdependencies with the other modules and including those related to system wide information management (SWIM), the meeting recommended to update the GANP and ASBU methodology to reflect such interdependencies as well as including a B2-AMET module in the Block 2 timeframe covering the period 2023-2028 which had not been explicitly developed previously. (Recommendations 1/1 and 1/2).

2.3 The meeting requested ICAO to ensure that the evolution of aeronautical meteorological service provisions was in the spirit of Resolution A38-11 of the 38th Session of the ICAO Assembly and consistent with the rolling fifteen-year strategy contained in the GANP (Recommendation 1/3).

3. IMPROVING THE SAFETY AND EFFICIENCY OF INTERNATIONAL AIR NAVIGATION THROUGH ENHANCED METEOROLOGICAL SERVICE PROVISION

3.1 To support the ASBU methodology contained in the GANP the meeting agreed to develop the world area forecast system (WAFS) during the 2013 to 2028 timeframe focussed around a set of principles including the implementation of improved turbulence and icing algorithms and other forecast improvements, the use of forecast ensembles and the integration of WAFS information into the SWIM environment (Recommendations 2/1, 2/5 and 2/13 refer).

3.2 To ensure that the operation of the aeronautical fixed service (AFS) satellite distribution system for information relating to air navigation (SADIS), and the Secure SADIS FTP and WAFS Internet File Service (WIFS) Internet-based services, continue to meet user expectations the meeting recommended an appropriate ICAO expert group be tasked to further develop them in a manner consistent with the GANP. In addition, in deciding that SADIS 2G should not be extended beyond 2019, the meeting recommended that an appropriate expert group should undertake formal testing of the exchange of global OPMET information and WAFS forecasts on the ATS message handling system (AMHS) (Recommendations 2/2 and 2/3).

3.3 With regard to international airways volcano watch (IAVW), the meeting agreed that it was vital that the IAVW continue to evolve in line with the GANP. Therefore the meeting recommended that an appropriate ICAO expert group be tasked, in close coordination with WMO, to further develop the requirements for the IAVW consistent with the GANP including its integration into the future SWIM environment (Recommendation 2/6).

3.4 With regard to the development of initial provisions to meet the requirements for information concerning space weather, involving the establishment of space weather centres the meeting agreed not to include them in the draft Amendment 77 to Annex 3in view of a lack of maturity but agreed that ICAO should work towards enabling space weather services for aviation by developing Annex 3 provisions for inclusion in 2018 (Recommendation 2/7).

3.5 With regard to the dissemination of information on the release of radioactive material into the atmosphere, the meeting recommended that an appropriate ICAO expert group, in close coordination with WMO, should be tasked to further develop provisions consistent with the evolving GANP (Recommendation 2/8).

3.6 The meeting supported, in principle, the evolution of the existing WAFS and IAVW, and the further development of provisions for space weather information, release of radioactive material and toxic chemicals and other hazardous meteorological phenomena. However, the meeting agreed that it was imperative that the future management and governance of the aeronautical meteorology system serving international air navigation be assessed in relation to the overall migration to the use of digital information. (Recommendation 2/4 refers).

3.7 In view of long-standing SIGMET implementation deficiencies in some States, the meeting agreed that there was an urgent need for the establishment of regional hazardous weather advisory centres (RHWACs) to assist meteorological watch offices (MWOs) with the provision of SIGMET information for select hazardous meteorological conditions that included, as a minimum, thunderstorms, icing, turbulence and mountain waves, but which excluded volcanic ash and tropical cyclones. Therefore the meeting recommended that a regional hazardous weather advisory framework should be implemented expeditiously and requested that an appropriate ICAO expert group, in close

coordination with WMO, be tasked to develop a regional advisory system for select en-route hazardous meteorological conditions especially in those States where notable SIGMET-related deficiencies persist (Recommendation 2/9).

3.8 The meeting recommended that ICAO, in close coordination with WMO, should be tasked to include meteorological service for the terminal area and other relevant operational requirements in Block 1 and subsequent blocks of the ASBU methodology to highlight potential related impacts on air traffic flow in consideration of air traffic control and ATM (Recommendation 2/10).

3.9 To support the implementation by 2028 of module B3-AMET of the aviation system block upgrades (ASBU) methodology the meeting recommended that an appropriate ICAO expert group be tasked, in close coordination with WMO, to undertake advanced planning, in the 2015 to 2020 timeframe, of the technological requirements and aeronautical meteorological service capabilities needed (Recommendation 2/11).

3.10 To support transition to a more collaborative operating environment and increased automation, the meeting recommended the development of provisions for aeronautical meteorological information services in the context of CDM and common situational awareness (Recommendation 2/13). Additionally, the meeting recommended that ICAO and WMO should ensure that human factors considerations remain integral to aeronautical meteorological service provision during the transition. (Recommendation 2/14).

4. INTEGRATING METEOROLOGICAL INFORMATION EXCHANGE DEVELOPMENTS INTO THE FUTURE SYSTEM WIDE INFORMATION MANAGEMENT ENVIRONMENT

4.1 To support trajectory based observations (TBO), the meeting recommended that an appropriate ICAO expert group (or groups), in close coordination with WMO finalize a draft concept of operations and roadmap concerning aeronautical meteorological information integration for TBO and establish further ATM requirements and aeronautical meteorological service capabilities (Recommendation 3/1).

4.2 To support the integration of meteorological information into a future SWIM environment, to allow the ATM system to develop along with the expectations of the GANP, the meeting recommended that ICAO, through an appropriate expert group and in close coordination with WMO, develop provisions to enable the inclusion of aeronautical meteorological information in the future SWIM environment consistent with the GANP based on given milestones and guided by an appropriate roadmap. (Recommendation 3/2).

4.3 To ensure that the meteorology-related developments within the SWIM environment are fully aligned with the mandates of both ICAO and WMO, the meeting recommended ICAO, through an appropriate expert group and in close coordination with WMO, to include consideration of a number of issues including the identification and recognition of approved data sources, cost recovery and the scalability of data requirements (Recommendation 3/3).

5. INSTITUTIONAL ISSUES

5.1 The meeting recommended that ICAO and WMO undertake a thorough review of the Working Arrangements between ICAO and WMO (Working Arrangements between the International Civil Aviation Organization and the World Meteorological Organization (Doc 7475)) in order to ensure that they appropriately reflect the respective mandates, governance structures and modes of operation of the two organizations (Recommendation 4/1).

5.2 In order to clarify the use of the terms “Contracting State” and “Meteorological Authority” in certain provisions of Annex 3/Technical Regulations [C.3.1] and in related guidance material, the meeting recommended ICAO, in coordination with WMO, to further clarify the notion of meteorological authority, through appropriate amendments to ICAO provisions and supporting guidance material (Recommendation 4/2).

5.3 With regard to the oversight of aeronautical meteorological service provision, the meeting recommended ICAO to urge States to ensure that the personnel performing safety oversight functions of the aeronautical meteorological service are adequately qualified and competent, thus meeting the requirements of Annex 19, and to develop appropriate guidance material to assist States (Recommendation 4/3).

5.4 To strengthen guidance on national cost recovery, particularly in those States with complex airspace arrangements, the meeting recommended that ICAO and WMO undertake a review and, as necessary, update of guidance/guidelines on the recovery of costs of aeronautical meteorological service provision (Recommendation 4/4).

5.5 To ensure that the competency and underpinning training of the aeronautical meteorological personnel is sufficient to adapt to new working practices, the meeting tasked WMO, in coordination with ICAO, to undertake steps through the implementation of a competency framework based on quality management system principles and supported by relevant training material. (Recommendation 4/5).

5.6 To mitigate the risk of critical misunderstandings caused by language problems that may, have flight safety implications downstream, the meeting recommended that ICAO, in close coordination with WMO, consider the development of provisions concerning the required level of English language proficiency of aeronautical meteorological personnel (Recommendation 4/6).

5.7 Taking into account existing ICAO provisions and WMO Resolution 40, and appreciating that the cost for the provision of aeronautical meteorological service was entirely recoverable from aviation, the meeting recommended that ICAO and WMO remind States/Members of their obligations in respect of the provision and use of aeronautical meteorological information for aeronautical purposes only (Recommendation 4/7).

6. STANDARDS, RECOMMENDED PRACTICES AND PROCEDURES

6.1 Taking into account the discussions under Agenda Items 1 to 5 the meeting formulated a draft Amendment 77 to Annex 3/Technical Regulations [C.3.1] and consequential amendments to Annex 11, PANS-ABC and PANS-ATM (Recommendation 5/1).

6.2 Noting the need for the clear distinction between functional and performance requirements and the elaboration of those requirements through technical specifications the meeting recommended that ICAO, in coordination with WMO, undertake a restructuring of Annex 3/ Technical Regulations [C3.1] and the development of a Procedures for Air Navigation Services — Meteorology (PANS-MET, Doc xxxx). This restructure would be done as part of Amendment 78 to Annex 3 (Recommendation 5/2)

7. NEXT STEPS

7.1 In late 2014, the Air Navigation Commission (ANC) will review the recommendations of the meeting during its 197th Session, with the Council likewise taking action, as necessary, during its 203rd Session.

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1. AIR NAVIGATION REPORT FORM (ANRF)

APAC Regional planning for ASBU Modules

2. REGIONAL PERFORMANCE OBJECTIVE – ASBU B0-AMET: Meteorological Information Supporting Enhanced Operational Efficiency and Safety **Performance Improvement Area 2: Globally Interoperable Systems and Data**					
3. ASBU B0-AMET: Impact on Main Key Performance Areas					
	Access & Equity	**Capacity**	**Efficiency**	**Environment**	**Safety**
Applicable	Y	Y	Y	Y	Y

4. ASBU B0-AMET: Planning Targets and Implementation Progress	
5. Elements	**6. Targets and implementation progress (Ground and Air)**
1. WAFS	Systems implemented to receive WAFS information and to make this available to users to support flight planning, dynamic and flexible management of airspace, improved situational awareness, collaborative decision making and flight trajectory planning.
2. IAVW	Implementation of VAACs to support IAVW. Agreements in place between Volcano Observatories and VAACs.
3. Tropical cyclone watch	Implementation of TCACs to support tropical cyclone watch.
4. Aerodrome warnings	Aerodromes identified that require Aerodrome Warnings.
5. Wind shear warnings and alerts	Aerodromes identified that require wind shear warnings and/or alerts.
6. OPMET	OPMET data available as per the requirements in the Regional Air Navigation Plan.

7. ASBU B0-AMET: Implementation Challenges				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
1. WAFS	WAFS data reception system, either via satellite or internet	Nil	Operations manuals. Contingency plans.	N/A
2. IAVW	AFTN/AMHS AFS	Nil	Operations manuals. Contingency plans.	N/A
3. Tropical cyclone watch	AFTN/AMHS AFS	Nil	Operations manuals. Contingency plans.	N/A
4. Aerodrome warnings	AFTN/AMHS AFS	Nil	Operations manuals. Contingency plans.	N/A
5. Wind shear warnings and alerts	AFTN/AMHS AFS ATIS Local networks	Nil	Operations manuals. Contingency plans.	N/A

7. ASBU B0-AMET: Implementation Challenges				
Elements	**Implementation Area**			
	Ground System Implementation	**Avionics Implementation**	**Procedures Availability**	**Operational Approvals**
6. OPMET	AFTN/AMHS AFS	Nil	Operations manuals. Contingency plans.	N/A

8. ASBU B0-AMET Performance Monitoring and Measurement **8A. ASBU B0-AMET: Implementation Monitoring**	
Elements	**Performance Indicators/Supporting Metrics**
1. WAFS	% of required States receiving WAFS and making this available to users.
2. IAVW	% of designated VAACs implemented. % of designated volcano observatories implemented.
3. Tropical cyclone watch	% of designated TCACs implemented.
4. Aerodrome warnings	% of the required aerodromes providing Aerodrome Warnings.
5. Wind shear warnings and alerts	% of the required aerodromes providing Wind Shear Warnings and/or Alerts.
6. OPMET	% availability, reliability and compliance of METAR/SPECI and TAF. Number of FIRs covered by SIGMET.

8. ASBU B0-AMET. Performance Monitoring and Measurement **8 B. ASBU B0-AMET: Performance Monitoring**	
Key Performance Areas	**Metrics (if not indicate qualitative Benefits)**
Access & Equity	Not applicable
Capacity	Optimized usage of airspace and aerodrome capacity due to MET support
Efficiency	Reduced arrival/departure holding time, thus reduced fuel burn due to MET support
Environment	Reduced emissions due to reduced fuel burn due to MET support
Safety	Reduced incidents/accidents in-flight and at aerodromes due to MET support.

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APAC VOLCANIC ASH EXERCISES STEERING GROUP

DRAFT TERMS OF REFERENCE

VISION

Maintain safety, regularity and efficiency of aviation in the event of a volcanic eruption.

OBJECTIVES

Coordinate all aspects of the organization and conduct of volcanic ash exercises in the APAC region in order to:

1. Test volcanic activity alerting, AIS and MET message routing, volcanic ash information, air traffic control procedures, air traffic flow and capacity management and aircraft operator response and the CDM between the various actors in accordance with regional and global procedures. The exercises should be designed to:

    a) practice the conduct of volcanic activity response in accordance with the regional reference documents;

    b) verify existing information, AIS and MET message routing via AFTN addresses, relevant e-mail addresses, telephone and fax numbers, and internet addresses (URLs);

    c) maintain appropriate information and message routing between all involved agencies and organizations;

    d) provide volcanic activity response training for key personnel involved;

    e) allow regulators to assess the preparedness and operational response in terms of planning, process and procedures of operators; and

    f) provide, when appropriate, recommendations for amendment of the reference documents, in accordance with the lessons learned and conclusions contained in the final exercise report.

2. Ensure that detrimental effects of exercises on the aviation system performance are avoided, but that nevertheless useful experience and information is generated; and

3. Practice and develop inter-agency response to volcanic activity.

SCOPE

There is significant regional variation in the nature, frequency, observation of and response to volcanic eruptions. As the APAC region encompasses much of the volcanically active zone known as the “Ring of Fire”, there are several States where regular air traffic flow is at risk from encounters with volcanic ash.

The IAVW was established globally to mitigate the risks; however the diverse nature of the APAC region, in terms of both its geography and its communities, is reflected by the diverse challenges faced in responding to volcanic ash events. Therefore, each exercise may have different objectives, which the scenario will be designed to address. For example, any or all of the activities listed below may be tested depending on the scope of the individual exercise:

a) AFTN, e-mail addresses, websites, message routing and voice communications;
b) alerting and observation of ash (e.g. use of VONA and VAR);
c) VAAC response (e.g. volcanic ash information);
d) ATS response (including air traffic control and AIS for NOTAM issuance);
e) ATM response;
f) aircraft operator response (including safety risk assessment);
g) MWO response (i.e. SIGMET); and
h) suitability of information, its frequency, format and content.

DELIVERABLES

The steering group is expected to:

1. Appoint an exercise leader for volcanic ash exercise/s

2. Conduct planning meetings for volcanic ash exercise/s (initial exercise to be conducted in 2015)

3. Publish volcanic ash exercise directive/s, including:

    - ✓ Scenario/s – location/s should cover an area/s that could be affected by volcanic ash and the time/period/s should ensure volcanic ash would impact international routes

    - ✓ Procedures/instructions

    - ✓ Participants

4. Conduct volcanic ash exercise/s (initial exercise to be conducted in 2015)

5. Conduct debrief meeting/s to review the volcanic ash exercise/s, including:

    - ✓ Discuss reports

    - ✓ Review the lessons learnt

    - ✓ Revise and improve the volcanic ash exercise directive/s (based on lessons learnt)

    - ✓ Recommend improvements to the regional volcanic ash ATM contingency plan

    - ✓ Recommend improvements to global ICAO provisions and forward to APANPIRG and/or IAVWOPSG

    - ✓ Update the future work plan – for subsequent volcanic ash exercise/s

    - ✓ Consolidated report to the appropriate Sub-Group/s and APANPIRG

STAKEHOLDERS, ROLES and RESPONSIBILITIES

STAKEHOLDERS / STAKEHOLDER GROUPS[1]	**ROLES**	**RESPONSIBILITIES**
Air navigation service providers (ANSP)[2] ~~(ACC/AIS/NOF)~~	Participant	Inform aircraft, issue ASHTAM/NOTAM, activate contingencies, forward special air-reports
Airport operators	Participant	Tactical response
Airspace users	Participant	Tactical response
ICAO	Facilitator	Support the steering group, meetings and exercises ~~support~~
Meteorological watch offices (MWO)	Participant	Provide MET watch, issue SIGMET, supply information on volcanic ash (VA)
Regional OPMET Data Banks (RODB)	Support	OPMET exchange
Regulators	Participant	Regulations
Volcanic ash advisory centres (VAAC)	Participant	Issue volcanic ash advisory information (VAA) including graphical format (VAG)
Volcano observatories	Participant	Send information on volcanic activity including Volcano Observatory Notice for Aviation (VONA)

Minimum representation (bold type underlined) required for a quorum for ~~in~~ the volcanic ash exercises steering group[3].

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[1] Includes relevant industry organizations (CANSO, IATA, AIC, IFALPA)

[2] Includes air traffic management (ATM), area control centres (ACC), aeronautical information services (AIS) and NOTAM offices (NOF)

[3] Note: A representative from each stakeholder group should be involved as necessary during each phase (planning, conducting, debrief) of volcanic ash exercises.

Revised 11/09/2014

SUBJECT/TASKS LIST IN THE MET FIELD

Updated by MET SG/18

The priorities assigned in the list have the following connotation:
A = Tasks of a high priority on which work should be expedited;
B = Tasks of medium priority on which work should be under taken as soon as possible but not to the detriment of Priority "A tasks; and
C = Tasks of medium priority on which work should be undertaken as time and resources permit but not to the detriment of priority "A" and "B" tasks.
TOR = Terms of Reference of the Sub-Group

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
1 (32)	RAN/3 C.8/14 APANPIRG/14 (TOR 3)	A-Safety Sustainability GPI-19	Subject: Inadequate implementation of procedures for advising aircraft on volcanic ash (VA) and tropical cyclones (TC) and other hazardous weather Task: Monitoring of the implementation of meteorological advisories and warnings which includes VA and TC	A	Monitor and provide assistance in the implementation of meteorological advisories and warnings procedures to ensure provision of timely information on weather hazardous to aircraft. Monitor outcomes of ICAO global groups and WMO for developing framework of contingency plan for specific phenomenon including VA, TC, radioactive cloud and Tsunami for the Region (coordinate with MET/R TF and RACP/TF as necessary)	MET SG (MET/H TF)	On going

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
2 (36)	APANPIRG D. 4/46 RAN/3 C.12/3 APANPIRG 5/3 (TOR 3)	C- Sustainability All GPIs	Subject: Provision of adequate MET services Task: Monitor performance based systems research and development, trials and demonstrations in the fields of MET and facilitate the transfer of this information and expertise between States.	A	1) Encourage States to conduct R&D, trials & demonstrations of new MET services; 2) Monitor global developments that may have beneficial consequences on regional planning activities; 3) Consolidate information on new capabilities in the CNS/ATM system, for the Sub-Group's review and action; 4) Serve as a focal point for review of ongoing work of regional formal and informal working groups that is relevant to MET; 5) Provide for coordinated training/seminars to keep all States informed on developments of trials and demonstrations.	MET SG	On-going

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
3 (37)	C 12/24	C- Sustainability GPI-19	Subject : Transition to the GRIB and BUFR coded WAFS products Task : Implementation of the transition to the GRIB and BUFR coded WAFS products	A	1) Monitoring of implementation of BUFR coded SIGWX forecasts 2) Monitoring of the migration to SADIS 2G 3) Assist in preparation for the new gridded products for turbulence, icing and cumulonimbus 4) Monitoring of the implementation of WIFS until cessation of ISCS G2 broadcast	MET SG (WAFS TF)	Completed Completed Completed Completed
4 (38)	C12/36 APANPIRG C14/45	C- Sustainability GPI-19	Subject: Developing the new requirements for MET products and services in support of ATM	A	1) Development of the initial draft of the MET Chapter; 2) Development of the MET components of the CNS/ATM concept/ strategy; 3) Inclusion of ATM requirements for MET information in the CNS/ ATM Plan; 4) MET/ATM Coordination Seminar – February 2006. 5) Conduct survey on ATM requirements for MET information	MET SG (MET/R TF)	Completed Completed Completed Completed 2014

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
					6) MET/ATM meeting in 2009 7) MET/ATM seminar in 2010 (in coordination with WMO) 8) MET/ATM seminar and MET/R TF meeting		Completed Completed 2013 Completed 2015 Planning
5 (39)	APANPIRG/13 D 13/28	A - Safety C- Sustainability GPI-19	Subject: To increase the OPMET availability and reliability needed for flight planning (efficiency) and in-flight planning (safety) of the regional and inter-regional OPMET exchange from the ASIA/PAC Region Task: Review and optimize the ROBEX scheme and other OPMET exchanges; introduce monitoring and management procedures for the ROBEX centres and Regional OPMET data banks	A	1) Review regional guidance material related to OPMET data; 2) Identify gaps in processes, procedures and OPMET exchange; 3) Improve the availability of OPMET data at the Regional OPMET Data Banks (RODB) and WAFS Provider States; 4) Improve the timeliness and regularity of exchange; 5) Facilitate and monitor the migration to AIM and new MET codes (eg. XML); 6) Review the current RODB structure in light XML implementation	MET SG (ROBEX WG)	Recurrent task Recurrent task Recurrent task Recurrent task 2014-2016 2014-2016

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
6 (43)		C- Sustainability GPI17,18,19,22	Subject: Implementation of data link Task: Encourage implementation	A	Encourage States to implement CPDLC, D-ATIS, D-VOLMET, PDC and DPC	MET SG CNS SG	
7 (45)	APANPIRG List of deficiencies	A – Safety GPI - 19	Subject: Implementation of SIGMET Task: Improve regional procedures and availability of SIGMET from ASIA/PAC States	A	1) Assist States in implementing SIGMET requirements; 2) Conduct regular SIGMET tests; 3) Review and update training and guidance material; 4) Regular monitoring on the availability and quality of SIGMET and advisories.	MET SG (MET/H TF in coordination with ROBEX WG)	Recurrent task Recurrent task Recurrent task Recurrent task

*** Number in bracket indicates sequential number since establishment of the Sub-group.**

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