

**INTERNATIONAL CIVIL AVIATION ORGANIZATION  
ASIA AND PACIFIC OFFICE**



**REPORT OF THE  
TWENTY-FIFTH MEETING OF THE ASIA/PACIFIC METEOROLOGY SUB-GROUP  
(MET SG/25)**

**Online, 18-22 October 2021**

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The views expressed in this Report should be taken as those of the Meeting and not the Organization.

Approved by the Meeting  
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## HISTORY OF THE MEETING

### 1. Introduction

1.1. The ICAO Asia and Pacific (APAC) Office hosted the Twenty-Fifth Meeting of the Meteorology Sub-group (MET SG/25) of the APAC Air Navigation Planning and Implementation Regional Group (APANPIRG) online from 18 to 22 October 2021.

### 2. Attendance

2.1. One-hundred and forty-one (141) participants from twenty-six (26) States and Special Administrative Regions and three (3) International Organisations (as listed below<sup>1</sup>) registered to participate in the Meeting. The list of registered participants is provided in **Appendix A** of this Report.

### 3. Chair and Secretariat

3.1. Mr Jun Ryuzaki (incumbent Chairperson of MET SG) presided over the first session of the Meeting in the role of Chairperson. Ms Sharon Lau (incumbent Vice-Chairperson of MET SG) presided over the remaining sessions of the Meeting in the role of Chairperson. Mr Pak-wai Chan (new Chairperson elect) and Ms Nguyen Lan Oanh (new Vice-Chairperson elect) assisted Ms Lau. Mr Peter Dunda, ICAO Regional Officer, Aeronautical Meteorology and Environment, acted as Secretary of the Meeting.

### 4. Organisation and language of the Meeting

4.1. The Meeting convened as a single body for discussion on the agenda items. The working language was English, including all documentation. The Meeting considered twenty-two (22) working papers (WPs) and twenty (20) information papers (IPs). The list of papers is in **Appendix B** of this Report.

### 5. Draft Conclusions, Conclusions, Draft Decisions and Decisions

5.1. The Meeting recorded its outcomes in the form of Draft Conclusions, Conclusions, Draft Decisions and Decisions within the following definitions:

- a) **Draft Conclusions** (formulated by the Sub-group for further consideration by APANPIRG) deal with matters involving economic, environmental or political aspects, or global implications, that, according to the APANPIRG terms of reference, will not be dealt with by the Sub-group but require the attention of States, or action by the ICAO, following established APANPIRG procedures;
- b) **Conclusions** (adopted by the Sub-group) deal with matters of a technical nature and regional applicability that, according to the Sub-group's terms of reference, require the attention of States, or action by the ICAO, following established APANPIRG procedures; and
- c) **Draft Decisions** (formulated by the Sub-group for further consideration by APANPIRG) deal with matters of concern only to the APANPIRG and its contributory bodies;
- d) **Decisions** (adopted by the Sub-group) relate solely to matters dealing with the internal

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<sup>1</sup> Australia, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Hong Kong China, Macao China, Fiji, India, Indonesia, Japan, Lao PDR, Malaysia, Maldives, Mongolia, New Zealand, Pakistan, Philippines, Republic of Korea, Singapore, Solomon Islands, Sri Lanka, Thailand, United States, Viet Nam, IATA, WMO and ICAO.

working arrangements of the Sub-group.

5.2. The Meeting formulated the following **three (3) Draft Conclusions**, adopted the following **three (3) Conclusions**, formulated the following **one (1) Draft Decision**, and adopted the following **four (4) Decisions**:

Draft Conclusions (3)

<b>Draft Conclusion MET SG/25-03: Updating Online Register of IWXXM Exchange Status</b>	
That, States/Administrations provide timely updates to the Online Register of IWXXM Exchange Status on the latest status of AMHS capability for IWXXM exchange among ROCs and NOCs, and the availability of IWXXM MET reports.	Expected impact: <input checked="" type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: To inform users and Regional OPMET Bulletin Exchange Scheme participants of each States' ability to generate and receive IWXXM over the required communication links and facilitate the Region-wide implementation of IWXXM exchange.	
When: Now	Status: Draft to be adopted by PIRG
Who: <input type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

<b>Draft Conclusion MET SG/25-07: SWIM architecture to enable the cost-effective and efficient provision and consumption of MET information services</b>	
That, APAC SWIM TF ensures it defines a SWIM architecture, corresponding technical infrastructure requirements, and implementation approach that continues to enable the cost-effective and efficient provision and consumption of MET information services to all users to support aviation safety and air navigation capacity and efficiency, in consideration of use cases of highly data-intensive MET information services.	Expected impact: <input checked="" type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: SWIM architecture, principally over CRV, might not provide a cost-effective and efficient solution for all use cases envisaged in ICAO's global plans, in particular after commencement of the provision of highly data-intensive quantitative and probabilistic MET information services and enable access from anywhere in the globe.	
When: Now	Status: Draft to be adopted by PIRG
Who: <input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

<b>Draft Conclusion MET SG/25-09: Update on the provision of Space Weather Advisory</b>	
That, States/Administrations urgently implement or adjust their systems to enable the forwarding of space weather advisories (in TAC and IWXXM form) as appropriate to users.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input checked="" type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: CRC will commence operation with effect from 16 November 2021, and the WMO message headers for TAC and IWXXM format SWX advisory messages were updated to have separate headers for each space weather impact type.	
When: Now	Status: Draft to be adopted by PIRG

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Who:             Sub groups    APAC States    ICAO APAC RO    ICAO HQ    Other: ROs

Conclusions (3)

<b>Conclusion MET SG/25-01: Publishing of IWXXM Frequently Asked Questions</b>	
That, MET SG approves the IWXXM Frequently Asked Questions in Appendix E of the MET SG/25 Report and requests the Secretariat to arrange its publishing on the ICAO APAC Office e-Documents website.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why:            To assist States in the implementation of IWXXM.	
When:            Now	Status:            Adopted by Subgroup
Who: <input type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

<b>Conclusion MET SG/25-10: Update to <i>Regional Guidance for Tailored Meteorological Information and Services to Support ATM Operations</i></b>	
That, MET SG approves the updates to the <i>APAC Regional Guidance for Tailored Meteorological Information and Services to Support Air Traffic Management Operations</i> in Appendix G of the MET SG/25 Report, for use by States, including the proposed updates to the format for the Appendices (1 and 2) of the guidance, the document maintenance procedure and the format for publishing the guidance on the ICAO APAC Office Website.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why:            To provide States with up to date guidance material and make the updated version available on the ICAO APAC “eDocuments” website.	
When:            Now	Status:            Adopted by Subgroup
Who: <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

<b>Conclusion MET SG/25-11: Updates to <i>Regional SIGMET Guide</i></b>	
That, MET SG approves the updates to the SIGMET Guide in Appendix H of the MET SG/25 Report for use by States and for publishing on the ICAO APAC Office website.	Expected impact: <input type="checkbox"/> Political / Global <input checked="" type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why:            To harmonise the ICAO APAC Regional SIGMET Guide with SIGMET Guide in the ICAO EUR Region, including guidance on IWXXM format relevant to SIGMET information.	
When:            Now	Status:            Adopted by Subgroup
Who: <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

Draft Decisions (1)

<b>Draft Decision MET SG/25-08: Meteorological expert contribution to SWIM/TF</b>
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MET SG/25  
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That, States consider identifying meteorological experts to contribute to the APAC SWIM/TF to ensure meteorological aspects are fully considered.		Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: Currently, few members of the SWIM/TF come from a meteorological background. The SWIM/TF would benefit from a greater understanding of the requirements and plans for meteorological information services.		
When: Now	Status: Draft to be adopted by PIRG	
Who: <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs		

Decisions (4)

<b>Decision MET SG/25-02:</b> Review the consistency in terminology and reporting format of the working groups		
That, ICAO Secretariat, the MET SG Chair/s and its subsidiary Working Group Chair/s, undertake a review of the terminology and reporting format of the working groups.		Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: For consistency in the reporting of progress.		
When: Now	Status: Adopted by Subgroup	
Who: <input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs		

<b>Decision MET SG/25-04:</b> MET Deficiencies ad hoc group TOR		
That, MET/S WG ad hoc group, formed to work with relevant members of the MET/IE WG, utilises the guidance in the APANPIRG Procedural Handbook, Part V: <i>Uniform methodology for the identification, assessment and reporting of air navigation shortcomings and deficiencies</i> and other relevant ICAO documentation, to assist the ICAO Secretariat with the following: a) continue to refine the process, based on the APANPIRG Procedural Handbook, for identifying, analysing, removing and proposing MET Deficiencies, utilising the results of annual ICAO SIGMET tests and OPMET Monitoring activities; b) Continue to refine the templates to be used for Deficiency Corrective Action Plans (CAP), Progress Reports and Final Reports; and c) As required, work with States concerned to develop a CAP, arrange for testing and monitoring and assist with the reporting to ICAO on the resolution of air navigation MET Deficiencies.		Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: To optimise MET SG's assistance to APANPIRG in identifying and resolving air navigation deficiencies in the field of MET.		
When: Now	Status: Adopted by Subgroup	
Who: <input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs		

MET SG/25  
History of the Meeting

<b>Decision MET SG/25-05: MET Deficiencies template and guidance</b>	
That, MET SG endorses the <i>MET Deficiency Report Guide</i> and <i>MET Deficiency Identification Guide</i> in Appendix F of the MET SG/25 Report.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: To assist States with reporting to ICAO on the resolution, progress or identification of air navigation deficiencies in the MET field.	
When: Now	Status: Adopted by Subgroup
Who: <input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

<b>Decision MET SG/25-06: Further update on SIGMET Coordination guidance for enhancement of SIGMET coordination activities in the Region</b>	
That, MET SG supports continual dialogue between neighbouring MWOs and also between MWOs and end-users to enhance mutual understanding for the betterment of SIGMET coordination activities and task the ad hoc group on SIGMET Coordination under MET/S WG to: (a) Consider and review the lessons learnt from SIGMET coordination activities, including outcomes of relevant workshops held in the Region; (b) Organise and support surveys on user requirements of SIGMET; and (c) Update guidance on SIGMET Coordination in consideration of the results of (a) and (b).	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: To facilitate more efficient and better coordinated SIGMET service to meet aviation users' expectations and operational requirements in the Region.	
When: Now	Status: Adopted by Subgroup
Who: <input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

**6. List of Draft Conclusions, Conclusions, Draft Decisions and Decisions**

Draft Conclusions (3)

**Draft Conclusion MET SG/25-03:** Updating Online Register of IWXXM Exchange Status

**Draft Conclusion MET SG/25-07:** SWIM architecture to enable the cost-effective and efficient provision and consumption of MET information services

**Draft Conclusion MET SG/25-09:** Update on the provision of Space Weather Advisory

Conclusions (3)

**Conclusion MET SG/25-01:** Publishing of IWXXM Frequently Asked Questions

**Conclusion MET SG/25-10:** Update to Regional Guidance for Tailored Meteorological Information and Services to Support ATM Operations

**Conclusion MET SG/25-11:** Updates to Regional SIGMET Guide

Draft Decisions (1)

**Draft Decision MET SG/25-08:** Meteorological expert contribution to SWIM/TF

Decisions (4)

**Decision MET SG/25-02:** Review the consistency in terminology and reporting format of the working groups

**Decision MET SG/25-04:** MET Deficiencies ad hoc group TOR

**Decision MET SG/25-05:** MET Deficiencies template and guidance

**Decision MET SG/25-06:** Further update on SIGMET Coordination guidance for enhancement of SIGMET coordination activities in the Region

## 7. List of Actions

7.1. In addition to the above outcomes, the Meeting agreed to fifteen (15) actions, as indicated in the Report on Agenda Items and recorded in the MET SG List of Actions at **Appendix C** of this Report.

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## REPORT ON AGENDA ITEMS

### 1. Organisational Matters

#### Opening of the Meeting

1.1. On behalf of the ICAO Regional Director, Mr Tao Ma, the MET SG Secretary, Mr Peter Dunda, and the incumbent MET SG Chairperson, Mr Jun Ryuzaki, opened the Meeting and welcomed all participants.

#### WP/01 – Adoption of the agenda (Secretariat)

1.2. The Meeting adopted the agenda circulated with the invitation, as follows<sup>1</sup>:

- Agenda Item 1: Organisational matters
- Agenda Item 2: Review outcomes from previous meetings
- Agenda Item 3: Planning and monitoring
- Agenda Item 4: Air navigation deficiencies
- Agenda Item 5: Research, development and other initiatives
- Agenda Item 6: Regional guidance material
- Agenda Item 7: Future work programme of the Meteorology Sub-group
- Agenda Item 8: Any other business

#### Election of new Chairperson and Vice-chairperson

1.3. As agreed by the previous Meeting (MET SG/24, Action No. 24/06), the Meeting conducted an election of a new Chairperson and Vice-chairperson.

1.4. For Chairperson, the Meeting elected Mr Pak-wai Chan, Assistant Director, Hong Kong Observatory.

1.5. For Vice-chairperson, the Meeting elected Ms Nguyen Lan Oanh (Lana), Deputy Director of Air Navigation Department, Civil Aviation Authority of Viet Nam.

#### WP/02 – Review the Terms of Reference (Secretariat)

1.6. When reviewing the Terms of Reference, as last approved by APANPIRG/31 (December 2020) and reproduced in **Appendix D** of this Report, the Meeting noted targets introduced by the last Meeting, specifically to ensure the timely availability of meeting invitations and papers, were not met.

1.7. The Meeting recognised this was chiefly due to the uncertainties of planning under the pandemic situation, which had affected the Secretariat's workload and schedule. However, the Meeting reemphasised that continued commitment by the Secretariat and all Members to meet the targets set out

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<sup>1</sup> Secretarial note: Due to the late publication of several Meeting papers, the Meeting agreed to a rearranged order of discussion on agenda items, as follows: 1, 4, 5, 2, 3, 6, 7, 8

in the Terms of Reference and Work Plan was essential to the successful conduct of the MET SG meetings and work program.

1.8. The Meeting noted several items in the Work Plan that required updating, including the plans for volcanic ash exercises, the management of SIGMET monitoring, and the appropriate delegation of work promoting SIGMET coordination. Given the above, the Meeting requested the Secretariat to action the appropriate revisions to the MET SG Work Plan in coordination with the Working Group Chairs [**Action No. 25/01, 25/02 and 25/03**].

## **2. Review Outcomes from previous Meetings**

### WP/03 – Review Outcomes from MET SG/24 (Secretariat)

2.1. The Meeting reviewed outcomes from the Twenty-Fourth Meeting of the Meteorology Sub-group (MET SG/24) and considered further actions, as necessary, to complete the follow-up work from MET SG/24.

2.2. The Meeting again noted a lack of progress in several items, mainly due to planning uncertainties under the pandemic, which affected the Secretariat's workload and schedule. The Meeting noted such scheduling issues were easing off but considered it essential that ICAO ensure sufficient resources to progress the MET SG's work.

### WP/04 – Review of APANPIRG/31 (Secretariat)

2.3. The Meeting reviewed outcomes from the Thirty-First Meeting of the Asia and Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/31), which directly relate to the work plan of the MET SG. In addition, under agenda item 7, the Meeting considered further actions for MET SG as necessary to support the work of APANPIRG.

2.4. The Meeting noted that APANPIRG/31 decided not to establish a cross-cutting task force to update APAC Air Navigation Plan (ANP), Volume III. However, APANPIRG/31 suggested that MET SG develop the MET-specific requirements and coordinate these as necessary with the other (APANPIRG) Sub-Groups.

2.5. The Meeting considered the need for proposals for amendment to the ANP to reflect requirements under the Aviation System Block Upgrades (ASBU). Therefore, the Meeting tasked the Meteorological Requirements Working Group (MET/R WG) to lead the development of the proposed amendment above in coordination with the Meteorological Information Exchange Working Group (MET/IE WG) and Meteorological Services Working Group (MET/S WG) [**Action No. 25/04**]. The Meeting also noted that the Secretariat would provide precise requirements for this task in coordination with ICAO Head Quarters.

### WP/05 – Review outcomes from MET/IE WG/19 (Chair MET/IE WG)

2.6. The Meeting reviewed outcomes from the 19<sup>th</sup> Meeting of the Meteorological Information Exchange Working Group (MET/IE WG), including a conjoint session with the 11<sup>th</sup> Meeting of the Meteorological Services Working Group (MET/S WG/11), held from 22 - 24 March 2021, including revised terms of reference and work plan of the MET/IE WG.

2.7. Outcomes of the MET/IE WG included a proposed online register of ICAO Meteorological Information Exchange Model (IWXXM) capability in the APAC Region and a Frequently Asked Questions (FAQs) resource supporting the required implementation and dissemination of IWXXM messages in the APAC Region.

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2.8. The Meeting deferred the discussion on the online register of current IWXXM exchange status to the discussion on the same topic under WP/08 in para. 3.9. to 3.11.

2.9. The Meeting noted that the draft FAQs document was made available via the Meeting website to facilitate feedback from users. The authors made some refinements based on feedback provided by IATA. The FAQs document is reproduced in **Appendix E** of this Report. The Meeting noted that the MET/IE WG has an ongoing task to review and refine the FAQs; however, MET/IE WG also recommends the document is sufficiently mature to publish for use by States. Given the above, the Meeting adopted the following Conclusion:

<b>Conclusion MET SG/25-01:</b> Publishing of IWXXM Frequently Asked Questions	
That, MET SG approves the IWXXM Frequently Asked Questions in Appendix E of the MET SG/25 Report and requests the Secretariat to arrange its publishing on the ICAO APAC Office e-Documents website.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why:	To assist States in the implementation of IWXXM.
When:	Now
Status:	Adopted by Subgroup
Who:	<input type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs

2.10. When reviewing its administrative documents and processes, to avoid confusion with individual tasks/activities within the Work Plan, the MET/IE WG proposed relabeling its “Task List” as an “Action List”. In addition, a review of terminology used by MET SG and its Working Groups would support the improved alignment of the groups’ respective Terms of Reference and Work Plans. Given the discussion above, the Meeting adopted the following Decision:

<b>Decision MET SG/25-02:</b> Review the consistency in terminology and reporting format of the working groups	
That, ICAO Secretariat, the MET SG Chair/s and its subsidiary Working Group Chair/s, undertake a review of the terminology and reporting format of the working groups.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why:	For consistency in the reporting of progress.
When:	Now
Status:	Adopted by Subgroup
Who:	<input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs

2.11. Concerning the annual ICAO APAC SIGMET tests, coordinated by the MET/IE WG and MET/S WG, the Secretariat informed the Meeting of coordination underway to postpone the tests for 4-weeks until December 2021 and that the invitation would be disseminated shortly.

2.12. The Meeting requested a slight revision to the SIGMET test procedures for an MWO that serves an FIR that falls within the area of responsibility of more than one VAAC or TCAC. In such

a case, the MWO should issue a separate SIGMET test message based on the advisory test message provided by each of its associated VAACs or TCACs.

WP/06 – Review outcomes from MET/S WG/11 (Chair MET/S WG)

2.13. The Meeting reviewed outcomes of the eleventh Meeting of the Meteorological Services Working Group (MET/S WG/11), which included developments in SIGMET coordination among the States in the Region, SIGMET deficiencies, capacity building, and the update of the SIGMET Guide.

2.14. The Meeting deferred its discussions on the progress of the MET/S WG regarding the ad hoc group on MET Deficiencies and updates to the Regional SIGMET Guide to the discussions under WP/11 in para. 4.4 to 4.11 and WP/22 in para. 6.5 to 6.6.

WP/07 – Review of the MET/R WG/10 (Chair MET/R WG)

2.15. The Meeting reviewed outcomes from the Meteorology/Air Traffic Management (MET/ATM) Webinar and the tenth Meeting of the Meteorological Requirements Working Group (MET/R WG/10), held online from 24 – 28 May 2021, including agreed actions and work plan.

2.16. The Meeting deferred its discussion on the update of the *Regional Guidance for Tailored Meteorological Information and Services to Support ATM Operations* to the discussion under WP/20 in para. 6.3 to 6.4.

2.17. The Meeting also deferred its discussion on the *Survey of State Meteorological Information Supporting Air Traffic Management* to WP/09 in para. 3.4 to 3.8.

2.18. The Meeting endorsed the proposed new task in the MET/R WG work plan to further develop the *APAC Regional Guidance for Tailored Meteorological Information and Services to Support Air Traffic Management Operations*. In addition, the Meeting endorsed updates to the terms of reference and work plan as proposed by MET/R WG/10 in Appendix B to WP/07.

### **3. Planning and Monitoring**

WP/18 – Review of the Asia/Pacific Air Navigation Plan (Secretariat)

3.1. The Meeting reviewed the APAC ANP, taking into account that the Secretariat is coordinating the preparation of a comprehensive proposal for amendment of the ANP, Volumes I and II. The amendments will include filling missing data in the Tables MET, including requirements for State volcano observatories and changes to meteorological services provided in several States.

3.2. The Meeting considered the need for further proposals for amendment to the ANP to reflect current operational requirements for Volume III, with guidance provided by ICAO HQ and ICAO Regional Office to MET/R WG.

3.3. The Meeting considered the action on the development of ANP amendment proposals for Vol I, II and III needed to be accelerated.

WP/09 – Survey of State Meteorological Information supporting Air Traffic Management (Ad hoc Group)

3.4. The Meeting reviewed an update on the survey for provision of current and future meteorological (MET) information services by States to support Air Traffic Management (ATM), in

particular Air Traffic Flow Management (ATFM).

3.5. MET/R WG/10 reviewed the survey questionnaire and proposed that it be distributed to States by ICAO State Letter (in PDF; Portable Document Format), inviting States to respond to the survey via an online survey tool to make it easier for States to respond.

3.6. To collect the views of both the MET and ATM communities within the APAC States, each APAC State would be requested to provide at least two separate survey returns from two different stakeholders, i.e., MET and ATM. In addition, States would be encouraged to invite other survey returns from Airspace Users.

3.7. The Meeting noted that MET/R WG/10 had decided to circulate the survey questionnaire to States to respond in August 2021 (Decision MET/R WG/10/02: *Survey of State Meteorological Information Supporting Air Traffic Management*, refers). However, there had been a slight delay from ICAO Regional Office in sending out the State Letter. Therefore, the Secretariat informed the Meeting that the letter would be distributed in early November 2021.

3.8. The Meeting noted that the survey’s closing date is 15 December and encouraged members States to complete the survey questionnaire. The ad hoc group envisaged that the survey results would be available for consideration by the next MET/R WG meeting and MET SG meeting in 2022.

WP/08 – Online Register of APAC IWXXM exchange status (Australia and Hong Kong, China)

3.9. The Meeting reviewed progress in developing an online register of current IWXXM exchange status (since MET SG/24) and the need for States to provide updates on their implementation status of IWXXM exchange in the online register.

3.10. The Meeting considered that the provision of timely updates by States to the register, which would facilitate the Region-wide implementation of the IWXXM exchange, required the attention of States/Administrations, including both MET and CNS communities. Therefore, recalling the Conclusion MET SG/24-12, approved in the previous MET SG meeting, the Meeting formulated the following Draft Conclusion:

<b>Draft Conclusion MET SG/25-03: Updating Online Register of IWXXM Exchange Status</b>	
That, States/Administrations provide timely updates to the Online Register of IWXXM Exchange Status on the latest status of AMHS capability for IWXXM exchange among ROCs and NOCs, and the availability of IWXXM MET reports.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: To inform users and Regional OPMET Bulletin Exchange Scheme participants of each States’ ability to generate and receive IWXXM over the required communication links and facilitate the Region-wide implementation of IWXXM exchange.	
When: Now	Status: Draft to be adopted by PIRG
Who: <input type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

3.11. The Meeting discussed the need for another (Regional) IWXXM workshop and agreed that the survey (on IWXXM implementation, as discussed at para. 7.3 to 7.4) should seek States’ views

for further consideration by MET/IE WG.

**IP/02 – IWXXM status in the United States (United States)**

3.12. The Meeting reviewed the status of IWXXM delivery and products in the United States, including building a new RODB to implement and distribute IWXXM. While TAC OPMET will stay under the older Washington RODB address: KWBCYMYX, the new Washington RODB will be under the following AMHS address: KWBCYZYZ. Completing the new Washington RODB is expected in Nov 2021, and IWXXM transmission and receipt testing will continue through February 2022.

**4. Air Navigation Deficiencies**

**WP/10 – Review APANPIRG Air Navigation Deficiencies (Secretariat)**

4.1. The Meeting recalled the MET SG/24 decision to form an ad hoc group (under the MET/S WG) to assist the Secretariat with identifying, reporting, and facilitating the resolution of air navigation deficiencies (Decision MET SG/24-05: *MET Deficiencies*, refers). This initiative was discussed further under WP/11 and reported at para. 4.4 to 4.11.

4.2. The Meeting reviewed the list of APANPIRG air navigation deficiencies, previously reported to APANPIRG/31 (December 2020), which still contained thirteen (13) open deficiencies in the MET field related to facilities and services in seven (7) of the APAC States.

**Table 1:** Summary of (open) APANPIRG air navigation deficiencies in the MET field

<b>MET facilities and services</b>	<b>Asia/Pacific States</b>	<b>Def. ID.</b>	<b>Status</b>
Aerodrome meteorological observations or reports	Kiribati	AP-MET-02	open
	Nauru	AP-MET-21	open
Meteorological watch office (MWO) or SIGMET information	Democratic Peoples' Republic of Korea	AP-MET-16	open
	Nauru	AP-MET-24	open
	Nepal	AP-MET-14	open
	Papua New Guinea	AP-MET-08	open
	Papua New Guinea	AP-MET-22	open
Volcanic ash/activity information	Solomon Islands	AP-MET-23	open
	Papua New Guinea	AP-MET-04	open
WAFS forecasts and/or flight briefings	Tonga	AP-MET-17	open
	Kiribati	AP-MET-18	open
	Nauru	AP-MET-19	open
	Solomon Islands	AP-MET-20	open

4.3. Notwithstanding achievements made in some areas, the overall rate of progress on the resolution of air navigation deficiencies remained limited. Furthermore, the Meeting noted that the ongoing absence of target dates in most States' corrective action plans represented a significant obstacle. Therefore, it requested the Secretariat to step up liaison with those States concerned to prompt the reporting and, critically, resolve the air navigation deficiencies [**Action No. 25/05**].

**WP/11 – Progress of the ad hoc group on Deficiencies (Ad hoc group)**

4.4. The Meeting reviewed the progress of the ad hoc group tasked with assisting the Secretariat in identifying and facilitating the resolution of air navigation deficiencies in the meteorology field (Decision MET SG/24-05: *MET Deficiencies*, refers).

4.5. The Meeting was pleased to note the significant achievements of the ad hoc group. These included the development of the *MET Deficiency Report Guide*; a template to facilitate States'

reporting (to MET SG) of progress on resolving deficiencies, a review of the APANPIRG Procedural Handbook, and the development of the *MET Deficiency Identification Guide*; a documented process for utilising the results of annual ICAO APAC SIGMET tests and OPMET monitoring in the identification of deficiencies. These guides are reproduced in Appendix F of this Report.

4.6. When comparing MET services' implementation status with the requirements outlined in the Regional Air Navigation Plan (ANP), the ad hoc group noted inconsistencies in the ANP Table MET II-2 and Table AOP I-1 and between the ANP, Table MET II-2 and the ROBEX Handbook Bulletin contents. The Meeting noted this would be problematic when utilising OPMET monitoring in the identification of deficiencies.

4.7. Given the situation described above, the Meeting requested the Secretariat to urgently finalise the proposed amendments to the ANP, which were agreed in previous meetings [**Action No. 25/06**].

4.8. Concerning the purported information inconsistencies in the ANP, as reported in WP/11, the Secretariat clarified footnote 1 in the APAC ANP, Vol II, Part V – MET, para. 2.2 was accurate and intentionally referred to Table AOP II-1 to identify RS and AS designated aerodromes for which METAR should be available at intervals of one half-hour.

4.9. Concerning the ad hoc group's proposal to monitor VONA information from late 2023, the Meeting noted that MET/S WG should carefully consider the readiness of SVOs when proposing regular regional VONA tests.

4.10. Based on the experience of the ad hoc group, the Meeting decided to revise the description of the ad hoc group's work to focus on more achievable activities and adopted the following Decision:

<b>Decision MET SG/25-04: MET Deficiencies ad hoc group TOR</b>	
That, MET/S WG ad hoc group, formed to work with relevant members of the MET/IE WG, utilises the guidance in the APANPIRG Procedural Handbook, Part V: <i>Uniform methodology for the identification, assessment and reporting of air navigation shortcomings and deficiencies</i> and other relevant ICAO documentation, to assist the ICAO Secretariat with the following: a) continue to refine the process, based on the APANPIRG Procedural Handbook, for identifying, analysing, removing and proposing MET Deficiencies, utilising the results of annual ICAO SIGMET tests and OPMET Monitoring activities; b) Continue to refine the templates to be used for Deficiency Corrective Action Plans (CAP), Progress Reports and Final Reports; and c) As required, work with States concerned to develop a CAP, arrange for testing and monitoring and assist with the reporting to ICAO on the resolution of air navigation MET Deficiencies.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: To optimise MET SG's assistance to APANPIRG in identifying and resolving air navigation deficiencies in the field of MET.	
When: Now	Status: Adopted by Subgroup
Who: <input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

4.11. In addition, the Meeting endorsed the use of the ad hoc group's *MET Deficiency Report*

*Guide* and *MET Deficiency Identification Guide* in its adoption of the following Decision:

<b>Decision MET SG/25-05: MET Deficiencies template and guidance</b>	
That, MET SG endorses the <i>MET Deficiency Report Guide</i> and <i>MET Deficiency Identification Guide</i> in Appendix F of the MET SG/25 Report.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: To assist States with reporting to ICAO on the resolution, progress or identification of air navigation deficiencies in the MET field.	
When: Now	Status: Adopted by Subgroup
Who: <input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

**WP/13 – Outcomes of the “Mini” Pacific SIGMET Test (New Zealand)**

4.12. The Pacific Island Aviation Weather Services Panel (PIAWS Panel) conducted an ad hoc SIGMET test to provide an opportunity for South Pacific Meteorological Watch Offices (MWOs) to practice the issuance of SIGMET test messages. Results of the test identified several opportunities for the MWOs concerned to improve their SIGMET service provision.

4.13. The Meeting noted that among the beneficial outcomes of the SIGMET test was identifying issues that required action by ICAO or the MET SG and its contributory bodies to facilitate improved SIGMET.

4.14. To resolve these issues, the Meeting requested that: i) the Secretariat amend the APAC ANP to rectify the inconsistent use of the location indicator for Port Moresby FIR in Table ATM I-1 and Table MET II-1 (AYPM vs AYPY) [**Action No. 25/07**]; ii) the Secretariat clarify the SIGMET test procedures, including its Tables 1, 3 and 4, concerning the need for MWOs associated with more than one VAAC to issue more than one SIGMET test message [**Action No. 25/08**]; and iii) the MET/S WG proposes additional guidance for MWOs in the SIGMET Guide on handling situations related to VAAC handover practices [**Action No. 25/09**].

**WP/12 – Air Navigation Deficiency AP-MET-23 Implementation by Solomon Islands (Solomon Islands)**

4.15. The Meeting congratulated Solomon Islands on progress towards resolution of the Air Navigation Deficiency AP-MET-23 concerning the provision of MWO and SIGMET service and its evidence-based Report to satisfy the APANPIRG requirements for the removal of an air navigation deficiency from the open list.

4.16. The Solomon Islands’ corrective action involved participation in SIGMET tests and training and volcanic ash exercises and collaboration with various operational units in Australia, Hong Kong, China, Fiji and New Zealand, and the WMO.

4.17. Notwithstanding the significant progress demonstrated by the Solomon Islands, the Meeting noted that WP/12 also reported unresolved issues concerning the content, format and timeliness of SIGMET.

4.18. Given the above, the Meeting requested the Solomon Islands, with assistance from its

partner States, to conduct additional corrective action to enable the MET SG to confirm that Solomon Islands had fully resolved the deficiency AP-MET-23. The Meeting also requested that Solomon Islands maintain a log of all SIGMETs issued over at least one month to capture the operational WC-, WS- and WV-SIGMETs, plus any test WV-SIGMETs. Details should then be passed to the ad hoc group to compare against SIGMETs received by RODB Brisbane [**Action No. 25/10**].

4.19. Subject to Solomon Islands demonstrating resolution of the issues concerning content, format and timeliness of SIGMET information, as discussed in WP/12, and sustainable provision of ICAO-compliant SIGMET service, MET SG would support the removal of deficiency AP-MET-23 from the APANPIRG open list. Therefore, to facilitate the removal of the deficiency from the open list, the Meeting requested the Secretariat coordinate with the Solomon Islands to report the resolution of the deficiency to APANPIRG [**Action No. 25/11**].

## **5. Research, Development and other Initiatives**

### WP/14 – Recent Progress of International Cooperation Scheme on Collaborative SIGMET Issuance (CSI) (Japan, Lao PDR, Myanmar, Philippines, Thailand and Vietnam)

5.1. The Meeting noted progress made by the international cooperation scheme of the Collaborative SIGMET Issuance (CSI) among six member States: Japan, Lao PDR, Myanmar, Philippines, Thailand and Vietnam, including the outcomes of the CSI Workshop held in January 2021 via online, which discussed further enhancement and expansion of SIGMET coordination in the Region.

5.2. The Meeting noted the WC SIGMET handover procedure among CSI members discussed and established in the CSI workshop and such procedure's effectiveness in the SIGMET coordination. The Meeting also noted the result of a survey from airlines on the acceptable difference of SIGMETs issued by neighbour MWOs and a draft guideline of CSI on the acceptable range on the SIGMET coordination. Such a survey enables more efficient SIGMET coordination with the necessity of further surveys.

5.3. The CSI activities indicated the following measures would be effective in further expanding SIGMET coordination:

- Review the technical issues that have been identified in SIGMET coordination so far, and investigate what is appropriate to include in the regional guidance;
- Encourage States to continue to share their SIGMET coordination activities, technical challenges and their solutions; and
- Investigate user requirements such as acceptable differences from 'neighbour' SIGMETs. (i.e., conduct a survey from the ICAO side.)

5.4. The Meeting continued its discussion on how to facilitate the States' further enhancement of SIGMET coordination activities under WP/15 and proposed appropriate action in para. 5.5 to 5.9.

### WP/15 – Outcome from a SIGMET Coordination cum User Requirements Workshop (Hong Kong, China)

5.5. The Meeting noted the outcome of a SIGMET Coordination cum User Requirements Workshop organised by Hong Kong Observatory in late June 2021. The online Workshop consisted of:

- i. Invited talks by ICAO, WMO and users;

- ii. Conducting an online interactive survey on the user requirements and issuance of SIGMET;
- iii. Sharing of local forecasting and SIGMET coordination practices by MWOs; and
- iv. Panel discussion.

5.6. The Meeting noted the fruitful results obtained from the online interactive survey, the comparison between MWO SIGMET issuance practice and users' perspective and the maximum acceptable difference between SIGMETs across FIRs summarised in the Workshop report (attached to WP/15).

5.7. The Meeting also noted that the Workshop had successfully brought the participating MWOs and some users together to share their respective experiences in SIGMET services for better mutual understanding.

5.8. The Meeting agreed that continual dialogue among the users and neighbouring MWOs are crucial to improving the SIGMET service in the APAC Region. The Meeting was invited to consider a draft decision on further developing guidance to the MWOs in the Region on SIGMET Coordination in response to MWOs and users' expectations.

5.9. The Meeting noted similar SIGMET coordination activities had been organised as reported elsewhere in this Report. Given the above, the Meeting formulated the following Decision of common concern for the ad hoc group on SIGMET Coordination, under the MET/S WG, to follow up:

<b>Decision MET SG/25-06:</b> Further update on SIGMET Coordination guidance for enhancement of SIGMET coordination activities in the Region	
That, MET SG supports continual dialogue between neighbouring MWOs and also between MWOs and end-users to enhance mutual understanding for the betterment of SIGMET coordination activities and task the ad hoc group on SIGMET Coordination under MET/S WG to: (a) Consider and review the lessons learnt from SIGMET coordination activities, including outcomes of relevant workshops held in the Region; (b) Organise and support surveys on user requirements of SIGMET; and (c) Update guidance on SIGMET Coordination in consideration of the results of (a) and (b).	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: To facilitate more efficient and better coordinated SIGMET service to meet aviation users' expectations and operational requirements in the Region.	
When: Now	Status: Adopted by Subgroup
Who: <input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

**IP/13 – Charting Aviation’s Future: Operations in an Info-Centric National Airspace System (United States)**

5.10. The United States introduced its Federal Aviation Administration’s (FAA) strategic vision and plan for 2035, titled “*Charting Aviation’s Future: Operations in an Info-Centric National Airspace System*”. The plan will drive aviation research and development in the United States over the next 15+ years towards implementing the conceptual roadmap presented in the ICAO GANP. Once the FAA’s plan is released, a copy will be provided to the Secretariat to share as deemed appropriate.

**IP/19 – The next generation of the World Area Forecast System (WAFS)(WAFC Washington)**

5.11. The Meeting reviewed developments of the next generation of the World Area Forecast System (WAFS) forecasts for international air navigation, including significant changes and improvements for the WAFS grid point forecasts, WAFS Significant Weather (SIGWX) forecasts, and the WAFS delivery system in November 2023.

**IP/03 – SIGMET coordination between Fiji and Solomon Islands (Fiji, Hong Kong, China and the Solomon Islands)**

5.12. The Meeting noted the round-the-clock SIGMET Coordination trial between Fiji and Solomon Islands since December 2020. The coordination helped the MWOs concerned build capacity in SIGMET preparation and SIGMET harmonisation, which assisted the Solomon Islands in working towards SIGMET deficiency removal.

**IP/04 – Collaboration on Hazardous Weather Services between HKO and PAGASA (Hong Kong, China and Philippines)**

5.13. The Meeting noted the operational collaboration between HKO and PAGASA aviation forecasters in effectively exchanging views on hazardous weather affecting or expected to affect the FIR boundary between the two MWOs, sharing weather and aircraft observations and sharing information on other operational matters via daily and ad hoc dialogue on their respective chat platforms.

5.14. Some inconsistencies existed among SIGMETs issued for volcanic ash, and their contents were also different from the corresponding volcanic ash advisory information. The Meeting recalled that SIGMET messages concerning volcanic ash cloud (and tropical cyclones) should be based on advisory information provided by VAACs (and TCACs). To harmonise the SIGMET and advisory information and avoid confusing aviation users, MWOs should contact the relevant VAACs (and TCACs) if they have additional information.

5.15. The Meeting agreed that timely coordination and response between VAACs / TCACs and MWOs is essential. However, some outdated VAAC contact information in the ICAO Doc 9766-AN/968 (Handbook on the International Airways Volcano Watch (IAVW)) had hindered coordination efficiency between MWOs and VAACs. Therefore the Meeting agreed to review and provide updates to the contact lists in the handbook to the ICAO METP [**Action No. 25/12**].

**IP/05 – SIGMET coordination trial (Malaysia, Philippines and Singapore)**

5.16. The Meeting noted the SIGMET coordination trial undertaken by Singapore, Malaysia and Philippines. The results and key findings of the trial highlighted the challenges to SIGMET coordination due to operational constraints and considerations, the benefits of recording SIGMET coordination activities efficiently, and the benefits for the MWOs and end-users from providing coordinated SIGMET information. As a result, this SIGMET coordination initiative has transitioned into operational mode on 15 October 2021.

**IP/06 – Bureau Of Meteorology and MetService collaboration (New Zealand)**

5.17. The Meeting noted how forecasters within the Australian Bureau of Meteorology (BoM) and the Meteorological Service of New Zealand (MetService) collaborate on VAAC and MWO related items. Both organisations use the Microsoft Teams (MS Teams) chat function and (on occasion)

video conferencing capability. This collaboration has led to closer daily interaction resulting in better clarity on VAAC processes and better alignment of SIGMETs in the flight information regions (FIRs).

**IP/20 – Enhancement of SIGMET coordination status in Indonesia (Indonesia)**

5.18. The Meeting noted the enhancement of SIGMET Coordination by Indonesia in 2021, which now has fully operational arrangements with four neighbouring MWOs and 24/7 trials with another three neighbouring MWOs. In addition, Indonesia is planning to expand its SIGMET coordination activities to involve its remaining three neighbouring MWOs.

**IP/07 – MET-ATM Integration Initiatives in Singapore (Singapore)**

5.19. The Meeting noted initiatives undertaken by the Meteorological Service Singapore in strengthening Meteorology – Air Traffic Management (MET-ATM) integration to ensure continuous support in the safety and efficiency of air traffic in the Region.

**WP/16 – Cost-efficient support of Meteorological SWIM Services**

5.20. The Meeting discussed issues concerning many APAC Meteorological Service Providers’ plans to offer SWIM services, which were highlighted when the recent SWIM/TF 5 meeting modified its Terms of Reference to specify the SWIM architecture and implementation approach will occur principally over the CRV.

5.21. Noting that, currently, Meteorological Service Providers and airlines do not have access to CRV, the Meeting discussed the need for Meteorological Service Providers to provide SWIM services directly to users for volume intensive and non-sensitive MET information and how this could be supported through the work of the SWIM TF.

5.22. Because of the concerns raised in the discussion above, the Meeting formulated the following Draft Conclusion:

<b>Draft Conclusion MET SG/25-07: SWIM architecture to enable the cost-effective and efficient provision and consumption of MET information services</b>	
That, APAC SWIM TF ensures it defines a SWIM architecture, corresponding technical infrastructure requirements, and implementation approach that continues to enable the cost-effective and efficient provision and consumption of MET information services to all users to support aviation safety and air navigation capacity and efficiency, in consideration of use cases of highly data-intensive MET information services.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: SWIM architecture, principally over CRV, might not provide a cost-effective and efficient solution for all use cases envisaged in ICAO’s global plans, in particular after commencement of the provision of highly data-intensive quantitative and probabilistic MET information services and enable access from anywhere in the globe.	
When: Now	Status: Draft to be adopted by PIRG
Who: <input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

5.23. The SWIM TF will have a Task Lead meeting in the following week. At the invitation of SWIM TF, the MET SG nominated three experts to represent the MET community to attend the Task Lead meeting to explain the concerns raised in the WP/16.

5.24. The Meeting noted that most SWIM TF members have a background in communications, navigation or surveillance, while meteorological service is not well represented. Therefore, the Meeting strongly recommended that the meteorological community increase its participation in the SWIM TF by formulating the following Draft Decision:

<b>Draft Decision MET SG/25-08: Meteorological expert contribution to SWIM/TF</b>	
That, States consider identifying meteorological experts to contribute to the APAC SWIM/TF to ensure meteorological aspects are fully considered.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: Currently, few members of the SWIM/TF come from a meteorological background. The SWIM/TF would benefit from a greater understanding of the requirements and plans for meteorological information services.	
When: Now	Status: Draft to be adopted by PIRG
Who: <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

**WP/17 – Update on the provision of Space Weather Advisories (Australia)**

5.25. The Meeting reviewed an update on the provision of space weather (SWX) advisories, including recent changes to the WMO headers for these products, and considered the pending introduction of a fourth global Space Weather Advisory Centre (SWXC) operated by the China-Russian Federation consortium, due to commence operations on 16 November 2021.

5.26. The paper reminded the Meeting that States need to ensure systems and processes are in place to distribute SWX advisory information to aviation users within their airspace. Given this requirement, the Meeting formulated the following Draft Conclusion:

<b>Draft Conclusion MET SG/25-09: Update on the provision of Space Weather Advisory</b>	
That, States/Administrations urgently implement or adjust their systems to enable the forwarding of space weather advisories (in TAC and IWXXM form) as appropriate to users.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input checked="" type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: CRC will commence operation with effect from 16 November 2021, and the WMO message headers for TAC and IWXXM format SWX advisory messages were updated to have separate headers for each space weather impact type.	
When: Now	Status: Draft to be adopted by PIRG
Who: <input type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

5.27. In addition, the Meeting considered what further action would be appropriate for the MET SG and its contributory bodies to continue to facilitate the distribution and use of space weather information in the APAC Region. The Meeting requested the Secretariat and Chairs of MET/S WG and MET/IE WG to coordinate with the METP on the possibility of organising dedicated training and

exercise activities in the APAC Region [**Action No. 25/13**].

**IP/08 – VAAC Darwin Management Report (Australia)**

5.28. The Meeting reviewed a combined IAVW Management Report for the VAAC Darwin covering 1 July 2020 to 31 August 2021, updating the Meeting on VAAC Darwin current activities, significant operational changes, training and development, collaboration and stakeholder engagement.

**IP/09 – VAAC Tokyo Management Report (Japan)**

5.29. The Meeting reviewed the VAAC Tokyo IAVW Management Report from 1 October 2020 through 31 August 2021.

**IP/10 – VAAC Wellington Management Report (New Zealand)**

5.30. The Meeting reviewed the VAAC Wellington activities for the period 1 October 2020 to 31 August 2021.

**IP/11 – Three-hourly update of Aerodrome Forecasts (TAF3) (Australia)**

5.31. The Meeting noted that Australia introduced an aerodrome forecast (TAF) service with a routine three-hourly update frequency at its major civil and military airports. This new service (TAF3) replaced Australia's previous trend forecast (TTF) service, which international operators did not use as widely as the TAF.

**IP/12 – Wind Shear Prediction System for Jeju International Airport (Republic of Korea)**

5.32. The Meeting noted the development by the Republic of Korea on a wind shear prediction system to support the safe operation of aircraft taking-off and landing at Jeju International Airport.

**IP/14 – NARAE-Weather R-and-D Project (Republic of Korea)**

5.33. The Meeting noted that the Republic of Korea had established a "NARAE plan" to respond to ICAO GANP (ASBU), including plans for the Aviation Meteorological Office (AMO) to promote "NARAE-Weather" to implement the ASBU AMET elements.

**IP/15 – SADIS update (WAFIC London)**

5.34. The Meeting noted updates reported on the operation of the Secure Aviation Data Information Service (SADIS) since the MET SG/24 meeting in November of 2020, including the November 2020 SADIS upgrade, annual SADIS Efficacy Survey, SADIS Data Catalogue, a trial of low-level area forecasts in graphical format on SADIS FTP, SADIS workstation evaluations, SADIS backup accounts, and the upcoming SADIS changes (due in November 2023).

**IP/16 – WMO activities of relevance to ICAO (WMO)**

5.35. The Meeting reviewed some of the recent activities of the World Meteorological Organization (WMO) of relevance to ICAO, including the following: WMO governance reform; WMO's contribution to global and regional aeronautical meteorology initiatives; WMO's response to the COVID-19 pandemic; and the WMO-IATA collaborative AMDAR Programme. In addition, the paper provided information on upcoming WMO meetings and events of relevance to ICAO and links

to available WMO resources and further information.

## 6. Regional Guidance Material

### WP/19 – Suggestions on the update of ICAO APAC ROBEX Handbook (China)

6.1. The Meeting reviewed a proposal by China to update Table A in the ICAO APAC ROBEX Handbook to reflect China’s requirement for OPMET bulletins from Sri Lanka, Indonesia, Malaysia and India. The proposed updates include the regular exchange of international OPMET bulletins from ROCs Colombo, Jakarta, Kuala Lumpur, Mumbai, Delhi and Kolkata to ROC Beijing (AFTN address: ZBBBYPYX).

6.2. The Meeting requested the Secretariat coordinate with China to develop the necessary ROBEX Handbook updates in consultation with the States concerned [**Action No. 25/14**].

### WP/20 – Updates of APAC Regional Guidance for Tailored MET Information and Services to support ATM Operations (MET/R WG ad hoc group)

6.3. The Meeting reviewed proposed updates to the *APAC Regional Guidance for Tailored Meteorological Information and Services to Support Air Traffic Management (ATM) Operations* developed by the MET/R WG ad-hoc group consisting of Australia, China, Hong Kong, China, Japan (rapporteur), Republic of Korea, Singapore, Thailand, Vietnam and IATA.

6.4. The Meeting supported the proposed updates to the guidance material as presented in WP/20, and reproduced in **Appendix G** of this Report, and adopted the following Conclusion:

<b>Conclusion MET SG/25-10:</b> Update to <i>Regional Guidance for Tailored Meteorological Information and Services to Support ATM Operations</i>	
That, MET SG approves the updates to the <i>APAC Regional Guidance for Tailored Meteorological Information and Services to Support Air Traffic Management Operations</i> in Appendix G of the MET SG/25 Report, for use by States, including the proposed updates to the format for the Appendices (1 and 2), the document maintenance procedure and the format for publishing the guidance on the ICAO APAC Office Website.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: To provide States with up to date guidance material and make the updated version available on the ICAO APAC “eDocuments” website.	
When: Now	Status: Adopted by Subgroup
Who: <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

### WP/22 – Update to Regional SIGMET Guide (MET/S WG ad hoc group)

6.5. The Meeting reviewed draft updates harmonising the APAC Regional SIGMET Guide with SIGMET Guide in the ICAO EUR<sup>1</sup> Region, including guidance on IWXXM format relevant to SIGMET information. The updates to the APAC Regional SIGMET Guide are reproduced in **Appendix H** of this Report.

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<sup>1</sup> European

6.6. The Meeting noted that to facilitate the exchange of SIGMET in IWXXM, the ad hoc group proposed to release the current draft version of the APAC Regional SIGMET Guide. Given the above, the Meeting adopted the following Conclusion:

<b>Conclusion MET SG/25-11:</b> Updates to <i>Regional SIGMET Guide</i>	
That, MET SG approves the updates to the <i>SIGMET Guide</i> in Appendix H of the MET SG/25 Report for use by States and for publishing on the ICAO APAC Office website.	Expected impact: <input type="checkbox"/> Political / Global <input checked="" type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: To harmonise the ICAO APAC Regional SIGMET Guide with SIGMET Guide in the ICAO EUR Region, including guidance on IWXXM format relevant to SIGMET information.	
When: Now	Status: Adopted by Subgroup
Who: <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: ROs	

6.7. The Meeting noted that matters concerning IWXXM formats are recommended to be discussed in the relevant global groups to be included in the global Documents to ensure consistency among the Regions.

## 7. Future Work Programme of the Meteorology Sub-Group

### WP/21 – Review Plan of Work (Secretariat)

7.1. The Meeting reviewed the work plan of the MET SG, which APANPIRG last updated in 2020, to ensure alignment of the work of the MET SG and its contributory bodies. The Meeting proposed revisions or updates as necessary to ensure the deliverables of the MET SG and its support of APANPIRG remain focused on the current and future needs of the APAC Region.

7.2. Based on the outcomes from the Meeting’s discussions, the Meeting requested the Secretariat and the Chairs of MET SG and its WGs to coordinate and update the work plan within one week of the end of the Meeting. [**Action No. 25/15**].

7.3. Considering that the MET/IE WG work plan already included a task to survey States on the status of IWXXM implementation and to report to MET SG on APAC States’ IWXXM implementation status and need/timing for another APAC IWXXM workshop, the Meeting noted that the Secretary and Chair MET/IE WG would review the MET SG deliverable concerning an IWXXM workshop.

7.4. The updated work plan agreed by the Meeting is provided in **Appendix D** of this Report.

## 8. Any other Business

### IP/17 – Aircraft-based observation operation status (Republic of Korea)

8.1. The Meeting noted the current operational status of aircraft-based observation in the Republic of Korea concerning observation on air routes.

### IP/18 – Real-Time thunderstorm notification service with mobile app (Republic of Korea)

8.2. The Meeting noted the real-time thunderstorm notification service provided by AMO for the safety of airport workers.

Progress of Secretariat actions

8.3. The Meeting noted the negative impact of the lack of progress of many Secretariat actions, including late finalisation of the Working Groups' reports and late availability of the Meeting papers. As a result, progress on critical items had been delayed, and the execution of the Meeting was not at the desired standard. The Meeting requested its concerns about the capacity of MET Secretariat resourcing be raised at APANPIRG.

Next Meeting

8.4. The Meeting agreed to the tentative schedule for the next meetings of the MET SG and its contributory Working Groups as follows:

- MET/IE WG/20
  - 28-30 March 2022
- Conjoint session of MET/IE WG/20 and MET/S WG/12
  - 30 March 2022
- MET/S WG/12
  - 30 March-01 April 2022
- MET/R WG/11 and MET/ATM Seminar
  - 3rd or 4th week of May 2022 (TBC)
- MET SG/26
  - July 2022 (TBC by Chair and Secretariat)

8.5. The Meeting noted that the Secretariat would also make arrangements for a virtual, seventh meeting of the ICAO APAC Volcanic Ash Exercises Steering Group (VOLCEX/SG/7) and requested the members to consider nominating a new Chairperson for the VOLCEX/SG.

—END—

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	99.	Mr. Malith Manuhara	Electronics Engineer Airport & Aviation Services (Sri Lanka) Ltd.	<a href="mailto:malith.eane@airport.lk">malith.eane@airport.lk</a> ;
<b>24.</b>	<b>THAILAND (16)</b>			
	100.	Mr. Somchai Yimsricharoenkit	Head of Aeronautical Meteorology Oversight Division Civil Aviation Authority of Thailand	<a href="mailto:somchai.y@caat.or.th">somchai.y@caat.or.th</a> ;
	101.	Mr. Anusit Deepradit	Aeronautical Meteorology Oversight Division Officer Civil Aviation Authority of Thailand	<a href="mailto:anusit.d@caat.or.th">anusit.d@caat.or.th</a> ;
	102.	Mr. Bancha Kaewngam	Director of Aeronautical Weather Forecast Sub- Division Thai Meteorological Department	<a href="mailto:bancha0110@gmail.com">bancha0110@gmail.com</a> ;
	103.	Ms. Rassmee Damrongkietwattana	Director of Aeronautical Weather Monitoring Sub- Division Thai Meteorological Department	<a href="mailto:rassmee@hotmail.com">rassmee@hotmail.com</a> ;

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	STATE/NAME		TITLE/ORGANIZATION	E-MAIL
104.	Ms. Tipsudawan Ruenchinda	Acting Director of Aeronautical Meteorology Standard Sub-Division Thai Meteorological Department	<a href="mailto:Rtipsuda2559@gmail.com">Rtipsuda2559@gmail.com</a> ;	
105.	Ms. Wattana Singtuy	Director of RTH – Bangkok Thai Meteorological Department	<a href="mailto:wattana_123@yahoo.co.th">wattana_123@yahoo.co.th</a> ;	
106.	Mr. Wanchalearm Petsuwan	Computer Technical Officer Thai Meteorological Department	<a href="mailto:wpetsuwan@hotmail.com">wpetsuwan@hotmail.com</a> ;	
107.	Ms. Sujin Promduang	Director, Aeronautical Information and Flight Data Management Centre Aeronautical Radio of Thailand Ltd. (AEROTHAI)	<a href="mailto:sujin.pr@aerothai.co.th">sujin.pr@aerothai.co.th</a> ;	
108.	Mr. Worapoj Yodjabog	Aeronautical Information Manager Aeronautical Radio of Thailand Ltd. (AEROTHAI)	<a href="mailto:worapoj.yo@aerothai.co.th">worapoj.yo@aerothai.co.th</a> ;	
109.	Ms. Narissara Na Rangsri	Aeronautical Information Assistant Manager Aeronautical Radio of Thailand Ltd. (AEROTHAI)	<a href="mailto:narissara.na@aerothai.co.th">narissara.na@aerothai.co.th</a> ;	
110.	Ms. Waraporn Sornthai	Aeronautical Information Assistant Manager Aeronautical Radio of Thailand Ltd. (AEROTHAI)	<a href="mailto:waraporn.sr@aerothai.co.th">waraporn.sr@aerothai.co.th</a> ;	
111.	Ms. Amornrat Jirattigalachote	Strategic Planning Manager (Engineering) Aeronautical Radio of Thailand Ltd. (AEROTHAI)	<a href="mailto:amornrat.ji@aerothai.co.th">amornrat.ji@aerothai.co.th</a> ;	
112.	Acting Sub.Lt. Prinya Viyasilpa	Air Traffic Engineering Manager Aeronautical Radio of Thailand Ltd. (AEROTHAI)	<a href="mailto:prinya.vi@aerothai.co.th">prinya.vi@aerothai.co.th</a> ;	
113.	Mr. Pongpob Mongkolpiyathana	Executive Air Traffic Systems Engineer Aeronautical Radio of Thailand Ltd. (AEROTHAI)	<a href="mailto:pongpob.mo@aerothai.co.th">pongpob.mo@aerothai.co.th</a> ;	
114.	Mr. Worapong Jirojkul	Senior Air Traffic Systems Engineer Aeronautical Radio of Thailand Ltd. (AEROTHAI)	<a href="mailto:worapong.ji@aerothai.co.th">worapong.ji@aerothai.co.th</a> ;	

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	STATE/NAME		TITLE/ORGANIZATION	E-MAIL
	115.	Mr. Suttipong Kornrapat	Air Traffic Services Engineer Aeronautical Radio of Thailand Ltd. (AEROTHAI)	<a href="mailto:suttipong.kr@aerothai.co.th">suttipong.kr@aerothai.co.th</a> ;
<b>25.</b>	<b>USA (4)</b>			
	116.	Ms. Karen Shelton-Mur	Meteorologist, International Aviation Weather Program Lead Policy and Requirements Branch, Aviation Weather Division, FAA, NextGen Federal Aviation Administration	<a href="mailto:karen.shelton-mur@faa.gov">karen.shelton-mur@faa.gov</a> ;
	117.	Mr. Michael Graf	Meteorologist/International Liaison Department of Commerce Meteorologist, Aviation and Space Weather Services Branch National Weather Service	<a href="mailto:michael.graf@noaa.gov">michael.graf@noaa.gov</a> ;
	118.	Mr. Larry Burch	AvMet Applications, Inc U.S. FAA Contract Support Advisor to the U.S. Member of ICAO's MET Panel	<a href="mailto:burch@avmet.com">burch@avmet.com</a> ;
	119.	Mr. Michael Watkins	Senior Air Traffic Representative, Asia Pacific Federal Aviation Administration Air Traffic Organization, System Operations	<a href="mailto:michael.w.watkins@faa.gov">michael.w.watkins@faa.gov</a> ;
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	120.	Ms. Nguyen Lan Oanh (Lana)	Deputy Director of Air Navigation Department Civil Aviation Authority of Viet Nam	<a href="mailto:lanoanh@caa.gov.vn">lanoanh@caa.gov.vn</a> ;
	121.	Mr. Le Quoc Khanh	Deputy General Director Vietnam Air Traffic Management Corporation	<a href="mailto:lequockhanh@vatm.vn">lequockhanh@vatm.vn</a> ;
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	STATE/NAME		TITLE/ORGANIZATION	E-MAIL
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	130.	Ms. Tran Thi Khanh Huong	Manager of Tan Son Nhat Aeronautical Meteorological Centre - Aeronautical Meteorological Centre Vietnam Air Traffic Management Corporation	<a href="mailto:khanhhuong@vatm.vn">khanhhuong@vatm.vn</a> ;
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	STATE/NAME		TITLE/ORGANIZATION	E-MAIL
	132.	Mr. Le Thanh Tung	Manager of Noibai Aeronautical Meteorological Centre - Aeronautical Meteorological Centre Vietnam Air Traffic Management Corporation	<a href="mailto:lttnb@yahoo.com">lttnb@yahoo.com</a> ; <a href="mailto:metnoibai@gmail.com">metnoibai@gmail.com</a> ;
	133.	Mr. Le Hong Hai	Captain of the observation team of Noibai Aeronautical Meteorological , Centre - Aeronautical Meteorological Centre Vietnam Air Traffic Management Corporation	<a href="mailto:jockingman1971@gmail.com">jockingman1971@gmail.com</a> ;
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	135.	Ms. Vu Thi Hang	Leader of the Forecasting team of Danang Aeronautical Meteorological , Centre - Aeronautical Meteorological Centre Vietnam Air Traffic Management Corporation	<a href="mailto:hangmet2015@gmail.com">hangmet2015@gmail.com</a> ;
	136.	Ms. Nguyen Thi Thom	Staff of ATFM Operational Department – ATFM Centre (ATFMC) Vietnam Air Traffic Management (VATM) Corporation	<a href="mailto:nguyenthom.atfmc@gmail.com">nguyenthom.atfmc@gmail.com</a> ;
<b>27.</b>	<b>IATA/AIRLINES INDUSTRY (1)</b>			
	137.	Mr. Paul Molomolo	Qantas Meteorology – Team Leader IATA/Qantas Airways Limited	<a href="mailto:paul.molomolo@qantas.com.au">paul.molomolo@qantas.com.au</a> ;
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	138.	Mr. Henry Taiki	WMO Representative for the South West Pacific World Meteorological Organization (WMO)	<a href="mailto:HTaiki@wmo.int">HTaiki@wmo.int</a> ;
<b>29.</b>	<b>ICAO (2)</b>			
	139.	Mr. Jun Ryuzaki	Technical Officer, Meteorology International Civil Aviation Organization HQs.	<a href="mailto:jryuzaki@icao.int">jryuzaki@icao.int</a> ;

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	STATE/NAME		TITLE/ORGANIZATION	E-MAIL
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**LIST OF PAPERS**

<b>WP/IP No.</b>	<b>Agenda Item No.</b>	<b>Subject</b>	<b>Presented by</b>
<b>WORKING PAPERS</b>			
WP/01	1	Adoption of the Agenda	Secretariat
WP/02	2	Review the Terms of Reference	Secretariat
WP/03	2	Review Outcomes from MET SG/24	Secretariat
WP/04	2	Review Outcomes from APANPIRG/31	Secretariat
WP/05	2	Review Outcomes from MET/IE WG/19	Chair of MET/IE WG
WP/06	2	Review Outcomes from MET/S WG/11	Chair of MET/S WG
WP/07	2	Review of the Tenth Meeting of Asia/Pacific Meteorological Requirements Working Group (MET/R WG)	Chair of MET/R WG
WP/08	3	Online Register of APAC IWXXM Exchange Status	Australia
WP/09	3	Survey of State Meteorological Information Supporting Air Traffic Management	Australia on behalf of Ad-Hoc Group
WP/10	4	Review APANPIRG Air Navigation Deficiencies	Secretariat
WP/11	4	Progress of Ad Hoc Group on Deficiencies	Ad Hoc Group
WP/12	4	Air Navigation Deficiency AP-MET-23 Implementation by Solomon Islands	Solomon Islands
WP/13	4	Outcomes of-the Mini Pacific SIGMET Test	New Zealand
WP/14	5	Recent Progress of International Cooperation Scheme on Collaborative SIGMET Issuance (CSI)	Japan
WP/15	5	Outcome from a SIGMET Coordination Cum User Requirements Workshop	Hong Kong, China
WP/16	5	Cost Efficient Support of MET SWIM Services	Australia
WP/17	5	Update on the Provision of Space Weather Advisories	Australia

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WP/IP No.	Agenda Item No.	Subject	Presented by
WP/18	3	Review of the Asia/Pacific Air Navigation Plan	Secretariat
WP/19	6	Suggestions on the Update of ROBEX Handbook	China
WP/20	6	Updates of Asia/Pacific Regional Guidance for Tailored Meteorological Information and Services to Support Air Traffic Management Operations	Ad Hoc Group
WP/21	7	Review Plan of Work	Secretariat
WP/22	6	Update to Regional SIGMET Guide	MET/S WG Ad Hoc Group

**INFORMATION PAPERS**

IP/01	-	Meeting Bulletin	Secretariat
IP/02	2	IWXXM Status in the United States	USA
IP/03	5	SIGMET Coordination-between Fiji and Solomon Islands	Fiji
IP/04	5	Collaboration on Hazardous Weather Services between HKO and PAGASA	Hong Kong, China
IP/05	5	SIGMET Coordination Trial - Singapore, Malaysia and Philippines	Singapore
IP/06	5	Bureau of Meteorology and MetService Collaboration	New Zea;amd
IP/07	5	MET-ATM Integration Initiatives in Singapore	Singapore
IP/08	5	VAAC Darwin Management Report	Australia
IP/09	5	VAAC Tokyo Management Report	Japan
IP/10	5	VAAC Wellington Management Report	New Zealand
IP/11	5	Three Hourly Update of Aerodrome Forecasts (TAF3)	Australia
IP/12	5	Wind Shear Prediction System for Jeju International Airport	Republic of Korea
IP/13	5	Charting Aviation's-Future Operations in an Info Centric National Airspace System	USA
IP/14	5	NARAE Weather R and D Project of the Republic of Korea	Republic of Korea

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<b>WP/IP No.</b>	<b>Agenda Item No.</b>	<b>Subject</b>	<b>Presented by</b>
IP/15	5	SADIS Update	WAFC London
IP/16	5	WMO Activities of Relevance to ICAO	WMO
IP/17	8	Aircraft Based Observation Operation Status	Republic of Korea
IP/18	8	Real Time Thunderstorm Notification Service with Mobile App	Republic of Korea
IP/19	5	The Next Generation of the World Area Forecast System (WAFS)	WAFC Washington
IP/20	5	Enhancement of SIGMET Coordination status in Indonesia	Indonesia

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<b>LIST OF ACTIONS</b>				
<b>Action No.</b>	<b>Detailed description of actions</b>	<b>Responsibility</b>	<b>Target date</b>	<b>Status</b>
25/01	<b>Revise the Work Plan of MET SG</b> to reflect the up-to-date status of progress on the various updated target dates, such as Final reports of volcanic ash exercises [Ref: para. 1.8.]	Secretariat	Nov 2021	Completed
25/02	<b>Revise the Work Plan of MET SG</b> to include the “organisation” as well as “analysis” of Regional SIGMET monitoring exercises [Ref: para. 1.8.]	Secretariat	Nov 2021	Completed
25/03	<b>Revise the Work Plan of MET SG</b> to ensure the responsibilities to promote integration and expansion of SIGMET coordination activities are delegated appropriately to the relevant working group/s [Ref: para. 1.8.]	Secretariat and WG Chairs	Nov 2021	Completed
25/04	<b>Revise the Work Plan of MET/R</b> to take the lead in developing the proposed amendment to ANP Volume III in coordination with MET/IE and MET/S [Ref: para. 2.5.]	Secretariat and MET/R WG	Nov 2021	To commence
25/05	<b>Reach out to States concerned with air navigation deficiencies</b> to identify and record target dates for resolving their respective air navigation deficiencies [Ref: para. 4.3.]	Secretariat	Nov 2021	To commence
25/06	<b>Finalise the proposals for amendment of the APAC ANP (Vol I and II) and ROBEX Handbook</b> as agreed in previous meetings to ensure accuracy of the requirements specifications against which the OPMET monitoring is analysed [Ref: para. 4.6.-4.7.]	Secretariat	Nov 2021	In progress
25/07	<b>Finalise a proposal for amendment of the APAC ANP (Table MET II-1) and consequential amendment to the APAC Regional SIGMET Guide</b> as necessary to ensure the correct use of FIR indicator for Port Moresby [Ref: para. 4.12.-4.14.]	Secretariat	Nov 2021	To commence
25/08	<b>Review and revise the APAC Regional SIGMET Test procedure</b> as necessary to ensure MWOs issue a SIGMET test message for each VAA test message received from each of its associated VAACs [Ref: para. 4.12.-4.14.]	Secretariat	Oct 2021	To commence
25/09	<b>Review SIGMET Guide</b> as necessary to guide MWOs to handle cases when VAAC would not hand over to the neighbouring VAAC even if	MET/S	Mar 2023	To commence

<b>LIST OF ACTIONS</b>				
<b>Action No.</b>	<b>Detailed description of actions</b>	<b>Responsibility</b>	<b>Target date</b>	<b>Status</b>
	the ash cloud is expected to cross the AoR [Ref: para. 4.12.-4.14.]			
<b>25/10</b>	<b>Assist the Solomon Islands in aligning procedures with ICAO Annex 3, conducting SIGMET monitoring by RODBs and follow-up SIGMET tests</b> to demonstrate ICAO-compliant content, format and timeliness of SIGMET information service and its sustainability [Ref: para. 4.15.-4.18.]	Solomon Islands, Secretariat, Australia and New Zealand	Feb 2022	To commence
<b>25/11</b>	<b>Coordinate removal of AN deficiency AP-MET-23 from the open list</b> with the relevant ICAO bodies (MET/S WG, MET SG and APANPIRG) after receipt of the additional evidence and report from Solomon Islands [Ref: para. 4.19.]	Secretariat	Mar 2022	To commence
<b>25/12</b>	<b>Provide updates to the contact lists in the ICAO Doc 9766-AN/968 (Handbook on the International Airways Volcano Watch (IAVW))</b> to the ICAO METP [Ref: para. 5.15.]	MET SG, MET/S WG, MET/IE WG	Mar 2022	To commence
<b>25/13</b>	<b>Coordinate possible SWX advisory exercise/s and training workshop/s</b> with the appropriate body under METP for [Ref: para. 5.28.]	Secretariat MET/S WG, MET/IE WG	Nov 2021	To commence
<b>25/14</b>	<b>Finalise the proposed amendment to the ROBEX Handbook, Table A, Appendix A</b> to reflect the requirement of China for regular exchange of OPMET bulletins with Sri Lanka, Indonesia, Malaysia and India in consultation with States concerned [Ref: para. 6.1.-6.2.]	Secretariat	Nov 2021	To commence
<b>25/15</b>	<b>Coordinate and update the MET SG work plan</b> based on the outcomes of the MET SG/25 Meeting's discussions [Ref: para. 7.1.-7.2.]	Secretariat and Chairs MET SG and WG's	29 Oct 2021	Completed

**METEOROLOGY SUB-GROUP (MET SG)  
TERMS OF REFERENCE AND PLAN OF WORK**

Editorial Note: Updates proposed by MET SG/25 shows deleted text using ~~text to be deleted~~, and added text with grey shading (text to be inserted).

**1. Objectives of the MET SG**

- a) Ensure the continuous and coherent development of the MET parts of the Asia/Pacific Regional Air Navigation Plan (APAC ANP) and other relevant regional documentation in a manner that is harmonized with adjacent regions, consistent with ICAO standards and recommended practices (SARPs), the Global Air Navigation Plan and the Global Aviation Safety Plan and reflects global requirements;
- b) Facilitate the implementation of aeronautical meteorological systems and services, as identified in the APAC ANP, Aviation System Block Upgrade (ASBU) priority modules and Asia/Pacific Seamless ANS Plan elements, with due observance to the primacy of air safety, regularity and efficiency; and
- c) Identify and address specific air navigation deficiencies in the field of aeronautical meteorological (MET) services.

**2. Functions of the MET SG:**

- a) Review MET parts of the APAC ANP, prepare amendment proposals as necessary to reflect updates and changes in the operational and global requirements;
- b) Monitor the level of and, as necessary, facilitate the implementation of aeronautical meteorological services to support the effective implementation of ASBU priority modules and the Asia/Pacific Seamless ANS Plan elements;
- c) Identify air navigation deficiencies in the field of aeronautical meteorology, e.g., through systems performance monitoring) and, where necessary, propose appropriate corrective action and facilitate the development and implementation of action plans by States to resolve identified deficiencies;
- d) Review and update the APANPIRG list of air navigation deficiencies in the field of aeronautical meteorology, as necessary, to reflect the current situation;
- e) Monitor research and development and trials and demonstrations in the field of aeronautical meteorology and other relevant areas and facilitate the transfer of this information and expertise, as necessary, between States;
- f) Make specific recommendations and develop guidance materials aimed at improving aeronautical meteorological services through the use of existing and/or new procedures, facilities and technologies;
- g) Review and identify inter-regional and intra-regional coordination issues in the field of aeronautical meteorology and, as necessary, recommend actions to address those issues; and
- h) Identify and progress environmental initiatives related to aeronautical meteorology.

### **3. Establishment of the MET SG**

3.1. The Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) established the MET SG to assist in its planning and implementation work, charging MET SG with preparatory work on specifically defined problems in the field of aeronautical meteorology requiring expert advice for their resolution. APANPIRG also appointed MET SG as the 'parent' group for other contributory bodies working in the field of aeronautical meteorology for APANPIRG.

### **4. Membership of the MET SG**

4.1. Membership of the MET SG comprises experts provided by States, whether Members or not of the APANPIRG, International Organizations and bodies having experience in the provision of aeronautical meteorological information and services.

### **5. Chairing and Secretary of the MET SG**

5.1. The MET SG shall elect a Chairperson, and Vice-Chairperson if needed, from the experts provided by States. The maximum term of the Chairperson and Vice Chairperson is four years. The Secretary of APANPIRG will appoint the Secretary of the MET SG.

### **6. Meetings of the MET SG**

6.1. The Chairperson of the MET SG, in consultation with Members and the Secretary, shall decide the date and duration of Meetings. As a rule, the MET SG should agree, at each Meeting, on the date and duration of the next Meeting and on a tentative schedule of future Meetings.

### **7. Documentation and Record of Meetings of the MET SG**

7.1. The MET SG shall record the proceedings of its Meetings in the form of a Report or a Summary and submit the Report or Summary for review and consideration by APANPIRG. A Meeting Report should cover completed action on any part of the MET SG work plan and outline the needs of MET SG for further directives or guidance from the APANPIRG to proceed in its work. Reports on Meetings shall be of a simple layout and as concise as practicable and should normally cover:

- a) Short introduction;
- b) Summary of findings (presented in the order of discussion of the agenda items, including any proposals for action); and
- c) Work plan and schedule for future Meetings.

7.2. The Secretary should publish the Report as early as practicable (21-days) after the Meeting.

7.3. The Secretary should disseminate the meeting invitation as early as practicable, i.e., not less than 3-months before the Meeting, and reminders for submission of papers approx. 6-weeks and 1-week before the due date for submission of papers.

7.4. Contributors should submit papers to the ICAO Secretariat as early as practicable, i.e., 28-days before the Meeting at which they are intended to be considered. The Secretary should publish papers, and send a notification of their availability, as early as practicable, i.e., 14-days before the Meeting at which they are intended to be considered.

7.5. The Secretary, in consultation with the Chairperson, may decide to accept papers submitted less than 28-days before the Meeting at which they are intended to be considered when there is a clear benefit to the Meeting in doing so.

## 8. Delegated authority of the MET SG

8.1. The MET SG may propose actions for further consideration by APANPIRG and record these in the MET SG Report as either draft Conclusions or draft Decisions of APANPIRG.

8.2. Additionally, APANPIRG has empowered MET SG to adopt proposals for action on technical matters (especially those concerning guidance to States in the implementation of ICAO SARPs and global and regional plans) that do not have additional economic, environmental, inter-regional or political effects, which should be considered by APANPIRG. The MET SG shall record these in its Meeting Report as Conclusions or Decisions of MET SG.

## 9. Work Plan of the MET SG

	Detailed description of deliverable	Responsibility	Target date	Status of progress
a) to h)	<b>Coordination meeting</b> for the Chairs of MET SG, MET/R WG, MET/IE WG, MET/S WG, VOLCEX/SG	Chair MET SG and Secretariat	Dec 2021 Mar 2022 Jun 2022 Sep 2022	In progress
a)	<b>Draft amendment proposal</b> for APAC ANP to fulfil missing data in Tables MET	MET/S WG and Secretariat	Mar 2022	In progress
a)	<b>Draft amendment proposal</b> for APAC ANP to clarify the MET-related implementation planning guidance in the ANRF and other parts of Volume III	MET/R WG MET/IE WG MET/S WG with guidance from ICAO	May 2022	In progress
b) c) g)	<b>Organisation and Analysis</b> of APAC Regional SIGMET test	MET/S WG (Activity 1 and 3) MET/IE WG (Activity 3)	Mar 2022	In progress Completed
b) c) g)	<b>Analysis</b> of APAC Regional OPMET-availability monitoring exercise	MET/IE WG (Activity 1)	Mar 2022	In progress Completed
b) c)	<b>Analysis</b> of APAC Regional OPMET-timeliness, -compliance and -regularity monitoring exercises	MET/IE WG (Activity 2)	Mar 2022	In progress Completed
b) g)	<b>Analysis</b> of APAC Regional VAAC backup tests	MET/IE WG (Activity 4)	Mar 2022	In progress Completed
b) g)	<b>Analysis</b> of APAC Regional IROG backup tests	MET/IE WG (Activity 5)	Mar 2022	In progress Completed
b)	<b>Revised draft regional guidance material</b> on MET information needed to support the elements of the APAC Seamless ANS Plan	MET/R WG (Deliverable 3)	May 2022	In progress
e)	<b>Organisation and Analysis</b> of APAC Regional SIGMET monitoring exercises	MET/S WG (Task 1)	Mar 2022	In progress Completed
b) c) g)	<b>Final report</b> on ICAO volcanic ash exercise APAC VOLCEX 18/01 TBD (Papua New Guinea)	APAC VOLCEX/SG (Milestone 5)	TBD	Not started

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Appendix D to the Report

	Detailed description of deliverable	Responsibility	Target date	Status of progress
b) e) g)	<b>Final report</b> on ICAO volcanic ash exercise APAC VOLCEX 18/02 (Indonesia/Sumatra)	APAC VOLCEX/SG (Task 6)	Completed	Completed
b) e) g)	<b>Final report</b> on ICAO volcanic ash exercise APAC VOLCEX 19/01 (Raoul Island, affecting Fiji's area of responsibility)	APAC VOLCEX/SG (Task 7)	Completed	Completed
b) c) g)	<b>Final report</b> on ICAO volcanic ash exercise APAC VOLCEX 20/01 TBD (North-east Asia)	APAC VOLCEX/SG (Milestone 9)	TBD Jun 2020	Not started
b) c) g)	<b>Final report</b> on ICAO volcanic ash exercise APAC VOLCEX 19/02 TBD (Philippines)	APAC VOLCEX/SG (Milestone 8)	TBD Jun 2020	Not Started
c) d)	<b>Update</b> the APANPIRG AN deficiencies database to add/remove deficiencies in the MET field	MET SG Chair, Secretariat	Jun 2022	In progress Completed
c) d)	<b>Reporting form updates</b> showing the status of implementation of corrective action for the resolution of AN deficiencies in the MET field	MET/S WG (Activity 2 and 6)	Mar 2022	In progress
e) f) g)	<b>First draft of input</b> to the Regional SIGMET Guide to assist States in aligning cross FIR boundary SIGMET information	MET/R WG (Task 1) MET/S WG (Task 4)	Completed	Completed
f)	<b>First draft of input</b> to the Regional SIGMET Guide on the use of objective criteria supporting the issuance of SIGMET information for thunderstorm	MET/S WG (Task 4)	Completed	Completed
f)	<b>Progress report</b> on implementation and testing of IWXXM exchange	MET/IE WG (Activity 5)	Jun 2022	In progress Completed
f) g)	<del><b>ROBEX Handbook updates</b> to support improved efficiency and effectiveness of the ROBEX scheme; develop new table indicating COMM links and status</del>	MET/IE WG (Task 6)	Mar 2020	Completed
g)	<b>Information</b> on ICAO provisions related to meteorological authority and quality assurance, cost recovery, competency, training and qualifications for meteorological service provision shared with States	MET SG Chair, Secretariat	Jun 2022	In progress
g)	<b>Analysis</b> of MET information used in the Region specifically to support ATM operations	MET/R WG (Deliverable 2)	May 2022	In progress
g)	<b>Plan and organize a for seminar</b> on regional implementation of MET information to support ATM operations	MET/R WG (Deliverable 5)	May 2022	In progress
h)	<b>Environmental Issues</b> Identify issues in the field of aeronautical meteorology related to environmental issues	MET SG Chair, Secretariat	Jun 2022	In progress
b) c) g)	<b>IWXXM workshop</b> Plan and conduct the IWXXM workshop based on outcomes from a survey of States' requirements for IWXXM implementation support	Secretariat, MET/IE WG Chair, MET SG Chair, Hong Kong China, Singapore	TBD April/May 2020	Not started Completed
f) g)	<b>SIGMET Guide update</b> Update the Regional SIGMET Guide to align with Annex 3, Amendment 79	MET/S WG (ad hoc group)	Jun 2020	Completed

MET SG/25  
Appendix D to the Report

	Detailed description of deliverable	Responsibility	Target date	Status of progress
e) f) g)	<b>SIGMET coordination activities in APAC Region</b> Coordinate on the next steps to promote integration and expansion of SIGMET coordination activities among States/Administrations.	MET/R WG (Deliverable 7) MET/S WG (Activity 8) (MET/R WG)	Jun 2022	In progress
	<b>Update</b> Regional Guidance for Tailored Met Information and Services to Support ATM Operations	MET/R WG	May 2022	In progress
	<b>Develop</b> User Requirements for SWIM-based MET Information Services Supporting ATFM	MET/R WG	May 2022	In progress
	<b>MET expert contribution to SWIM/TF</b> – Identify meteorological expert/s to contribute to the APAC SWIM/TF to ensure meteorological aspects are fully considered	MET SG	Nov 2021	In progress

— END —

## **IWXXM IMPLEMENTATION IN APAC REGION**

### **Frequently Asked Questions (FAQs)**

**Working Draft (October 2021)**

## **Introduction**

The majority of the information contained below are answers to questions raised during previous ICAO APAC IWXXM workshops or webinar:

- Hong Kong, China (10 – 12 October 2017)
- Bangkok, Thailand (12 – 14 June 2019)
- Nuku'alofa, Tonga (04 – 06 December 2019)
- Webinar (27 – 29 October 2020)

These FAQs are categorized into the following topics:

1. What is IWXXM?
2. The role of IWXXM in the international air navigation system
3. IWXXM production
4. IWXXM exchange
5. IWXXM exchange testing
6. IWXXM compression
7. IWXXM versions
8. IWXXM translation
9. IWXXM validation and QC
10. IWXXM extensions
11. Guidance, education, capacity building
12. End-user considerations
13. Cyber security

For further details, please refer to the aforementioned technical presentations and the following ICAO documentation:

- ICAO Doc 10003 – *Manual on the Digital Exchange of Aeronautical Meteorological Information*
- ICAO IWXXM Guidelines - *Guidelines for the Implementation of OPMET Data Exchange using IWXXM* (Refer <https://www.icao.int/APAC/Pages/eDocs.aspx> > MET)

## **1. What does the acronym IWXXM stand for?**

### 1.1 What does the acronym IWXXM stand for?

- ICAO Meteorological Information Exchange Model (commonly mistakenly pronounced as ICAO Weather Information Exchange Model due to the WX in the acronym).

### 1.2 What actually is IWXXM?

- It is a form of human-readable and machine-readable computer code in Extensible Markup Language (XML). It also uses Geography Markup Language (GML) which is a way of writing geographic information in Extensible Markup Language (XML) in order to share, store and display geographic information.

### 1.3 What will IWXXM be used for?

- IWXXM products are used for operational exchanges of meteorological information for use in aviation. It includes XML/GML-based representations for current products standardized in International Civil Aviation Organization (ICAO) Annex 3 and World Meteorological Organization (WMO) No. 49, Vol II, such as METAR/SPECI, TAF, SIGMET, AIRMET, Tropical Cyclone Advisory, Volcanic Ash Advisory and Space Weather Advisory, but will expand the scope significantly beyond these legacy formats for meteorological data.

### 1.4 Why change to IWXXM?

- Using XML and GML formats allows significantly more richer data to be shared more efficiently between modern systems. This will contribute to greater efficiency and safety in air traffic both for Aircraft Operators (AOs) and Air Navigation Service Providers (ANSPs).

### 1.5 Who will use IWXXM?

- Because IWXXM is for sharing aviation meteorological data, all stakeholders in the aviation value-chain, in particular Air Traffic Management, will gain value from having IWXXM capable systems. This includes airlines, ANSPs, airports and of course MET service providers.

## **2. The role of IWXXM in the international air navigation system**

### 2.1 What's the relationship between the role of IWXXM and GANP?

- We are migrating from product-centric to data-centric in accordance with the Global Air Navigation Plan (GANP). For more information on the latest GANP, refer to <https://www4.icao.int/ganpportal/>

### 2.2 We need to transition from traditional alphanumeric code (TAC) form to IWXXM. Specifics to this transition include:

- Introduction of IWXXM.
- Proposal to remove generation of TAC as an Annex 3 standard from 2026.
- States should consider necessary systems changes to migrate to IWXXM data as an alternate information service by 2026.
- These Annex 3 changes do not preclude a State from generating TAC but there will be no ICAO requirement for international distribution or distribution to other States.

### 2.3 What's the next plan of ICAO on IWXXM in detail?

- Refer to presentation on GANP
- Following the initial IWXXM implementation, ICAO is planning to migrate IWXXM away from being product oriented (e.g. METAR, TAF) to be more service oriented. As a result, it is expected that new IWXXM reports for aerodrome observations and aerodrome forecasts will likely be

introduced

- 2.4 How does the ICAO Meteorological Panel (METP) roadmap envisage architecture for exchange of IWXXM after 2026? AMHS or SWIM?
- The architecture will migrate into a SWIM architecture. The exact architecture is still being developed but here is the current draft proposal of timeframe and capabilities:

	<b>Block 0 2013-2018</b>	<b>Block 1 2019-2024</b>	<b>Block 2 2025-2030</b>	<b>Block 3 and Beyond &gt;2031</b>
<b>Communication Protocols</b>	AFTN AMHS Basic	AFTN AMHS Basic AMHS FTBP AMQP/HTTP (optional)	AMHS FTBP AMQP/HTTP	AMQP/HTTP
<b>Information Exchange Services</b>	RODB TAC request/reply RODB IWXXM request/reply	RODB TAC request/reply RODB IWXXM request/reply RODB IWXXM notification (optional) WFS, WCS, WMS (optional)	RODB IWXXM request/reply RODB IWXXM notification (optional) WFS, WCS, WMS	WFS, WCS, WMS Other web services
<b>Data Types</b>	Gridded Objects	Gridded Objects	Gridded Objects	Gridded Objects
<b>Data Addressing</b>	AFS Addressing	AFS Addressing IP (optional) SWIM Registry (optional)	AFS Addressing IP SWIM Registry	IP SWIM Registry

- 2.5 How to manage TAC from now until 2026?
- No different to today
- 2.6 The timetable of IWXXM development in the future?
- The timetable is still being developed. Eventually all text Annex 3 products will either be migrated to IWXXM or they will be decommissioned. Annex 3 products are being implemented in IWXXM-form in a priority order. The remaining order is currently being reanalysed. The next products to be developed in IWXXM are SIGWX (high/mid & low). Regional Hazardous Weather Advisory products may follow.
- 2.7 Will future ICAO provisions for METAR/SPECI enable automated data via IWXXM?
- Yes
  - While IWXXM provides opportunities for exchange of high-fidelity MET observation data, the MET Panel is capturing user requirements which will either result in updates to existing IWXXM schema or more likely introduction of new IWXXM reports to meet these new needs.
- 2.8 How to transmit MET information (beyond Annex 3 products) in IWXXM (Radar, LLWAS, ATM-tailored Met Info, etc.)
- IWXXM is well suited to supporting point, line and polygon-based features. Other formats such as gridded (e.g. GRIB) formats and image (e.g. PNG) are better suited for some products and these will

be implemented through SWIM which is beyond the scope of IWXXM.

- These requirements and services are being developed in ICAO METP and will be discussed further at other ICAO APAC forums such as the System Wide Information management (SWIM) Task Force (SWIM/TF) and other workshops.

2.9 What is the global/regional plans for transition to SWIM – roles of MET in SWIM?

- METP/4, Recommendation 5/5, endorsed the MET-SWIM Plan and MET-SWIM Roadmap and invited ICAO to upload the draft MET-SWIM Plan and draft MET-SWIM Roadmap to the ICAO METP website (both public and secure) and to distribute it to the Planning and Implementation Regional Groups (PIRGs).
- “Plan for MET in SWIM” is available at: <https://www.icao.int/APAC/Pages/eDocs.aspx> > MET

2.10 Will displaying historic data become an issue for any tool in the future? It will need to be able to handle TAC as well as all IWXXM editions that may have been used.

- Potentially. This is being considered by both ICAO and WMO. This should also be considered by States. Often historic records are not kept in their WMO/ICAO format but instead as records in a database.

~~2.11 Meteorological services do more than just supply aviation data so will METAR format remain for non-aviation use?~~

- ~~• METAR/SPECI formats are used more broadly than aviation.~~
- ~~• WMO is discussing the introduction of IWXXM with its members and will do the same for removal of METAR. It's likely that IWXXM will be adopted more broadly than aviation.~~

2.12 What if meteorological fields evolve far faster than the standard IWXXM format wants to handle?

- Yes, this is possible. If users have local requirements, they can extend the IWXXM schema through extensions, as they do with the TAC today through remarks
- If the same extensions capability is required by multiple States, a regional extension or global optional parameter may be implemented
- Extending the schema does however come with a range of other requirements and costs for States and users, so careful consideration should occur before a State chooses to extend the schema.

2.13 Can we use TAC format (current format) before implementing IWXXM?

- TAC for OPMET is an ICAO standard in Annex 3 and will continue to be until 2026 (at least). So you will need to continue to provide TAC.
- IWXXM became an ICAO Annex 3 standard in November 2020.

2.14 If a State is yet to implement IWXXM, what should they do?

- If implementation of IWXXM is delayed (due to COVID or any other reason), a State should register a difference against the relevant Annex 3 provisions in the Electronic Filing of Differences (EFOD) system with an estimated date of implementation.
- Please use the EFOD to file the differences including with Am. 79. Please note that, with reference to ICAO State Letter AN 11/55-20/50, ICAO created a COVID-19 Contingency Related Differences (CCRD) sub-system in the existing EFOD system to capture any differences from ICAO Standards on certification and licensing that may arise from mitigation measures due to the COVID-19 pandemic. It is accessible via the USOAP dashboard. The CCRD specifically facilitates recognition or validation of licenses or certificates affected by the special measures.
- States can also look to arrange another State to perform TAC to IWXXM translation to support expedited IWXXM implementation.

2.15 Is the flexibility in the implementation timelines sufficient to allow for the impact of COVID 19.

applicable to both MET providers, COM and all users?

- Annex 3 amendment cycle changed to a 3-year cycle. Next main amendment is 2023 then 2026 etc.
- METP, in conjunction with WMO and IATA, are looking at impacts of COVID-19 - particularly on when Annex 3 provisions become applicable and how we will implement IWXXM and SWIM in a cost-effective manner.
- ICAO & IATA are encouraging earlier adopters.

2.16 Any insight on what will be included in Annex 3, Amd. 80, 81, and 82?

- Amd 80 (2021) is only introducing changes to State of the Runway (no other changes).
- Amd 81 (2023), IWXXM and TAC are still standards. Procedures for Air Navigation Services – Meteorology (PANS-MET) is likely to be introduced.
- Amd 82 (2026), IWXXM is still a standard. ICAO & IATA are still looking at whether TAC remains as a standard (and a means of compliance if PANS-MET is implemented). Another critical thing we need to look at is the implementation of SWIM in this timeframe - particularly given COVID-19.

### 3. **IWXXM production**

3.1 Is it mandatory for IWXXM to be from source?

- No, but the best implementation is IWXXM generated at source
- Preference for IWXXM generated at source (best implementation), but IWXXM converted from TAC is better than no IWXXM
- In the future IWXXM will contain information not present in TAC, so it will not be possible to generate this from TAC.

3.2 If a parameter is missing in TAC (e.g., WX is missing in METAR) how to generate the report in IWXXM?

There are all sorts of examples at IWXXM translation repository in the Github of WMO Information Management for IWXXM: <https://github.com/wmo-im/iwxxm-translation>

- Is it possible to make the IWXXM element "translatedBulletinID" mandatory for easy reference to the TAC bulletin?
- While the attribute "translatedBulletinID" is optional, it's presence will be checked by schematron rule Common.Report-3 in iwxxm.sch. See the one for IWXXM 3.0.0 at official schema repository of the World Meteorological Organization (WMO): <http://schemas.wmo.int/iwxxm/3.0/rule/iwxxm.sch>

3.3 Is there any experience or suggestions about how to convert the location of the significant weather in TAC report to latitude and longitude (or polygons) in IWXXM?

- It's always easier to start with a polygon in the TAC SIGMET message. So where possible it is preferred that a polygon is used. However, Annex 3 still allows us to write "S OF", "W OF", "ENTIRE FIR" etc. In that case the FIR boundary needs to be used to help make up the polygon.
- The line will intersect with the FIR and together they will form a closed polygon covering the meteorological phenomenon involved. There are many software libraries out there to help you do the intersection and return the polygon to you.
- There is also a wiki page summarizing the way geometric objects are described in different IWXXM reports. You may want to take a look at <https://github.com/wmo-im/iwxxm/wiki/Geospatialobjects-in-IWXXM>

3.4 When we would like to disseminate IWXXM reports, is it always necessary to aggregate the reports? I wonder whether we must use <collect:...> schema even if we would like to send non-regular reports,

such as SIGMET, SPECI and TAF AMD.

- Only METAR and TAF needs to be aggregated.
- All IWXXM messages, no matter aggregated or not, will have to be encapsulated with COLLECT before sending out through AMHS.

#### 4. **IWXXM exchange**

- 4.1 Should TAC over AMHS be distributed independently of IWXXM, or part of IWXXM?
- TAC and IWXXM should be distributed independently, in parallel
  - For every TAC message, there should be corresponding IWXXM report, and visa-versa
  - Inclusion of TAC inside (the comments part of) IWXXM is not recommended. WMO have done this in their examples such that users can clearly see the corresponding TAC and IWXXM information
  - Note: When producing IWXXM from TAC, and the translation cannot be reliably performed, the original TAC is included in the message with no further information
- 4.2 How to manage exchange of TAC and IWXXM concurrently within COM networks?
- The TAC and IWXXM messages have different (but correlated) headers, such that they will not be confused e.g. an Australian TAF TAC bulletin and IWXXM collective would have the WMO headers of FTAU31YBBN and LTAU31YBBN, respectively.
- 4.3 Will IWXXM be disseminated by Regional OPMET Centres (ROCs) in the same way as ROBEX Handbook?
- IWXXM exchange shall differ from traditional OPMET exchange, whereby:
    - There is no distributing responsibility for originating stations and National OPMET Centres other than to get their products to their Regional OPMET Centre (ROC);
    - Originating ROC distributes every type of IWXXM OPMET to all other ROCs in the APAC region; and
    - ROCs will distribute received IWXXM messages to the NOC and users in their respective area of responsibility.
- 4.4 How will ROCs identify whether recipients are capable of receiving IWXXM?
- Refer to [Online Register of APAC IWXXM Exchange Status](#), which will be included in the ROBEX Handbook. This online register records the implementation status of IWXXM exchange, including their readiness to receive IWXXM, corresponding AMHS addresses, supported AMHS capability and the status in disseminating IWXXM reports to other ROCs or National OPMET centres (NOCs).
- 4.5 What is the status and capability States with respect to AMHS with FTBP in the APAC region?
- Refer to the Online Register of APAC IWXXM Exchange Status
  - Refer to papers, presentations, discussions, reference material, networking contacts in the previous IWXXM workshops and MET/IE WG meetings
- 4.6 What protocol is used between the MET/IWXXM generation system and the AMHS for exchange of IWXXM?
- Entirely the prerogative of the State, but AMHS/FTBP is preferred. A secure method of transfer is recommended. ICAO does not require AMHS/FTBP for exchange within the State.
- 4.7 What is the bandwidth requirement for exchange of IWXXM using AMHS Extended services?
- Depends on amount of IWXXM reports exchanged and what other data is sent on the link, but IWXXM is approximately 10x data volume of TAC and IWXXM will be sent in addition to TAC and other data

- States should ensure there is adequate capacity in their communication links to support the new IWXXM data
- 4.8 What is the dependency of the exchange of IWXXM within the Region and Globally?
- The exchange of IWXXM within the Region and Globally is dependent on the ROCs and RODBs being IWXXM-exchange capable and therefore ROCs and RODBs need to be the first to implement support for IWXXM and AMHS+FTBP+IHE.
- 4.9 What is the technical specification for gateways system that will translate TAC to IWXXM format?
- There is no single technical specification. There is a functional description of the capability with the IWXXM Guidelines but interface specification may vary between different solutions/vendors and may include web service, AFTN links, or various other interfaces.
- 4.10 How do we ensure that there is no message lost in the AMHS when handling TAC & IWXXM format during the Transition period (mixed environment)?
- This has been designed into the system architecture for this transition period. Once IWXXM is implemented, there shall be one IWXXM message for every TAC message. If converting from TAC to IWXXM and poorly formed TAC is identified, then a partially translated IWXXM will be generated. Refer to IWXXM Guidelines.
- 4.11 Do we need to save all of the converted data in IWXXM to our disk storage? Since the size of the converted data in IWXXM is larger than TAC format but the content is same.
- ICAO requires States to archive all aviation products for at least 28-days. Longer is recommended for various reasons, including investigations and verification.
- 4.12 What is the maximum size permissible for IWXXM attachments in AMHS?
- AMHS network should support the transfer of IWXXM messages with a maximum file size of 4 MB including FTBP of up to 2 MB [*Guidelines for the implementation of OPMET data exchange using IWXXM*, 4.1.5, refers]
- 4.13 What if the bandwidth of a comms link is insufficient to satisfy IWXXM requirements in some existing AMHS circuits?
- Yes, bandwidth is likely to be insufficient in some APAC links
  - Upgrades of these links may be required and can be addressed through either through capacity changes of the existing links or the use of the CRV
  - Higher than 64 Kbps is recommended, and the required bandwidth is dependent on the use on the link.
- 4.14 May I know who is actually responsible for technical implementation of AMHS in a particular member country? Is it responsibility of MET or COM?
- Annex 3 [2.1.4] requires that each Contracting State shall designate the authority, hereinafter referred to as the meteorological authority (MA), to provide or to arrange for the provision of meteorological service for international air navigation on its behalf. Therefore, the MET Authority has a clear role and responsibility in ensuring the dissemination of MET information in IWXXM form. It follows that the MA has a responsibility in ensuring that the required mechanism/s are in place (e.g., AMHS + FTBP) to enable the State to disseminate the required MET information in IWXXM GML form. It will almost undoubtedly require close liaison between those concerned with the supply (e.g., MET service provider, COM service provider) and those concerned with the use of meteorological information.
- 4.15 The exchange of IWXXM requires full path of FTBP-capability communications from originator to

destination. It's hard to ensure the whole path is FTBP-ready especially during interruption or reply to an RQX.

- Agree. This is the case until all of the AFS network is AMHS FTBP.

4.16 Is there any document describe more detail about RQX and RQM, which explain the IWXXM step before passing AMHS?

- Please refer to IWXXM Guidelines:
  - 2.8 International OPMET Databank, Operational principles: - OPMET Databank Requests
  - 5.1.5 International OPMET Databank, Operational principles: - DB Requests

4.17 Can AFTN links support the relay of IWXXM?

- Due to technical differences between the old and new formats, aeronautical meteorological information in IWXXM form cannot be transmitted in the same way as it is in Traditional Alphanumeric Code (TAC) form via the Aeronautical Fixed Telecommunication Network (AFTN). Instead, the ICAO guidance identifies the Air Traffic Services Message Handling System (AMHS) as a mechanism for the exchange of IWXXM information using the extended AMHS File Transfer Body Part (FTBP) feature over the Aeronautical Fixed Service (AFS).
- In addition, due to the much larger file sizes associated with IWXXM, the ICAO guidance indicates that the total size of an AMHS message (including FTBP) should be up to 4 MB.

4.18 When the IWXXM bulletin is needed to be disseminated to many destinations, could all of the addresses be added in one AMHS message (like sending an e-mail)?

- Many addresses can be added in one AMHS message. For your system it will just be one message being sent out, but it may end up at 20 destinations.

4.19 Are there any ICAO procedures or guidelines that any NOC has to follow if there is a need to request IWXXM translation services from ROC? If so, any template or predefined form that could be used?

- Please refer to IWXXM Guidelines, including sections 6.3.1: Prerequisites for Translation Centres; and 6.3.7: Translation Agreement.

4.20 Our system now sends out 2 body parts for IWXXM message, one as ATS headers with no message and second as FTBP. Are ATS Headers needed for Basic AMHS with FTBP as originators/recipients.

- IHE and FTBP should be used for the IWXXM exchange over AMHS.
- IWXXM messages should be exchanged using extended AMHS FTBP (single body part) with IPM Heading Extension (IHE). You may refer to ICAO document 'Guidelines for the implementation of OPMET data exchange using IWXXM'.

## 5. **IWXXM exchange test**

5.1 TEST message addresses: is anyone considering being a test (AMHS) endpoint for any parties/countries to send their test IWXXM?

- It is recommended that the RODBs plus any additional volunteer States conduct coordinated testing of IWXXM exchange of AMHS+FTBP as early as possible, if not already done so. It would also be beneficial for airlines to undertake test with ANSP and MET agencies to understand user needs and potential system solutions.

5.2 How to conduct simulations (tests) of sending/exchanging OPMET data thru AMHS in IWXXM format?

- As answer to Q43 above
- Ref: *Guidelines for the implementation of OPMET data exchange using IWXXM*

- 5.3 Where can one find the knowledge of Tests Performed?
- A log of international IWXXM exchange test on behalf of MET/IE WG is being maintained by
    - MET/IE WG Activity 7.2: Undertake IWXXM tests with other centres
    - MET/IE WG Activity 7.6: Maintain a register of IWXXM tests conducted, detailing Met software, UAs and MTAs tested
- 5.4 What are the common issues observed during IWXXM exchange test over AMHS?
- Two body parts are observed, while IWXXM shall contain single body part which is an FTBP
  - Required fields are missing or in incorrect format, such as Precedence, Precedence-policy-identifier 1.3.27.8.0.0 and Authorization Time (should ends with “Z”)
  - Reference: Appendix A of "Guidelines for the Implementation of OPMET data exchange using IWXXM "

## 6. **IWXXM compression**

- 6.1 Will compression always be required?
- Gzip compression has been adopted for IWXXM compression
  - Compression shall always be done unless a specific agreement has been reached with the corresponding NOC or ROC to perform the compression on behalf of the originating State
  - Basic AMHS might provide an acceptable alternate solution (To be confirmed) where there are difficulties implementing the FTBP, the link has ample capacity to support the transmission of uncompressed IWXXM data and an agreement is in place for the aggregator to perform compression/decompression on behalf of the originator
- 6.2 Is there any rough estimate on the file size of IWXXM for METAR or TAF? Wondering if AMHS/ROC/NOC/RODB in APAC be able to support IWXXM messages exchange with large file size.
- a sample METAR bulletin with 6 reports in it makes a ~30k IWXXM file - which becomes ~3.7k compressed

## 7. **IWXXM versions**

- 7.1 What version of IWXXM is recommended to be used?
- ICAO Doc 10003 – Manual on the Digital Exchange of Aeronautical Meteorological Information, stipulates that to meet the requirements of Amendment 79 to Annex 3, only Version 3 of IWXXM, or later, shall be exchanged on operational networks from 5 November 2020
  - WMO envisage limited changes to version 3 in the coming few years.
- 7.2 Is IWXXM version 3 supporting image data? How it works?
- IWXXM will not support image data, but it will support SIGWX forecasts (i.e. object data).
  - Other formats GRIB/PNG will support image data.
- 7.3 How is IWXXM version be upgraded?
- Versions of IWXXM are independent of changes to Annex 3, therefore whilst Amendment to ICAO Annex 3 occur every 3-years, updates to IWXXM are not expected to occur every 3-years
  - WMO manage the version of IWXXM
  - Typically, multiple versions of IWXXM will be allowable at any one time, and future versions of the Guidelines for the implementation of OPMET data exchange using IWXXM will specify which versions are acceptable to meet Annex 3 requirements

## 8. **IWXXM translation**

- 8.1 How are Translation Centres established?
- Translation Centres will likely be required
  - ROCs, RODBs are encouraged to provide translation services
  - Each State is responsible for arranging the provision of IWXXM, and where required, an agreement with another State to provide TAC to IWXXM translation on their behalf
  - Formal agreement is required
  - More information on translation function, Translation Centre pre-requisites and Translation Centre Agreement is in the presentation on translation from TAC to IWXXM in the IWXXM Guidelines.
- 8.2 After translation (from TAC to IWXXM), can the data be sent direct to the aggregator or does it need to be returned to the originator to then send it to the aggregator?
- Either scenario is acceptable, depending on the arrangement between the originator and the translator
- 8.3 Will the conversion apply in both formats at the RODB?
- Translation of TAC to IWXXM is OK, if necessary, but the distribution of IWXXM to TAC is not permitted when the original TAC from source is available
- 8.4 What happens to regional countries that will not be able to change to IWXXM?
- Each State is responsible to arrange translation services as necessary
  - Translation Centres will likely be required  
Caution: National extensions can be implemented (for differences to Annex 3), but this requires additional effort and cost by the State and should only be implemented in the globally agreed standard way  
Caution: Original TAC must be well structured and reliably structured for it to be reliably converted to IWXXM
  - Refer to presentations on Translation of TAC to IWXXM in IWXXM workshops for more details
- 8.5 To provide translation for other States, it is understood that agreement is required. Is there any agreement form/example which State can refer to?
- For guidance on what an agreement should contain, please refer to the IWXXM Guidelines, including the following:
    - Section 6.3.7: Translation Agreement - Provides a list of elements that should be contained in the service agreement between the Translation Centre and applicant State
    - Section 5.1.3: Data Translation Centre - A data translator converts TAC data into IWXXM on behalf of their State and/or another State (i.e. when the data producer is unable to do so). A bi-lateral or regional agreement should be defined for such circumstances.
    - Section 6.3.1: Pre-requisites for Translation Centres - Provides a list of items considered pre-requisite for data translation centres.
    - Reference could be made to the translation service request form available in ICAO EUR/NAT region website
- 8.6 When could the IWXXM attribute "translationfailedTAC" be used?
- If the wrong codes in TAC lead to incomplete (partial) translation, it should be considered as translation failure and indicated by "translationfailedTAC".
- 8.7 Where can we obtain converted file that including TAC and XML (TAC to XML)? We need to check (validation) translator of IWXXM (TAF/TAF AMD, METAR, SPECI, SIGMET, AIRMET).

- Apart from some examples under <http://schemas.wmo.int/iwxxm/3.0/examples/>, there are some additional examples at <https://github.com/wmo-im/iwxxm-translation> which may want to try with your translator.

8.8 Some bulletins contain METARs and TAFs from multiple States. If some of these States require translation services and others generate their own IWXXM, what are the options for aggregation - or, if not possible due to current ROC capabilities, creating new bulletins?

- It is recommended that the existing bulletin gets split into two separate bulletins, one containing IWXXM generated as source, the other containing data for sites that are generated in TAC and translated to IWXXM. An aerodrome (METAR or TAF) data should only exist in one bulletin.
- The ICAO APAC Region has an opportunity, through the MET/IE WG, to develop a proposal/s to update or revise the current ROBEX scheme and ROBEX Handbook to guide States towards the most appropriate solution for ICAO APAC OPMET bulletins.

8.9 For an incomplete TAC to IWXXM (Partial) translation, where does the error message send to if the ROBEX generated TAC bulletin is generated from a ROC noting that NOC is the originator of the TAC message?

- The error message should be sent to the TAC originator if it is confirmed that the incomplete translation is caused by invalid TAC format.

## 9. **IWXXM validation and quality control**

9.1 How will IWXXM extensions pass validation?

- Extensions should be implemented in a consistent way
- States implementing extensions are also required to develop a schema and recommended to develop Schematron. The schema and Schematron need to be web-accessible such that validation of extensions can be performed.
- Validation should be performed on the extended data

9.2 At this stage, do we need some other IWXXM validation apart from schema and schematron, such as bulletin is out of period or correction received but no prior initial message?

- As this moment the team considers it more important to deal with integrity of IWXXM messages. There will likely be separate checks of business rules as part of a mature QC process.

9.3 Where can I find a tool to validate IWXXM?

- There are a number of open source and commercial tools to validate IWXXM messages. One open source tool you may want to check out is CRUX from NCAR at <https://github.com/NCAR/crux>

## 10. **IWXXM extensions**

10.1 How to deal with differences to Annex 3 / IWXXM extensions?

- ICAO does not recommend States extend the IWXXM schema to include additional information  
Caution: National extensions can be implemented (for differences to Annex 3), but this requires additional effort and cost by the State and should only be implemented in the globally agreed standard way

10.2 Can IWXXM Extension be used to transfer information outside State? If so, is there any specific body like FIXM CCB to validate such Extension for wider user?

- There is no Change Control Board (CCB) for IWXXM. Changes are managed through WMO and

ICAO.

- The Meteorology Panel Working Group on Meteorological Information Exchange (WG-MIE) has been looking at the topic of Extensions. There are a number of WMO Task Team on Aviation Data (TT-AvData) experts that are also experts on WG-MIE.

10.3 Is there a mechanism to indicate that an IWXXM Extension must be understood by the consuming system? That is, the extension cannot be ignored as there are possible safety issues.

- Yes. There is indeed a directive in the extension part of the IWXXM schema requesting validators/parsers to have access to external schemas being used, otherwise it will return an error.
- This is also why a producer needs to think twice before producing an IWXXM message with extensions requiring external schemas. Downstream users will get an error when trying to consume the message if they cannot get hold of the schemas of the extension.

## 11. **Guidance, education, capacity building**

11.1 Will the ROBEX handbook be updated to support the exchange of IWXXM at the RODB?

- Yes; MET/IE WG, Activity 9.4: Review and update ROBEX HB and ICD, including aligning with OPMET bulletin contents and changes associated with IWXXM
- Note, much of the IWXXM related technical detail will not be incorporated into the ROBEX Handbook but instead be contained within the *Guidelines for the implementation of OPMET data exchange using IWXXM* is the main source of guidance

11.2 Where can I find the sharing of lesson learnt from States that have progress on the IWXXM implementation on challenges faced & recommended solutions for best practice?

- Refer to presentations, discussions, reference material, networking contacts
- Refer to the log of testing, coordinated by Singapore

11.3 Are there any guidelines on IWXXM Visualisation & display?

- METP Working Group on Meteorological Requirements and Integration (WG MRI) has this within their scope and its likely to be included within the new ICAO *Procedures for Air Navigation Services for Meteorology* (PANS MET)

## 12. **End-user considerations**

12.1 As an end-user, how will IWXXM format affect us?

- As the TAC will continue at least until 2026, initially there will be no effect on users. However, users wishing to benefit from utilizing IWXXM will be required to either develop new capability or upgrade their systems to support the ingestion of IWXXM data.
- Some solutions may be as simple as acquiring off-the-shelf software that can process IWXXM and translate TAC, and be usable on a standard computer screen.
- IWXXM is based on XML and will simplify the development of new airline and pilot applications
- Data volumes are substantially larger than TAC and the use of IWXXM may impact some users and their communication links (e.g. to aircraft)

12.2 Some airlines have flight planning departments. How will IWXXM be integrated into their flight planning systems?

- Users are required to:
  - Arrange access to IWXXM from one or many sources
  - Manage non-translated TAC in IWXXM

- Users are recommended to:
    - Take appropriate malware and anti-virus precautions if ingesting compressed files
    - Validate received IWXXM
    - Manage off-line copies of all required schema's & code tables
  - IWXXM is considered to be beneficial to users, flight planning systems, but TAC will remain available until at least 2026
- 12.3 What is the implication for States & RODB that unable to comply with the IWXXM implementation timeline?
- In November 2020, it became an ICAO requirement to implement and exchange IWXXM
  - Depends on the State and their required function. RODBs are critical in the ROBEX scheme – so consequences of non-compliance will be significant
  - States should file not compliance with Annex 3 in the Electronic Filing of Differences (EFOD)
- 12.4 On consumers' aspect, I think consumer (e.g. airlines) will not be able to connect to AMHS, where and how can they get IWXXM information?
- Quite a few airlines are connected to the AFS via their domestic COM Centre; others connect to the AFS via SITA gateways. The airlines can upgrade their AFTN connections to local COM Centre to AMHS FTBP, but this might be an investment that is hard to commit to at this moment. Some States also provide access to OPMET information via web services or similar. Alternative source of IWXXM data will be through WIFS and SADIS.

### 13. **Cyber security**

- 13.1 What is the recommended/appropriate cyber security strategy for IWXXM?
- Scan attachment at Message Transfer agent and isolate/remove infected file before distributed further (e.g. to end users)
  - Users systems should scan at either user server or terminals depending on implementation architecture and risk appetite
  - Testing should be conducted to assess the impact of scanning at various stages in the ROBEX scheme

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## MET Deficiency Report Guide



ICAO

*International Civil Aviation Organization*

**WORKING or INFORMATION PAPER**

**Meeting information**

Meeting location and date

**USE OFFICAL MEETING WORKING PAPER OR INFORMATION PAPER TEMPLATE – THIS DOCUMENT PROVIDES GUIDANCE IN WRITING A PAPER BUT IS NOT THE OFFICAL MEETING PAPER TEMPLATE TO BE USED.**

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**Agenda Item x: choose from provisional agenda items**

### **UPDATE ON MET DEFICIENCY AP-MET-xx**

(Presented by <name of State or Organisation>)

#### **SUMMARY**

*<Use this section to summarise the paper e.g. This paper outlines the work done by <State name> on resolving deficiency AP-MET-xx. If this is a progress update to inform of actions taken to date, then use an information paper template. For providing information to support a deficiency resolution, use a working paper template.>*

## **1. INTRODUCTION**

1.1 *<Describe the deficiency – e.g. APANPIRG deficiency AP-MET-xx refers to METAR from xxxx aerodrome not being available on a regular basis.>*

## **2. DISCUSSION**

### Corrective Action Plan and Implementation

2.1 *<Use this section to describe the actions taken or planned to resolve the deficiency e.g. regular METARs are now provided from the aerodrome or an AWS will be installed later in the year or information on volcanic activity is now provided to various organisations. Give some details on how these corrective actions help resolve the deficiency. The Corrective Action Plan can be provided as an attachment to the paper.>*

Evidence of MET deficiency resolution

2.2 *<Use this section to outline evidence of deficiency resolution or progress – e.g. letter from local airlines, ATS, MWO, VAAC, etc and/or results from OPMET monitoring, results of SIGMET test or other evidence as appropriate. Evidence such as letters can be included as an appendix to the paper and be referred to in this section.>*

**3. ACTION BY THE MEETING**

3.1 *<If this is a working paper, you can request the meeting to carry out an action – e.g. agreeing that the deficiency should be resolved and making a recommendation to APANPIRG to remove it from the deficiency list. If this is an information paper, you can request the meeting to note the progress of the deficiency resolution work.>*

*[Example for WP]*

3.1 The meeting is invited to:

- i. Note the information contained in this paper; and
- ii. formulate a Draft Conclusion for the removal of the deficiency AP-MET-xx from the APANPIRG Deficiency Database.

*[Example for IP]*

3.1 The meeting is invited to note the information on the progress of the deficiency resolution work contained in this paper.

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*<If adding attachments such as letters or monitoring results, include them here under the main body of the paper.>*

## MET Deficiency Identification Guide

### Purpose

Analysis of the annual ICAO SIGMET test and annual OPMET Monitoring activities by the APAC RODBs may highlight potential air navigation deficiencies in the meteorology field. This document is aimed to provide guidance on identification of potential deficiencies, with a focus on first assisting States in undertaking a root cause analysis to determine whether the issue may be resolved quickly (minimum resolution time to be determined on a case by case basis). A deficiency is to be applied only when there is no simple resolution planned and undertaken. Other sources of MET deficiency information may also be provided by the ICAO Secretariat and the principle of root cause analysis to determine an appropriate response will also be used.

Note – the identification of a deficiency can be an opportunity for a State to use as evidence for the need for increased resources and/or assistance.

### Method

#### 1. Annual ICAO SIGMET test

Following finalisation of the results of the annual ICAO SIGMET test, the following criteria will indicate when a possible MET deficiency should be considered:

- a) An expected SIGMET is not received by *any* RODB during the test.
  - If a SIGMET is received by 4 or less RODBs, then the MWO shall be requested to update their dissemination list to include all RODBs and a test SIGMET shall be issued to confirm this update.
- b) An expected SIGMET cannot be ingested by user systems.
  - A SIGMET may contain format errors. Minor errors such as priority indicators should be communicated directly to the MWO for resolution, followed by a test SIGMET being issued to confirm the correct format/bulletin information.
- c) A SIGMET is not received by *any* RODB within 5 minutes of issuance (referring to Annex 3 Appendix 10 section 1.1 “*Messages and bulletins containing operational meteorological information shall achieve transit times of less than 5 minutes, unless otherwise determined to be lower by regional air navigation agreement.*”).
  - States to undertake root cause analysis, with assistance from deficiencies ad hoc group, to determine reason for slow dissemination or receipt (eg internal process requiring email to ATS to disseminate via AFS on behalf of MWO).

### *Notes*

- 1) Deficiencies ad hoc group to recommend whether follow up SIGMET tests should be conducted to ensure SIGMET issues have been resolved

2) *While the items above discuss SIGMET issuance, they can equally apply to VAA and TCA issuance.*

## 2. APAC RODB Annual OPMET Monitoring

Following finalisation of the results of the APAC RODB Annual OPMET Monitoring, the following criteria will indicate when a possible MET deficiency should be considered:

- a) A METAR/SPECI or TAF for aerodromes in Table MET-II-2 is not received by *any* RODB during the test.
  - If a METAR/SPECI or TAF is received by 4 or less RODBs, then the NOC or ROC shall be requested to update their dissemination list to include all RODBs and the RODBs will be requested to confirm receipt, once complete.
- b) A Table MET-II-2 METAR/SPECI or TAF with an availability/regularity/compliance score of less than 50% (threshold to be reviewed regularly).
  - NOC to provide information to explain score. If resolution can be made quickly, then RODBs will be requested to confirm resolution by compiling one month's statistics, once complete. If resolution requires a longer term (ie greater than 3 months, but to be determined on a case by case basis), consider deficiency.

## 3. Any other potential deficiency source

The ICAO Secretariat may identify other sources of information that could indicate a MET deficiency and, if appropriate, request the ad hoc group on deficiency under MET/S WG to assist with root cause analysis.

### Deficiency Resolution Support

Once a MET deficiency has been applied (and for existing MET deficiencies), the following steps may be followed by the ad hoc group on deficiencies:

1. Engage with State holding a deficiency, to assist in carrying out a root cause analysis of the issue.
2. Develop a Corrective Action Plan (template to be developed) in coordination with the State to resolve the issue and collect evidence to show resolution. This may include the development of tests/exercises to support the deficiency resolution.
3. Assist State in compiling a report to ICAO, outlining evidence of resolution deficiency.

*Note – the ad hoc group on deficiencies will assist the State in the deficiency resolution, but the State is responsible for the work being carried out and for ensuring the resolution remains in place.*

# INTERNATIONAL CIVIL AVIATION ORGANIZATION



## ASIA/PACIFIC REGIONAL GUIDANCE FOR TAILORED METEOROLOGICAL INFORMATION AND SERVICES TO SUPPORT AIR TRAFFIC MANAGEMENT OPERATIONS

Second Edition, XX 20xx

Adopted by MET SG/xx in xx 20xx



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## **1. Introduction**

### **1.1 Purpose and overview of the guidance**

1.1.1 This guidance aims to foster States' implementation and enhancement of meteorological (MET) information and services for air traffic management (ATM)<sup>1</sup> within Asia/Pacific (APAC) region.

1.1.2 The guidance captures most of the necessary processes from preparatory to operational phases. Furthermore, it provides detailed operational services, with specific examples and an operational scenario on ATM-tailored MET information and services. Information in this guide can also be used to facilitate further improvement by the States who have already implemented ATM-tailored MET services.

1.1.3 A stepwise (process-wise) structure of the guidance is expected to allow each State to refer to chapters, sections or subsections useful for the commencement, implementation or improvement of its MET information and services to support effective ATM.

### **1.2 Development of the regional implementation guide**

1.2.1 ICAO APAC Meteorological Requirements Task Force (MET/R TF) 4<sup>th</sup> meeting, held in July 2015 in Tokyo, noted that so-called 'ATM-tailored' MET information, when provided to support international air navigation, is still required to comply with the Annex 3 - *Meteorological Service for International Air Navigation*, 'General Provisions'. However, the detailed technical specifications for the information has not yet been specified in Annex 3. The meeting also noted that specific regional guidance material is necessary to assist States in developing and implementing tailored meteorological information and services to support effective ATM and agreed to develop the regional guidance material.

1.2.2 An ad-hoc group consisting of Australia, China, Hong Kong, China, Japan (rapporteur), New Zealand, Republic of Korea, Singapore, Thailand and Vietnam was tasked to develop a regional guidance material for tailored meteorological information to support ATM operations.

1.2.3 Detailed historical background of efforts for implementation and enhancement of MET information and services for ATM in APAC Region is described in section 1.4.

### **1.3 Importance of ATM-tailored MET information and services**

1.3.1 With unprecedented growth in air traffic movements in the Asia/Pacific Region, ATM is paramount for the continued assurance of safe, efficient and timely aircraft

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<sup>1</sup> Note. ATM is defined in PANS-ATM (Doc 4444) as follows;

*The dynamic, integrated management of air traffic and airspace including air traffic services, airspace management and air traffic flow management – safely, economically and efficiently – through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions.*

operations. Recognizing the importance, various States have continued to evolve their ATM systems and procedures to meet the growing demand and to maintain safety as the priority. Additionally, neighbouring States are increasingly collaborating on activities such as Air Traffic Flow Management (ATFM<sup>2</sup>), which are enhanced by the incorporation of dedicated support from MET services.

1.3.2 Information sharing and collaborative decision-making (CDM) by relevant stakeholders are indispensable for the successful provision of effective and efficient ATM. Aircraft operations are influenced by atmospheric conditions and meteorological phenomena, and so adverse conditions can have a significant impact on ATFM planning and provision.

1.3.3 In APAC, we experience diverse weather features on a daily basis as the region is influenced by climates varying from tropic to sub-polar and is further complicated by geography including both broad land masses and wide oceanic areas. It is therefore critical that the region's ATM, and particularly ATFM operations are supported by tailored MET information and services to ensure safe, efficient and orderly aircraft operations.

#### **1.4 Historical backgrounds**

1.4.1 Since ICAO endorsed the *Global Air Traffic Management Operational Concept* (GATMOC, Doc 9854) in 1996, States have worked on the enhancement of ATM. In the APAC Region, since the late 1990s, ATM (and ATFM) has evolved significantly in many States. Subsequently, tailored MET information and services has been recognised as critical information for the effective provision of ATM and subsequently has been incorporated as part of the strategic and tactical ATM operations of those States. For example, in Japan, the Air Traffic Meteorology Center (ATMetC) of the Japan Meteorological Agency (JMA) was established in February 2006, as a specialized MET service provider for the Air Traffic Management Center (ATMC) of the Japan Civil Aviation Bureau (JCAB).

1.4.2 In 2001, the ICAO APANPIRG Communications/Navigation/Surveillance and Meteorology Sub-Group (CNS/MET SG) formed the MET/ATM Task Force (TF) to facilitate regional implementation of meteorological services in support of ATM. The first Regional MET/ATM Seminar was held at the ICAO Regional Office in Bangkok, Thailand, in February 2006. In order to enhance regional implementation, in 2009, APANPIRG agreed to call for the 1<sup>st</sup> meeting of the MET/ATM TF to plan the 2<sup>nd</sup> Regional MET/ATM Seminar and TF Meeting in the 2010 timeframe. In February 2011, the Seminar and the 2<sup>nd</sup> meeting of the TF were held in Fukuoka, Japan, where experts from MET, ATM and other international organizations in the APAC region gathered to discuss their plans and best practices on the development and implementation of

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<sup>2</sup> Note. ATFM is defined in PANS-ATM (Doc 4444) as follows:

*A service established with the objective of contributing to a safe, orderly and expeditious flow of air traffic by ensuring that ATC capacity is utilized to the maximum extent possible, and that the traffic volume is compatible with the capacities declared by the appropriate ATS authority.*

meteorological services in support of ATM. The meeting also included a technical tour to the ATMetC to provide an example of the collaborative work undertaken between MET and ATM organisations. Subsequent TF meetings, and later the MET/R Working Group, successor to the MET/ATM TF, continued the important work of developing regional guidance to assist Asia/Pacific States with implementation or improvement of MET information and services to support ATM.

## **2. Implementation procedures**

### **2.1 Preparatory phase (processes toward implementation)**

#### **2.1.1 Communication channel establishment**

2.1.1.1 The most important step in the implementation of ATM-tailored MET information and services is to establish a good communication channel for mutual collaboration between MET and ATM organizations through periodic meetings, tours to each operation room and so on. To develop and facilitate an implementation plan, it would be useful to exchange views and information and build mutual understanding of each other's services, through regular consultations and meetings with clear focus.

2.1.1.2 In addition, consultation with collaborative decision-making (CDM) stakeholders from the initial stage will be desirable for smoother and better planning. This will further assist in the implementation process, given that CDM is an essential element in the ATM operational concept and concerned parties including airspace users<sup>3</sup>, such as major airlines, are encouraged to participate in CDM.

#### **2.1.2 Service Identification**

##### **2.1.2.1 Understanding ATM and aircraft operations**

ATM operations vary in each State depending on its technical capabilities and characteristics of their responsible airspace. Better understanding of the State's ATM system is necessary to determine the scope of MET information and services to support ATM. This aspect will assist in understanding the local ATM requirements and determining the most appropriate process.

Additionally, procedures for aircraft operations adopted by airlines are also important in defining ATM-tailored MET information and services. The safety and efficiency of aircraft operations are fundamentally dependent on weather conditions. For example, each aircraft has maximum crosswind threshold values for take-off and landing. Adverse weather conditions may force aircraft to fly irregular flight routes and conduct unusual operations, which could result in significant diversion from the normal and planned distribution of air traffic. In this context, understanding aircraft operational procedures is helpful in designing a *fit-for-purpose* MET information and services.

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<sup>3</sup> Note. Airspace users is defined in Global Air Traffic Management Operational Concept (GATMOC) (Doc 9854) as follows;

*The term airspace users mainly refers to the organizations operating aircraft, and their pilots.*

#### 2.1.2.2 Past Events and Case Studies

Investigation of MET-related impacts on air traffic flow is essential to determine what kind of MET information and services are required to effectively support ATM. One practical approach, in cooperation with airlines, is to compare operational records (including causes of delay, if available) with past weather data.

Once ATFM is implemented, focus could be on more direct ways to use the flow management records in the ATFM process in addition to the aircraft operations records for the comparison with past MET data.

#### 2.1.2.3 Service proposal (Proposal from MET organization)

Through the process mentioned in 2.1.2.1 and 2.1.2.2, it is expected to obtain better understanding of the ATM processes based on aircraft operational procedures and possible weather impact on air traffic flow. The next step would be to develop a draft plan for MET information and services in support of ATM and to provide a proposal to the ATM organization. The proposed plan could be conceptual process with specific explanation and prototypes of MET information or services, should be sought on the proposal.

#### 2.1.2.4 Service development (Requirements from ATM organization)

With the feedback from the ATM organization described in 2.1.2.3, the MET and ATM organisations could modify and make necessary changes to the proposed plan. This will ensure that both parties (MET and ATM) are aware of the requirements and limitations and are able to adopt a practical plan for the region.

This would be an iterative process, until the proposed plan for MET information and services becomes matured.

#### 2.1.2.5 Service definition

Once the proposed plan is mature, the provision of MET information and services in support of ATM can be formalized. The plan should also describe how the ATM tailored MET products will be utilised in conjunction with the other MET products, are made available to the airspace users in a timely fashion so that all stakeholders are in possession of the same information at the same time. It may be that bespoke MET information solutions, tailored to the specific ATM service provider, are also made available to the airspace users as part of CDM arrangements.

### 2.1.3 System development

The next step is to develop a system and associated software applications necessary to provide ATM-tailored information and services defined in section 2.1.2.5.

#### **2.1.4 Trial run of the system and service**

It is essential to conduct a trial of the system and procedures to test secure delivery of the defined MET information and services. If any issues are identified through the trial, they should be resolved through close consultation with the stakeholders concerned (mainly the ATM organizations), before the service becomes operational. In addition, the trial process will assist in determining the system reliability. The outcomes of the trial and lessons learnt should be well documented to assist with future requirements.

#### **2.1.5 Service provision agreement**

In parallel with the system development, to ensure that continuous provision of the defined MET information and services is maintained, it is important to formalize a written agreement (or to amend an existing agreement, if applicable) between the MET and ATM organizations. The Agreement should include the MET and ATM capabilities, and outline the operational processes, the working relationship and the communication channels. When such an agreement is later implemented with airlines or other stakeholders, existing agreements should also be amended accordingly.

### **2.2 Operational phase (processes for continuous improvement)**

#### **2.2.1 Operational trial**

Before MET information and services are provided operationally, an operational trial should be conducted so that forecasters and ATM officers can familiarize themselves with the provision and usage of the new information and services. The trial period should be set based on agreement between the parties concerned. A post implementation of the operational trial should be conducted to ensure lessons learned from the process are documented and improvements are made prior to implementation.

#### **2.2.2 Provision of MET information and services**

MET information and services developed according to the process described in 2.1 are provided to ATM officers in accordance with the service provision agreement between the MET and ATM organizations.

#### **2.2.3 Verification and evaluation**

After the implementation of ATM-tailored MET information and services, it is required (i) to regularly verify and evaluate its quality to ensure that it practically supports ATM and (ii) to improve MET information and services.

### **2.2. Continuous improvement**

Regular evaluation meetings between relevant parties such as airspace users, ATM and MET organizations are one of the basic approaches to continuously improve the implemented information and services. When a meteorological condition has a significant impact on ATM, it is also recommended that stakeholders conduct a post-event analysis to identify lessons learnt and subsequent improvements.

### **3. MET information and services in support of ATM**

In this chapter, some examples of MET information and services that are effective for supporting ATM operations are discussed. As it will require budget, resources, technology, and time to introduce relevant MET information and services, some of which may not be defined in ICAO Annex 3, it is worthwhile to consider implementing them in a stepwise manner, depending on the situation in each State.

Examples of MET information and services for ATM in some States are described in Appendix 1. In addition, operational scenarios of MET/ATM collaboration, such as how MET information and services are provided to ATM officers, are described in Appendix 2.

#### **3.1 Participation of MET organizations in CDM**

3.1.1 CDM is an approach where relevant stakeholders share necessary information in order to make decisions collaboratively to enable enhanced ATM operations. This process involves a collaboration of stakeholders to generate products suitable for better pre-tactical traffic management strategies and optimised use of available capacity. The expected role of a MET organization in CDM is for aviation forecasters with an understanding of the effects of meteorology on ATM to provide necessary meteorological information at and around relevant aerodromes and air routes in a timely manner.

3.1.2 To achieve effective CDM, aviation forecasters should have a basic understanding of ATM and Air Traffic Control (ATC) procedures, such as, inter alia, runway weather minima and aircraft operating criteria so that they would be able to foresee aviation impacting weather and provide appropriate briefings to ATM and ATC in a timely manner.

3.1.3 Where an event or phenomena has a significant impact on normal air traffic flows (e.g.: mass deviation of aircraft), it is vital to ensure that common situational awareness is maintained at all times among affected stakeholders. Rapid identification of the possible cause of such a situation (e.g. adverse meteorological conditions, runway closure) allows both ATM and MET organizations to take immediate action in a collaborative manner to mitigate the impact.

#### **3.2 Weather briefing in support of ATM**

3.2.1 Direct weather briefings for ATM officers is an effective method to share current and expected weather assessments in and around major aerodromes and air routes, including any expected impacts on aircraft operation and air traffic flow.

3.2.2 Regular weather briefings in support of ATM may be provided several times per day. Depending on rostered shift arrangements in ATC centres, MET briefings may be scheduled for groups of controllers just prior to commencing their operational duty.

3.2.3 Where unexpected weather phenomena may affect aircraft operation and/or air traffic flow, or the actual weather deviates significantly from that forecast, a special briefing should be provided by aviation forecasters. Special briefings can be either proposed by aviation forecasters or requested by ATM officers.

### **3.3 ATM-tailored meteorological information**

#### **3.3.1 Impact-based weather information**

3.3.1.1 Tailored MET information that shows possible impact on air traffic flow (e.g. when and where the weather phenomenon affects air traffic flow) can be useful to support the management of air traffic capacity in each ATC sector and execution of air traffic flow controls.

3.3.1.2 Information that is relevant to the impact to air traffic flow will be extremely valuable; for example, a probabilistic forecast of impact to ATFM may provide a quantitative estimate of reduction in air traffic capacity. To develop such *impact-based* information, consensus among stakeholders has to be developed regarding relationships between specific meteorological conditions and their possible impacts on air traffic flow.

#### **3.3.2 Information for common situational awareness**

3.3.2.1 It would be helpful for ATM representatives and other relevant stakeholders to understand the background of relevant meteorological conditions (e.g. occurrence process and characteristics), as well as the associated forecast confidence, which would facilitate risk assessment to enable more effective and efficient ATM operations. It is desirable to provide relevant graphical information which can explain meteorological conditions effectively, such as pressure distribution charts, weather radar and satellite imagery, and/or weather advisories with simple associated descriptions.

### **3.4 Information and products developed for other use**

3.4.1 Existing meteorological information may also be useful to support ATM. Some examples are listed below.

- OPMET information
- Volcanic ash advisory (VAA) and tropical cyclone advisory (TCA)
- WAFS products (Wind and Temperature (WINTeM) chart, SIGWX chart and gridded global forecast of wind, temperature, cumulonimbus clouds, icing and turbulence)
- Real-time observational data at congested aerodromes
- Weather radar imagery

- Specific phenomena based information, such as Thunderstorm and lightning information
- Satellite imagery and derived products
- Nowcasting products
- Numerical weather prediction data and derived products
- Earthquake and tsunami information
- Space weather

### **3.5 Means of provision**

#### **3.5.1 Dedicated information sharing system**

3.5.1.1 To facilitate CDM, information sharing among all relevant stakeholders in MET and ATM is necessary, to ensure common situational awareness is maintained. In order to support ATM operations, a system should be acquired or developed which enables ATM officers to utilize MET information at any time. Similarly, aviation forecasters need an environment through which they can look at ATM-related information to provide appropriate MET information. It is thus required that dedicated systems for information sharing between MET and ATM organizations be established, so that ATC officers and aviation forecasters can effectively exchange information operationally.

#### **3.5.2 Means of communication**

3.5.2.2 Listed below are some examples of how ATM stakeholders can communicate and share necessary information.

- The aeronautical fixed service (i.e. AFTN/AMHS)
- Hotline (direct phone line)
- Web-chatting system
- Telephone or video conference system
- Use of common CDM software/application
- Joint use of an operation room
- Information sharing web-portal

## **4. Future progress in MET/ATM services**

### **4.1 Global Air Navigation Plan (GANP)**

4.1.1 In 2014, the 38<sup>th</sup> Session of the ICAO Assembly amended the Global Air Navigation Plan (GANP) and formulated the Aviation Systems Block Upgrades (ASBUs), the implementation plan of the GANP, as proposed by the twelfth ICAO Air Navigation Conference (AN-Conf/12). The ICAO Meteorology Panel (METP) was established in September 2014 is tasked with providing standard and recommended practices for MET

information and services in support of ATM for the terminal area and in line with the aviation system block upgrades (ASBU).

4.1.2 In the future, States in a position to do so would be required to provide ATM-tailored MET services based on globally consistent requirements. Since this global standardization is being welcomed among users such as airlines and pilots, the States in the APAC Region may adapt their systems accordingly when such standards are available.

#### **4.2 Future integration of MET information into ATM decision-making**

4.2.1 The ICAO Air Traffic Management Requirements and Performance Panel (ATMRPP), in coordination with the METP and other panels concerned, has discussed future integration of MET information into ATM decision-making system, along with the Global Air Traffic Management Operational Concept (GATMOC) (ICAO Doc 9854). The “Concept for the integration of Meteorological information for ATM” has been developed by the ATMRPP and other bodies concerned. It provides guidance on methods and procedures to interpret MET information as it relates to possible constraints on air traffic flow. It supports estimation of the potential impact of the meteorological condition to ATM and provides ATM officers with possible actions to be taken, e.g. selecting the safest routes while minimising diversions.

#### **4.3 Next generation air transportation system developments**

4.3.1 To deal with growing air traffic congestion, some States or Regions have been planning the development of next generation air transportation systems. These include NextGen (United States), SESAR (Europe) and CARATS (Japan). It is important for MET organizations to make the best effort to improve their capability in the provision of MET information and services to meet such future requirements and facilitate the development of a new generation air transportation system.

## References

- International Civil Aviation Organization (ICAO) Annex 3 - Meteorological Service for International Air Navigation
- Global Air Traffic Management Operational Concept (Doc 9854)
- Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services (Doc 9377)
- Air Traffic Management (Doc 4444)
- GANP Portal (<https://www4.icao.int/ganportal/>)

## Acronyms

AN-Conf	Air Navigation Conference
APAC	Asia and Pacific region
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
ASBU	Aviation System Block Upgrades
ATC	Air traffic control
ATFM	Air traffic flow management
ATM	Air traffic management
ATMC	Air Traffic Management Center
ATMetC	Air Traffic Meteorology Center
ATMRPP	Air Traffic Management Requirements and Performance Panel
CARATS	Collaborative Actions for Renovation of Air Traffic Systems
CDM	Collaborative Decision Making
GANP	Global Air Navigation Plan
GATMOC	Global ATM Operational Concept
ICAO	International Civil Aviation Organization
JCAB	Japan Civil Aviation Bureau
JMA	Japan Meteorological Agency
MET	Meteorological services for air navigation
MET/ATM TF	Meteorology/Air Traffic Management Task Force
METP	Meteorology Panel
MET/R WG	Meteorological Requirements Working Group
OPMET	Operational Meteorological/Meteorology
SESAR	Single European Sky ATM Research
SIGWX	Significant Weather
TCA	Tropical Cyclone Advisory
VAA	Volcanic Ash Advisory
WAFS	World Area Forecast System
WINTEM	Wind and Temperature

## Note for Appendix 1 and 2

- The example from each State for Appendix 1 should be up to four pages, following the format:
  1. ATM-tailored MET information and services
    - ✧ MET information and/or services for ATM, excluding OPMET information
    - ✧ One section for each MET information or service  
e.g. Dedicated MET information, Participation in CDM, Briefing for ATM officers.
  2. Means of Provision
    - ✧ Means of MET information provision for ATM officers, such as dedicated information provision system
  3. Other useful information (if any)
    - ✧ Collaboration with ATM officers for MET information and/or services improvement (e.g. regular meeting, collaborative post event analysis)
    - ✧ Verification of MET information described in chapter 1.
    - ✧ Implementation history of ATM-tailored MET information and services, including how long it took to implement such information and services.
- The operational scenario from each State for Appendix 2 should be up to four pages.
- Maintenance procedure
  - ✧ States, who wish to add or update their own examples or operational scenarios, would need to submit WPs describing the drafts of examples to MET/R WG for discussions and/or adoption.
  - ✧ The ad hoc group of the MET/R WG is to consolidate the changes and seek MET SG's endorsement for updating the guidance.
  - ✧
- Means of publication
  - ✧ Each example and operational scenario of Appendix 1 and 2 is published on the ICAO APAC website (APAC eDocuments) with separated PDF files considering the user's accessibility to the information.

## APPENDIX 1 - Hong Kong, China

### 1. ATM-tailored MET information and services

Under the agreement between the Hong Kong Observatory (HKO) and Civil Aviation Department (CAD), HKO provides a suite of ATM-tailored MET information and services in support of international air navigation.

#### 1.1 Tactical Decision Products

1.1.1 Taking the opportunity of the replacement of CAD's Air Traffic Management System (ATMS), closer integration of tailored MET information with ATMS was realized to support ATC in tactical decision making. These include a) 10 layers of Constant Altitude Plan Position Indicator (CAPPI) imageries from 1 km to 10 km with range 256 km of the two Doppler weather radars in Hong Kong; and b) 1 layer of the HKO Aviation Thunderstorm Nowcasting System (ATNS) 1hr forecast for the assessment of the significant convection over HKFIR at 3 km height.

1.1.2 On the ATC console of the new ATMS, either weather radar imagery of a specific height or an ATNS forecast can be chosen to be overlaid with the aircraft indicators (Figure 1). Further details can be found in the presentation included in Joint Session ATFM/SG/7 and MET/R WG/6.

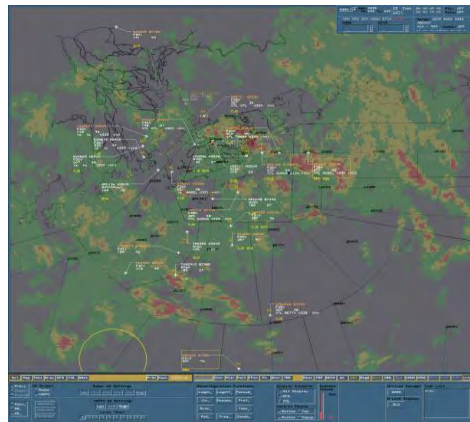


Figure 1 ATC console display showing aircraft positions overlaid on a CAPPI imagery

#### 1.2 Meteorological Services for Terminal Area (MSTA) Products

1.2.1 The Hong Kong Air Traffic Flow Management Unit (ATFMU) of CAD regularly assesses the capacity of the Hong Kong International Airport (HKIA), which depends on both the runway and airspace capacity, in the next few hours. In collaboration with CAD, HKO has been providing tailored MSTA, grouped under the product named Significant Convection Monitoring and Forecast (Figure 2), to support ATFM operation since 2010. These are briefly summarized in the following paragraphs. Further details can be found in MET/R TF/3 WP07.

1.2.2 The suite of MSTA products to support runway capacity estimation includes amongst others, ATNS to automatically forecast the future location of weather cells that may block the intended flight path or significant points in the airspace. While forecasts of products D, E, and G in Figure 2 are generated automatically, they could be adjusted manually by Aviation Forecasters.

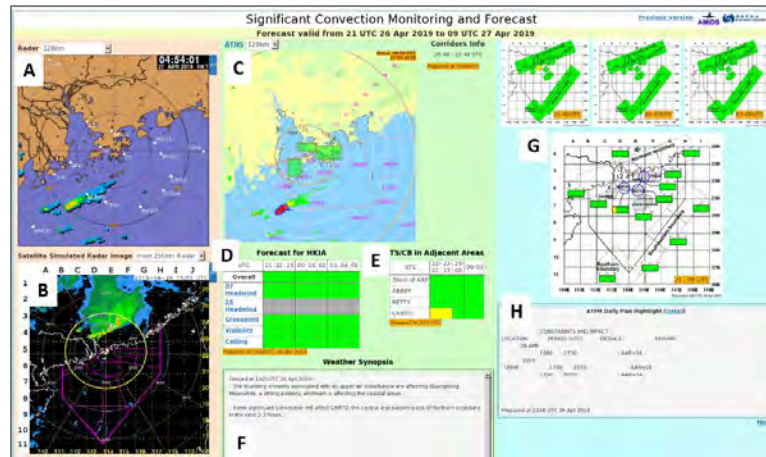


Figure 2. Integrated display of the MSTA: A) Choice of actual radar at different ranges and lightning overlays; B) Radar blended with satellite simulated radar image developed using Artificial Neural Network technology; C) 2hr convection nowcast for arrival/departure corridors by ATNS; D) 9hr performance-based weather forecast for the aerodrome; E) 6hr convection forecast around HKIA and major waypoints; F) weather synopsis around HKIA and the major waypoints; G) 12hr significant convection forecast time series for key ATC areas based on blended NWP and nowcasting outputs; and H) ATFM Daily Plan.

1.2.3 All the above products/systems use three levels of colour code to indicate the impact to air traffic, viz GREEN for mild or no impact, AMBER for medium impact and RED for significant impact. Though the actual criteria for defining the colour codes vary across different forecast products, the simple three levels of colour code are adopted uniformly in all the products described above. The Significant Convection Monitoring and Forecast also includes the latest ATFM Daily Plan issued by ATFMU after taking into account the above significant convection nowcast and forecast information as well as consultation by Aviation Forecaster via regular and ad hoc weather briefings (para.1.5 below).

### 1.3 Arrival Management and other Miscellaneous tailored Products

1.3.1 25 layers of gridded upper wind and temperature forecasts over HKFIR at a resolution of 0.2 degrees at hourly interval for up to 24 hours are provided to ATMS for trajectory prediction of individual aircraft and a system for aircraft arrival sequencing.

1.3.2 Apart from the above products, other major tailored products include a) Weather Summary for HKIA which includes, inter alia, local winds, radar, satellite, lightning information and lightning alert for the airport, weather synopsis, aerodrome forecast with possible alternative scenario, TAFs of nearby airports, SIGMET for the HKFIR, TC track, weather analysis and forecast charts (Figure 3); b) HKIA Local Routine/Special Report and c) MET page showing the latest observation, data from the Automatic Meteorological Observing System, windshear alerts, forecast of HKIA and neighbouring aerodrome.

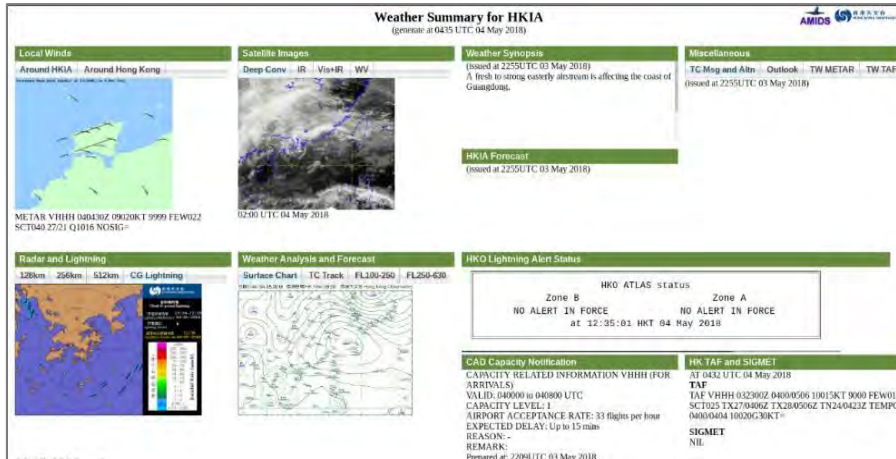


Figure 3. HKO Weather Summary for HKIA

### 1.4 Lightning Nowcast Products

1.4.1 For the protection of ground personnel from being injured by lightning strikes, HKO has developed the Airport Thunderstorm and Lightning Alerting System (ATLAS), a nowcasting system for detecting and nowcasting lightning activities over HKIA. The system generates RED or AMBER alerts based on either detection or forecast of cloud-to-ground lightning activities (CG). When CG is detected within 10 km or forecast to be within 5 km from the ARP, AMBER alert will be issued. When CG is detected or forecast to be within 1 km boundary of the alert zones (respectively encompass the Chek Lap Kok Island, and the majority of passenger and cargo apron), RED alert will be issued for the corresponding zone.

### 1.5 Integrated monitoring system for MET-ATM

1.5.1 HKO has developed two integrated monitoring pages for aviation forecasters to appreciate the weather impact on air traffic. One displays the real time aircraft positions together with weather radar (Figure 5, Left). Another one displays arrival and departure rates and any traffic interruption messages from ATIS and NOTAM (Figure 5, Right). These two pages heighten common situation awareness and enhance the communications between MET and ATM office particularly during weather briefings (para. 1.6 below).

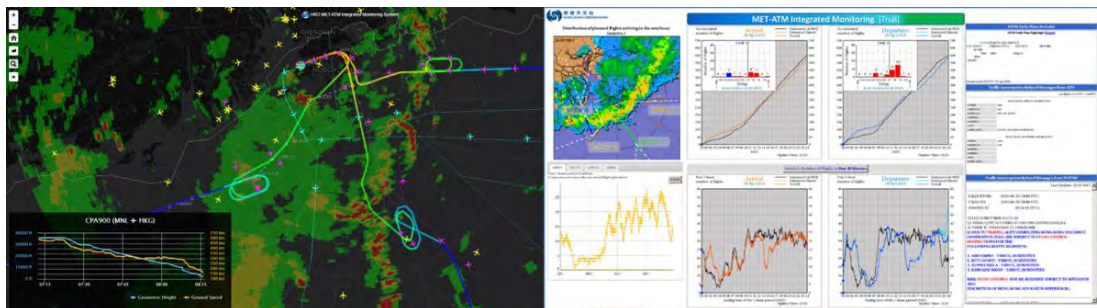


Figure 5. MET-ATM Integrated Displays showing arrival flights forced into holding patterns due to convective activities (Left) and the arrival/departure rates (Right).

## 1.6 Regional SIGMET monitoring

1.6.1 To support Hong Kong ATFMU's participation in Distributed Multi-Nodal ATFM Network trial operation, HKO has developed an Integrated Monitoring webpage to show real-time en-route hazardous weather within the APAC region. Information provided includes SIGMET and advisory information, as well as VONA, METAR, TAF, PIREP, global satellite imageries, radar reflectivity, lightning, numerical weather prediction data, significant convection and turbulence forecast, etc., for ATFMU's reference (Figure 6).

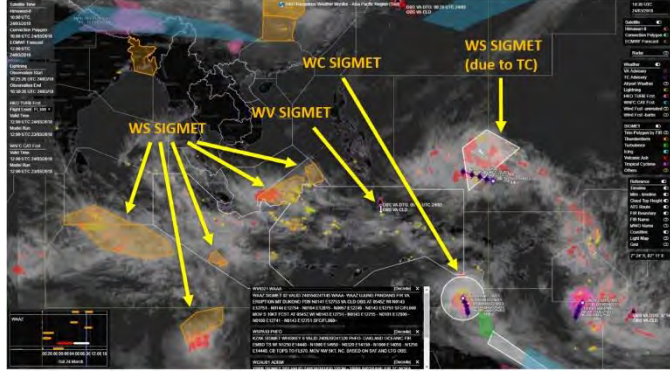


Figure 6. HKO Regional SIGMET Monitoring Page.

## 1.7 Weather briefing

1.7.1 HKO provides MET weather briefings to ATFMU/ATC three times a day, once in the early morning, once at noon and once in the early evening, through teleconference. The briefing mainly makes use of the MSTA products and the Weather Summary for HKIA discussed under 1.2 and 1.3.2 above. Timely updates are also provided through a hotline should there be any change in the weather conditions.

1.7.2 In preparation for adverse weather such as the approach of tropical cyclone (TC), additional weather briefings are conducted for the whole aviation community at HKIA to heighten common situation awareness and to support Collaborative Decision Making.

## 2. Means of Provision

2.1 The tactical decision products and the arrival management products discussed under para. 1.2 and 1.3.1 respectively are ingested directly into CAD's ATMS. Products under para. 1.3.2 b) are sent to CAD's ATS Data Management System (ATSDMS).

2.2 The rest of the products, including MSTA and miscellaneous tailored products are provided via the web-based Aviation Meteorological Information Dissemination System.

## 3. Other useful information

3.1 Regular high level meetings with CAD and the Airport Authority Hong Kong are held on an annual basis. Regular working level meetings with ATC are held generally a few times every year.

3.2 A Verification System has been set up for verification of both the ICAO Annex 3 and MSTA products.

## Japan

### 1. ATM-tailored MET information and Services

#### 1.1 ATMetC, TMAT, NCAT (Figure 1)

The Japan Civil Aviation Bureau (JCAB) established the Air Traffic Management Center (ATMC) in Fukuoka in 2005 as a core organization for ATM in Fukuoka FIR. In line with ICAO's global concept for ATM, ATMC facilitates safe and efficient flight operation through ATM close cooperation with Airspace Management (ASM), Air Traffic Flow Management (ATFM) and oceanic ATM. At the same time as ATMC began operation, the Japan Meteorological Agency (JMA) established the Air Traffic Meteorology Center (ATMetC) to provide meteorological information and services in support of ATMC, and started their operation in 2006. ATMetC forecasters work in the same operation room as ATM officers to directly provide weather information and briefings tailored to ATM officers' needs. ATMetC preparations were carried out over a period of three years (see MET/ATM Seminar 2013 IP/3).

For tactical and flexible ATFM to deal with increased air traffic, JCAB subsequently organized Traffic Management Units (TMUs) operating as ATMC branches – two in the Tokyo metropolitan area and one at New Chitose airport (a local major hub where aircraft operation is significantly affected by snowstorm). To support TMU operation with detailed ATM-tailored meteorological information on related airports and air space, JMA organized two teams operating as branches of ATMetC – the Tokyo Metropolitan Area Team (TMAT) at Tokyo International airport and New Chitose Area Team (NCAT) – in different offices at the same location to operate as TMUs. (See MET/R WG/5 IP/10, MET/R WG/8 IP/18).

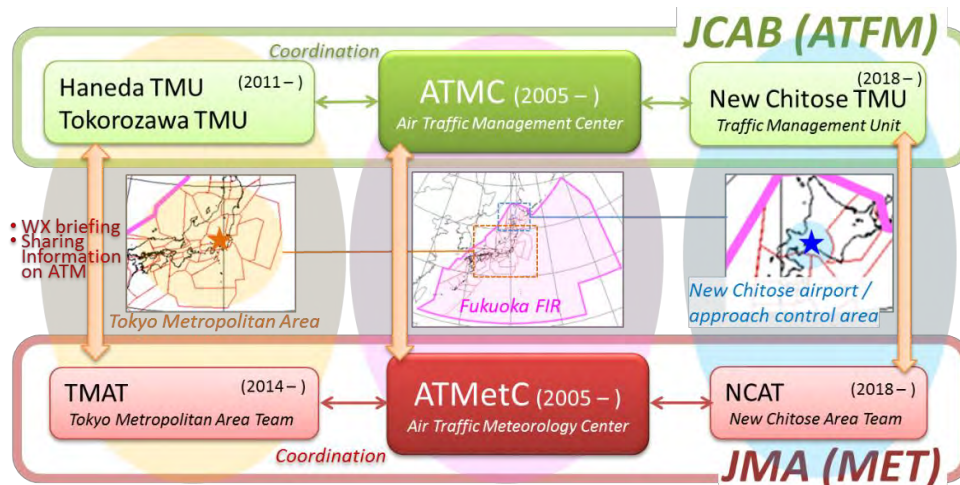


Figure 1 MET organization and target areas for supporting ATM in Japan

MET information and services specifically tailored for ATM requirements are as follows.

#### 1.2 CDM conferences

Daily online ATMC conferences held at 0620 and 2345 UTC for collaborative decision making (CDM) are attended by ATM, ATC and airline officers, with an ATMetC officer providing MET information targeted at Fukuoka FIR and neighboring FIRs. TMAT and NCAT officers in attendance also contribute MET information. Additional conferences are also held as necessary except midnight.

#### 1.3 Briefings (regular/extra)

ATMetC, TMAT and NCAT officers provide weather briefings to ATM officers based on the ATMC and TMU areas of responsibility (e.g., the Fukuoka FIR for ATMetC, Tokyo ACC areas of responsibility and Tokyo approach control area for TMAT) as detailed in Section 2. Briefings are provided regularly before ATM officers start work or before traffic

congestion begins (e.g., 4 times/day by TMAT), with additional briefings as necessary in line with changing weather conditions.

**1.4 Wx Bulletins (Figure 2)**

TMAT and NCAT provide at-a-glance meteorological information for ATM officers during work shifts and periods of traffic congestion. The bulletins contain brief comments on phenomena expected to affect air traffic flow and imagery highlighting weather conditions and forecasts for the next 6 hours (see MET/R WG/5 IP/10, MET/R WG/8 IP/18 and MET/R WG/9 IP/1)

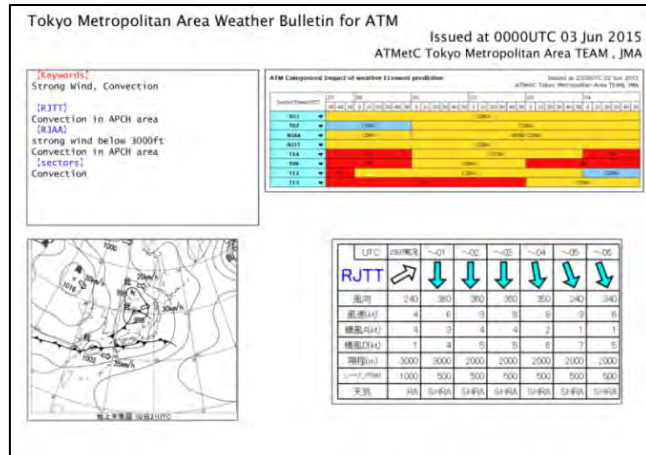


Figure 2 WX Bulletin

**1.5 Impact-based category forecasts for supporting ATM**

ATMetC and TMAT provide sequential category forecasts indicating expected impacts of weather conditions on air traffic flow in color-coded categories.

Forecasts are issued hourly outside the nighttime hours of 14 to 16 UTC when air traffic volumes are low. The forecast period of up to six hours supports ATM officers with ATFM operations.

Target weather phenomena are followings:

- Airports: Thunderstorm, Visibility, Ceiling, Wind, etc.
- Approach control area: CBs, Convective clouds and Wind
- ATC sectors: CBs, Convective clouds

Product specifications are outlined below.

**1.5.1 ATMet Category Forecast (Air Traffic Meteorological Category Forecast)**

(Figure 3)

- Target areas: major airports and ATC sectors in Japan
- Contents: the potential for meteorological impact on air traffic flow with four color-coded categories (red, yellow, blue and white)
- Temporal resolution: 1 hour (see MET/ATM Seminar 2011 WP/9\*)



Figure 3 ATMet Category Forecast

**1.5.2 ATM CIEL (ATM Categorized Impact of weather Elements prediction)**

- Target areas: Tokyo/Narita international airport, Tokyo approach control area and ATC sectors around the Tokyo metropolitan area



Figure 4 ATM CIEL

- Contents: level of expected impact of significant weather on ATC operations
  - ◇ High : Need to reduce capacity value (CAPA) significantly
  - ◇ Medium : Need to reduce CAPA
  - ◇ Slight : Need to reduce CAPA slightly
  - ◇ None : Not need to reduce CAPA
- Temporal resolution: 10 minutes to 1 hour  
(see MET/ATM Seminar 2015 IP/7\*)

### 1.5.3 ECLAIR (Estimated convective CLOUD impact on AIR-routes) (Figure 5)

The ECLAIR provides route-based information. It is semi-automated NWP-based product incorporates the level of expected impact of convective cloud forecasted in ATM CIEL which is manually produced by TMAT forecasters (see MET/R WG/9 IP/1). Product specifications are as follows:

- Target air routes: main RJTT/RJAA arrival/departure routes
- Content: levels of expected impact of convective cloud on individual air routes with more precise categorization than ATM CIEL
- Issuance: hourly (except 14 - 16 UTC)
- Forecast period: up to 6 hours (temporal resolution: 10 minutes to 1 hour)

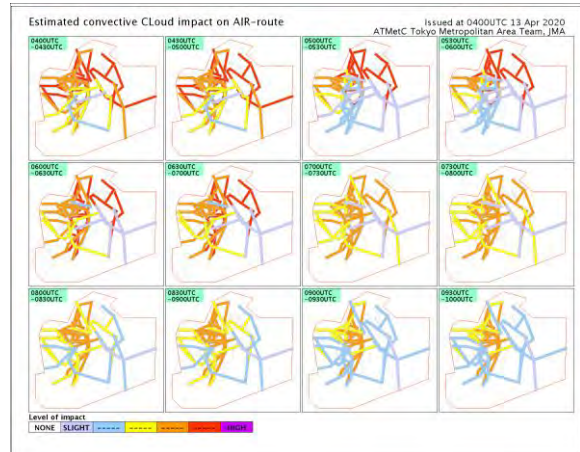


Figure 5 ECLAIR

### 1.6 Other information

JMA automatically provides the following information in addition to the OPMET data via ATMmetS described in Section 2.1.

- Analysis and hourly forecasts of upper-wind speed/direction on major air-routes (updated hourly; figure 6)
- Observation data including weather radar (three-dimensional vertical/horizontal sectional viewing), Doppler radar for airport weather, lidar and 6-second aerodrome observations
- Seismic intensity for quakes at major airports, along with tsunami warnings where necessary (ASAP post-earthquake)
- NWP model output provided via Adverse Weather Forecast for Tokyo Metropolitan Area (see ICAO APAC MET/R WG/9 IP1)

東海から関東上空の風予想表

地点名	ALT/UTC	19日07時	19日09時	19日12時	19日15時	19日18時
河和 (KOHWA)	FL350	260 61	270 57	280 62	290 71	290 75
	FL250	270 32	280 35	280 37	290 40	290 40
逸州 (ENSYU)	FL310	260 49	270 46	270 46	280 52	280 60
	FL190	280 39	280 40	290 38	300 31	300 28
大島 (XAC)	FL230	270 42	270 39	280 36	280 32	280 33
	13000FT	290 29	290 30	290 26	300 19	330 20
館山 (UTIBO)	10000FT	300 25	300 23	290 18	300 19	330 20
	5000FT	030 04	360 05	290 04	260 05	280 12
木更津 (KZT)	10000FT	300 26	300 24	300 22	310 23	320 22
	5000FT	210 01	340 05	020 02	240 08	270 17
羽田 RJTT	SFC	180 08	190 10	200 06	240 04	300 05

Figure 6 Upper-wind analysis/forecast

## 2. Means of Information and Service Provision

ATMetC and NCAT provide information and services via direct interaction, as ATMetC and NCAT officers work in close proximity to ATM officers. (i.e. ATMetC officers share the operations room with ATM officers, and NCAT officers are able to visit ATM officers' operation room.) TMAT provides information via telephone and TV conferencing due to limited proximity. The JMA systems outlined below also allow sharing of MET information to support ATM.

### 2.1 ATMetS

The ATMetS information sharing system for ATM officers provides the products described in Section 1 via terminals on each ATM officer's desk.

### 2.2 MetAir

The MetAir weather information system allows not only ATM officers but also aviation users to obtain MET products for airspace and aerodrome on a real time basis. Airlines can receive them through MetAir.

### 2.3 Web chat system

To support the need for prompt decision making in ATM within terminal areas, speedy and appropriate information sharing is necessary even if ATM and MET officers are unable to share their operations room. For weather briefing services in particular, TMAT and NCAT coordinate with TMUs as needed via online chat for live interaction in addition to video conferencing and telephone communication. As text information remains in the chat tool, TMU officers can reaffirm the contents of briefings at any time. Also, graphical information can be posted on the tool (Figure 7). This function helps TMU officers to easily understand the weather condition which is sometimes difficult to grasp only by the explanation on the telephone.

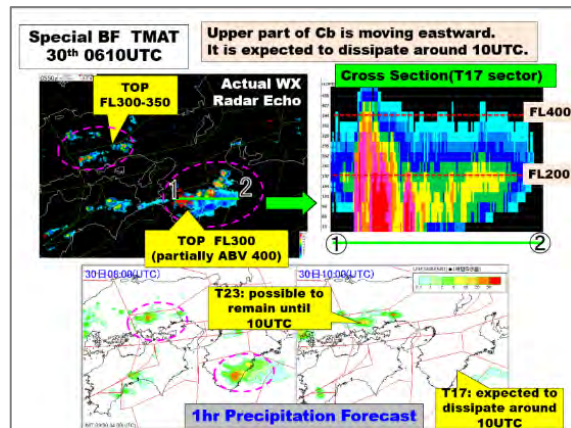


Figure 7 Graphical info on online chat tool

TMU officers can reaffirm the contents of briefings at any time. Also, graphical information can be posted on the tool (Figure 7). This function helps TMU officers to easily understand the weather condition which is sometimes difficult to grasp only by the explanation on the telephone.

## 3. Continuous improvement of services

### 3.1 Verification

ATMet category forecast criteria are weather conditions (or sometimes a combination thereof) defined through verification processes carried out by ATMetC in coordination with ATMC. This process involves three main steps:

- Investigation of impacts on ATM in previous significant cases;
- Confirmation of operational rules and conditions with reference to aircraft operation manuals and flight operations manuals; and
- Checking of the latest requirements from ATM officers, such as high-priority airways and altitude, and important air navigation facilities (waypoints or typical holding areas).

Each criterion is verified by calculating the Weather Impact Ratio (WXIR), which is the ratio of the frequency of cases in which a weather condition has influenced air traffic flow to all cases of the weather condition concerned.

$$\text{WXIR} = \frac{\text{(Number of occurrence of air traffic controls)}}{\text{(Number of occurrence of WX conditions)}}$$

Meteorological services provided to support ATM need to be flexibly applicable to the various operational variables of such management, including ATC procedures, airways and aircraft types, which are also developed in parallel. It is therefore highly important to ensure close and continuous coordination with ATM officers in order to revise criteria appropriately based on the results of verification using WXIR in consideration of operational requirements. Through such continuous improvement, the gap between ATM operational requirements and MET capability can finally be closed (Figure 8).

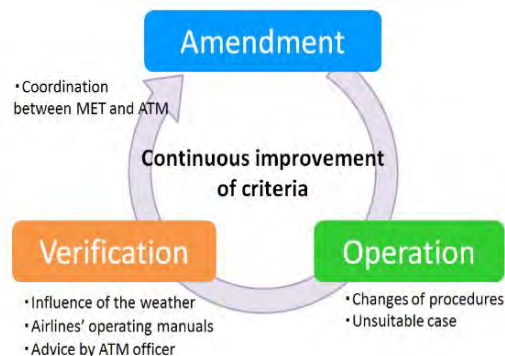


Figure 8 Continuous improvement of criteria

As of October 2021)

\* The product specifications have been updated from those described in this paper.

## **Singapore**

### **1. ATM-tailored MET information and services**

#### Meteorological and Air Traffic Management (MET/ATM) Collaboration in Singapore

The provision of air navigation services in the Singapore Flight Information Region (FIR) is undertaken by the Civil Aviation Authority of Singapore (CAAS), and Meteorological Service Singapore (MSS) is the aeronautical meteorological service provider. CAAS and MSS collaborated to develop ATM-tailored MET information and services aimed at enhancing the safety, efficiency and orderly flow of air traffic. The following lists some examples of MET information and services implemented in Singapore.

#### **1.1. Weather briefing for ATC**

MSS provides daily MET weather briefings through teleconference to air traffic controllers at the start of the morning and afternoon shifts of ATC units. Aided by visuals from a dedicated weather information portal which provides an integrated view of meteorological information in graphical and tabular formats (Figures 1), operational meteorologists brief the air traffic controllers on the weather conditions that can be expected around Singapore and the surrounding region. Timely updates are also provided by operational meteorologists through a direct communication line (dedicated hotline) should there be any change in the weather conditions.

#### **1.2. Weather Window Products**

Given that thunderstorms are common weather hazards in the deep tropics, MSS has been delivering categorical forecast on the occurrence of thunderstorms over critical watch areas. The watch areas are determined in consultation with the CAAS ATS units to align with their operational requirements. The enhanced categorical forecast (called the 'Weather Window') augments the standard Annex 3 products and provides information on the forecast of not only the occurrence of thunderstorms, but also their areal extent. The forecast is valid for 24 hours and is updated every 3 hours or on an ad-hoc basis when changes to the weather situation warrants it. The temporal resolution is higher in the shorter forecast range to provide more detailed information of a possible rapid development of adverse weather (considering the dynamic nature of tropical weather systems). The temporal resolution becomes coarser at longer forecast range to reflect the lower predictability of tropical convective-scale weather. The weather window is presented in colour-coded, tabular format for easy interpretation and is used for air traffic flow management planning.

### **1.3. Improvements to SIGMET Information**

Apart from the weather window products, MSS has been leading the coordination with MET Watch Offices (MWOs) of neighbouring States under the Operational SIGMET Coordination (OSC) for Southeast Asia initiative on the issuance of harmonised cross-FIR SIGMETs to airspace users, air traffic controllers and planners.

### **1.4. Nowcasting for convective weather**

Tropical weather systems tend to be dominated by thunderstorms that are localized and short-lived and have significant impact on air traffic operations. Given the nature of our local weather systems, there is limited predictability, and forecasts tend to be short range. This poses difficulties for ATM. To address these challenges, MSS in collaboration with the UK Met Office has developed a convective-scale Numerical Weather Prediction (NWP) model – SINGV to better predict convective-scale weather in the tropics. In addition, Singapore is developing capabilities in nowcasting model, leveraging on techniques such as machine learning with radar and satellite data. This is a tropical convective-scale NWP/Nowcasting system that is continuously being fine-tuned to provide improved weather forecasts to support ATM decision making.

## **2. Means of Provision**

### **2.1. Analysis by Operational Meteorologist**

While outputs from numerical weather predictions are used to provide a first-cut forecast of the weather situation, these numerical predictions have limitations in predicting convective weather in the tropics. Local knowledge and expertise of operational meteorologists are essential and continue to be integrated in the provision of MET information and services to the users.

### **2.2. ATC Weather Information Portal**

A dedicated web portal (ATC web portal) has been developed for the provision of more MET information in support of ATM decision-making. The web portal is an integrated platform that allow users to view the current observations and weather window forecast products to enhanced situational awareness for ATC, and to aid users in pre-tactical air traffic flow management planning. In addition, for ease of visualization that may not be best served by a tabular format of weather window, thunderstorm areas are also presented on geospatial maps. Weather briefings using this web portal allows the operational meteorologists and the users to establish a common understanding of the weather situation and to discuss on any possible adverse weather that may affect operations.

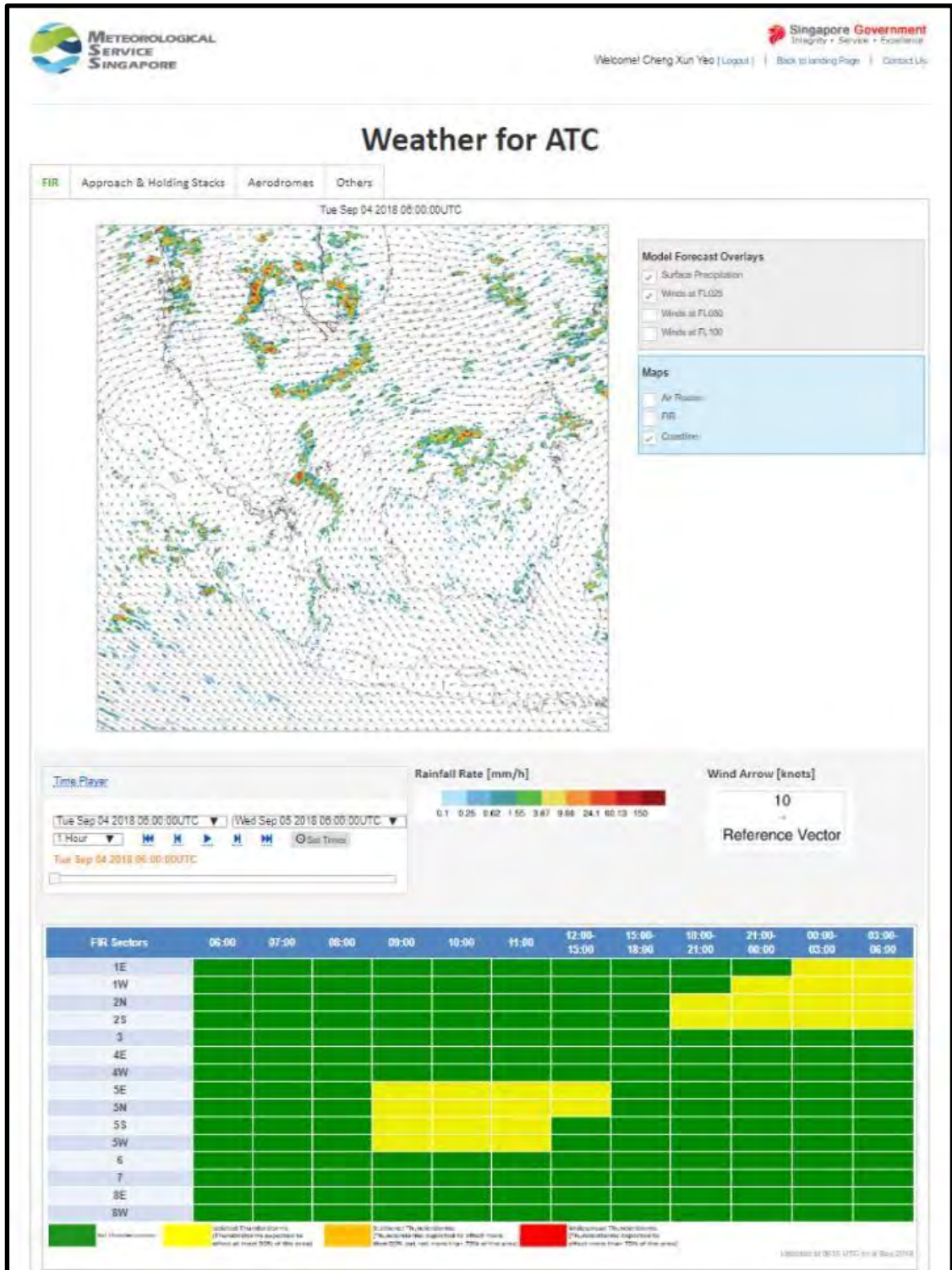


Figure 1a: Dedicated Web Portal for ATC showing Categorical Forecast of Thunderstorms.

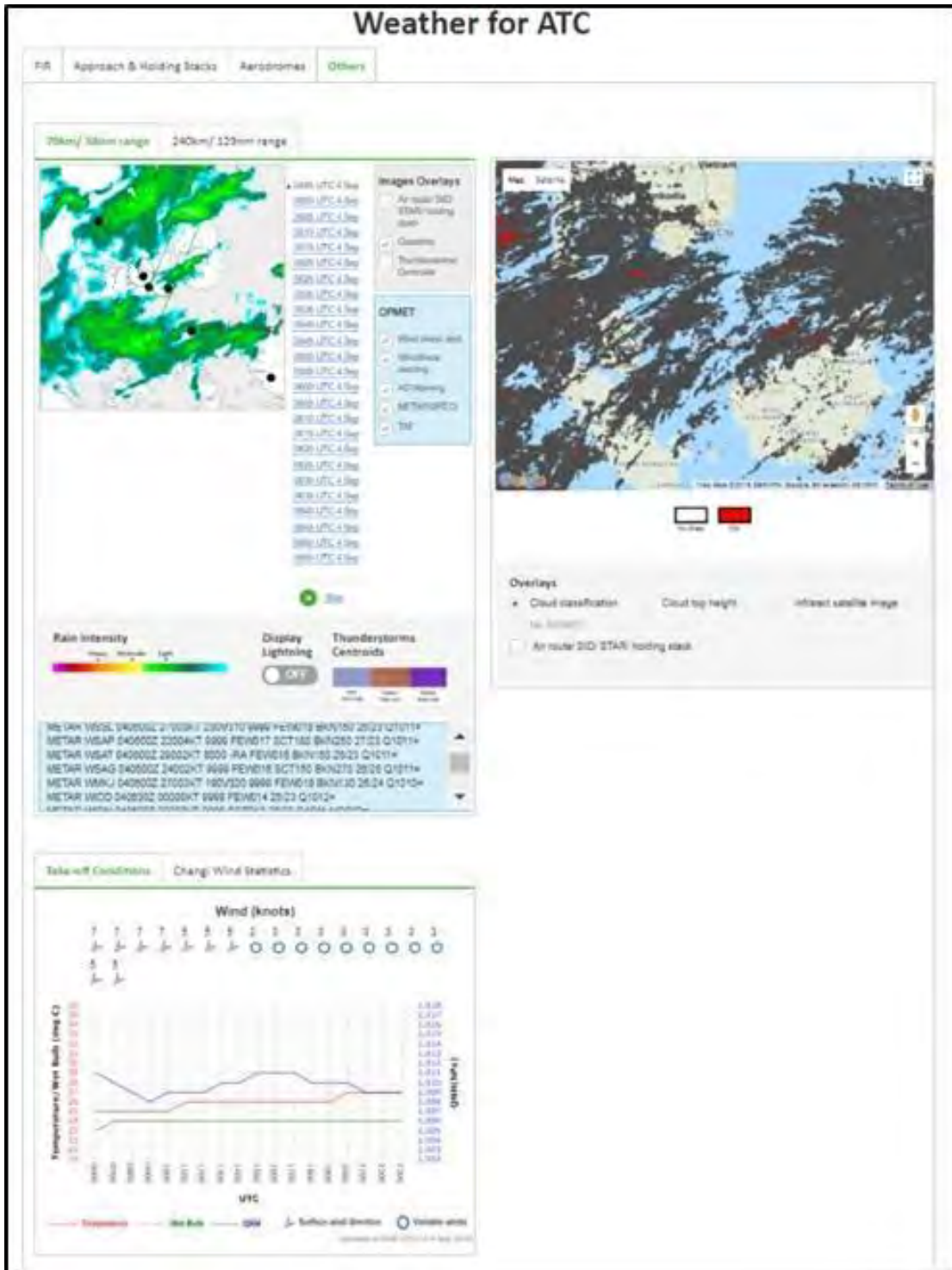


Figure 2b: Dedicated Web Portal for ATC showing observations including satellite and radar images, OPMET and AD warning information.

### 2.3. Direct Communication Line

A direct communication line has been established to facilitate exchange of information in a timely manner. This enables the operational meteorologists and ATC officers to readily react to changes in weather situation.

## Republic of Korea

### 1. ATM-tailored MET Information and Services

To improve the safety of air-navigation and the efficiency of ATFM, the Ministry of Land, Infrastructure and Transport (MOLIT) of the Republic of Korea has been operating the Air Traffic Command Center (ATCC) at the Air Traffic Management Office (ATMO) since July 2017. The Aviation Meteorological Office (AMO) of the Korea Meteorological Administration (KMA) works 24 hours a day at the ATCC to support decision-making for ATFM. The AMO participates in the CMD to provide weather information for domestic airports, as well as significant weather information for foreign airports, airspace and air routes.

#### 1.1 CDM Meeting

The ATCC regularly holds a CDM meeting once a day (0700 UTC). At the meeting, the AMO provides a weather briefing to the CDM members. Whenever a weather event that may have a significant impact on aircraft operation occurs, or is expected to occur within a few hours, a non-regular CDM meeting will be held and the AMO will provide a weather briefing.

##### 1.1.1 CDM on heavy snow

Snow causes aircraft de/anti-icing and runway snow removal, affecting airport capacity and air traffic flow. When snow is expected to be more than 3cm, a CDM will be held prior to the regular CDM, and will be joined by the AMO, ATCC, airport operators and airlines to share weather information and analyze the impact on air traffic flow.

#### 1.2 Weather Briefing

##### 1.2.1 Weather briefing for ATCC

The AMO provides a weather briefing for ATCC twice a day (0000 and 0900 UTC). The weather briefing is offered during the shift of air traffic flow managers, and describes the expected weather conditions at domestic and foreign airports and airspace, which could affect ATFM during on their duty.

##### 1.2.2 Weather briefing for ACC

The AMO provides a weather briefing for Incheon and Daegu ACC once or twice a day. The weather briefing is provided during shifts of air traffic controllers, and describes the expected weather conditions (such as upper-level winds, convective clouds, etc.) at domestic airports and airspace during their duty.

#### 1.3 Weather Analysis (Meteorological Information) to Support ATFM

The AMO provides weather analysis to support ATFM twice a day (0000 and 0700 UTC) (Fig 1). The format of the analysis was determined in November 2020, in cooperation with MOLIT. The analysis offers quantitative figures to strengthen the support for decision-making for ATFM.

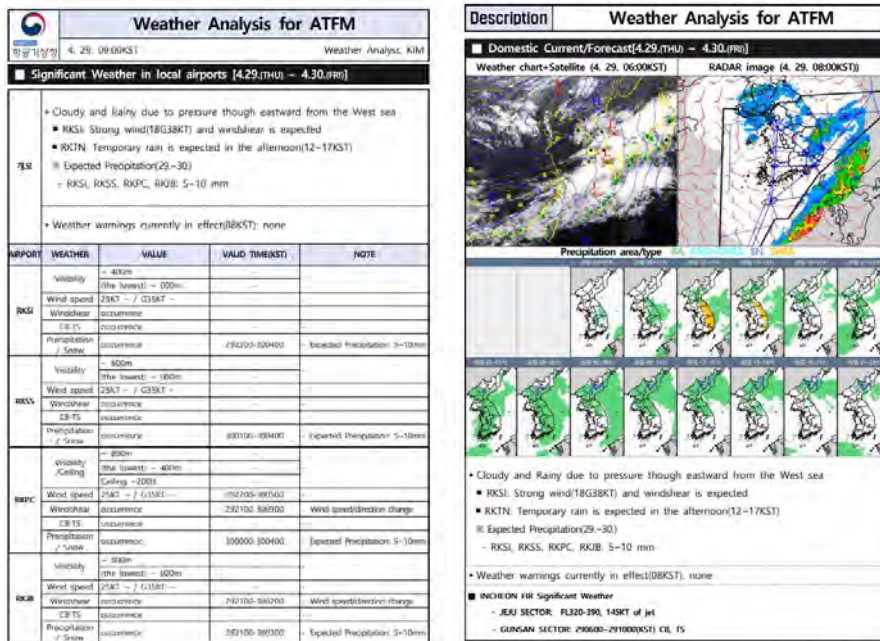


Fig 1. Weather analysis provided by AMO (twice a day) includes i) significant weather forecasts for each airport and ii) weather charts

- Target: Major domestic and foreign airports, Incheon FIR, and neighboring FIR
- Issue time: 0000 UTC and 0700 UTC (twice a day)
- Means of provision: Flow Management Terminal (FMT) System (operated by MOLIT)
- Content: Information on meteorological conditions expected to affect ATFM within 24 hours
  - 1) Detailed information for major airports (low visibility, strong wind, windshear, CB, precipitation/snow, etc.)
  - 2) Satellite images, radar images, volcanic ash information, etc.
  - 3) Weather charts of numerical model, WINTeM, etc.

### 1.3.1 Significant Weather Scenarios

When a typhoon, heavy snow, or low visibility, which has a significant impact on ATFM is expected to occur, the AMO provides weather scenarios with the aim of supporting not only ATFM but also flight decisions of airlines and airport operations.

- 1.3.1.1 For typhoons, similar typhoons in the past and impact-based forecasts for airports and airspace (FIX, airways) are provided. They are used to manage the air traffic volume according to the decisions on detour air route and to determine whether the aircraft should be operated or not (Fig 2).
- 1.3.1.2 For heavy snow, dry/wet snow information and hourly forecasts are provided to predict delays in aircraft due to de/anti-icing, and are utilized for ATFM.
- 1.3.1.3 For low visibility, the lowest visibility is additionally provided to minimize aircraft holding and to utilize for the low visibility operational procedures at airports.

**Major Airports' Expected Wind(9. 6. 19KST valid)**

TIME(KST) AIRPORT	9.6.					9.7.					9.8.				
	18	21	00	03	06	09	12	15	18	21	00	03	06	09	12
RKPC	20G35	20G35	25G40	25G35	40G50	40G40	20G40	20G35							
RKJV			040	360	360										
RKPK	20G35	20G40	25G45	30G30	35G40	40G40	35G40	20G40	20G35						
RKPU	20G35	20G40	25G45	25G30	40G40	45G40	40G35	30G45	20G35						
RKJB			360	340	340	180	210								
RKQY			20G35	20G40	30G45	35G35	30G30	25G45	20G35						
RKSS			20G25	25G45	35G45	40G40	40G35	30G45	20G35						
RKSS			25G40	25G40	35G30	35G30	35G40	30G40	20G35						

  : more than 25G35KT   
   : more than GUST 60KT   
   : Cross wind

**CASE1. Similar Typhoon(2020-09 Maysak/ 9.2.~9.3.)**

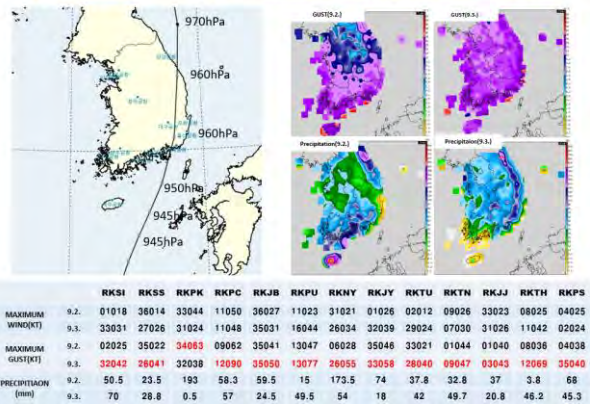


Fig 2. i) Significant Weather (Typhoon) Scenario and ii) similar typhoons in the past

**1.4 Terminal Area Weather Service**

**1.4.1 Monitoring and prediction of hazardous convection**

In cooperation with the Korea Weather Radar Center, the AMO has developed a hazardous convection monitoring and prediction system for the terminal area (Fig 2) to provide hazardous convection monitoring and prediction service. The service offers real-time observation information such as on precipitation echo, lightning, wind data by altitude, precipitation type, and hail. It provides information on precipitation echoes and atmospheric bodies with a radius of 15 kilometers around the runway and a vertical length of 10 kilometers. It also gives very short-term precipitation information within the next two hours, based on radar observations.

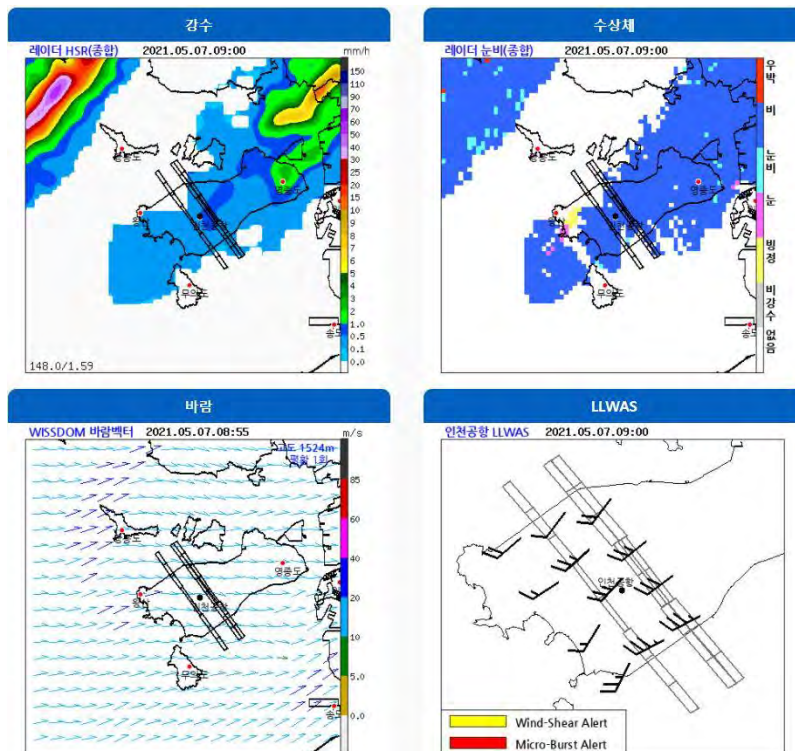


Fig 2. Significant convection monitoring and forecast for the terminal at Incheon international airport

### 1.4.2. Windshear forecast information

In order to provide information on the occurrence of windshear affecting aircraft, the AMO has developed windshear forecast information based on the numerical model (100 m resolution) in 2020, in cooperation with the National Institute of Meteorological Sciences (NIMS). The windshear forecast information provides windshear altitude, maximum value, and three levels of risk (in green, yellow and red) on the board (Fig 3) to help recognize windshear prediction information at a glance.

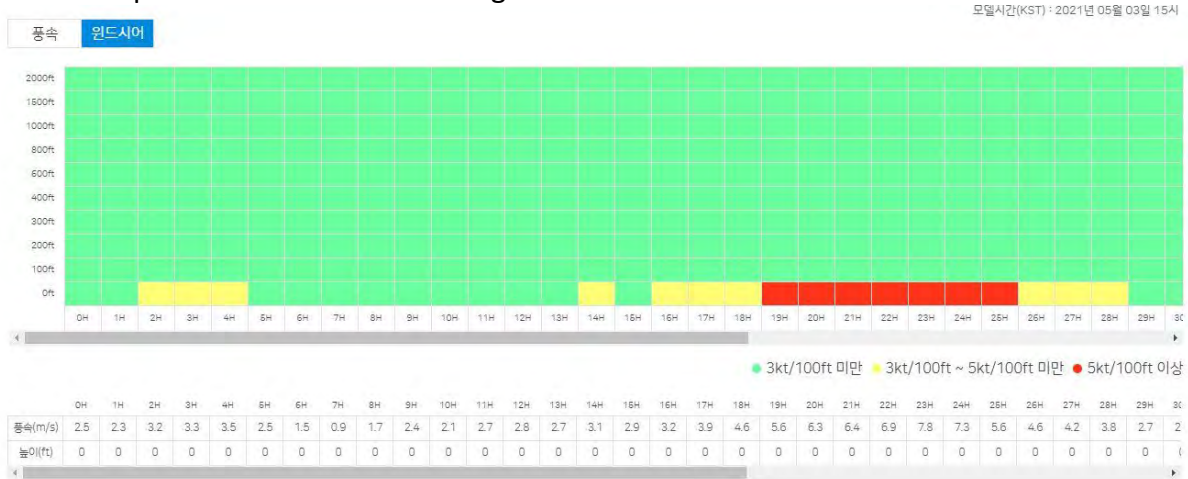


Fig 3. Display screen showing windshear information for Jeju Airport

## 2. Means of Provision

### 2.1. Flow Management Terminal (FMT) System

Real-time weather information such as radar images, satellite images, TAFs and METAR are provided by the FMT system operated by MOLIT.

### 2.2. Website

All MET information released by the AMO is available on the websites of the AMO, the Weather Radar Center, and the Weather Resources Map. It will be provided on an integrated platform in the future.

## APPENDIX 2 - Scenario 1

### CBs affected air traffic flow around approach control area of Tokyo International Airport (18 August, 2015)

#### 1. Overview

A developing squall line was moving eastward along the coast of Tokai and Kanto Region of Japan. It caused many deviations from the planned air-routes and holdings in and around the terminal area, for aircraft approaching from west to Tokyo International Airport (RJTT). The Air Traffic Management Center (ATMC) reduced air traffic capacity (CAPA) in the affected ATC sectors, such as sector T09 and T14, and executed air traffic flow controls for aircraft flying in / heading to the air space. In addition, because some westbound aircraft departed from RJTT were forced to enter into neighboring sectors, such as sector T12 and T13, to avoid developed CBs of the squall line, ATMC finally conducted capacity reduction and flow controls for those ATC sectors to prevent possible conflicts between eastbound and westbound aircraft within those sectors (See Fig. 1 and Fig. 2).

This case shows how MET forecasters and ATM officers collaboratively dealt with this adverse weather condition described above, which occurred around a congestive international airport.

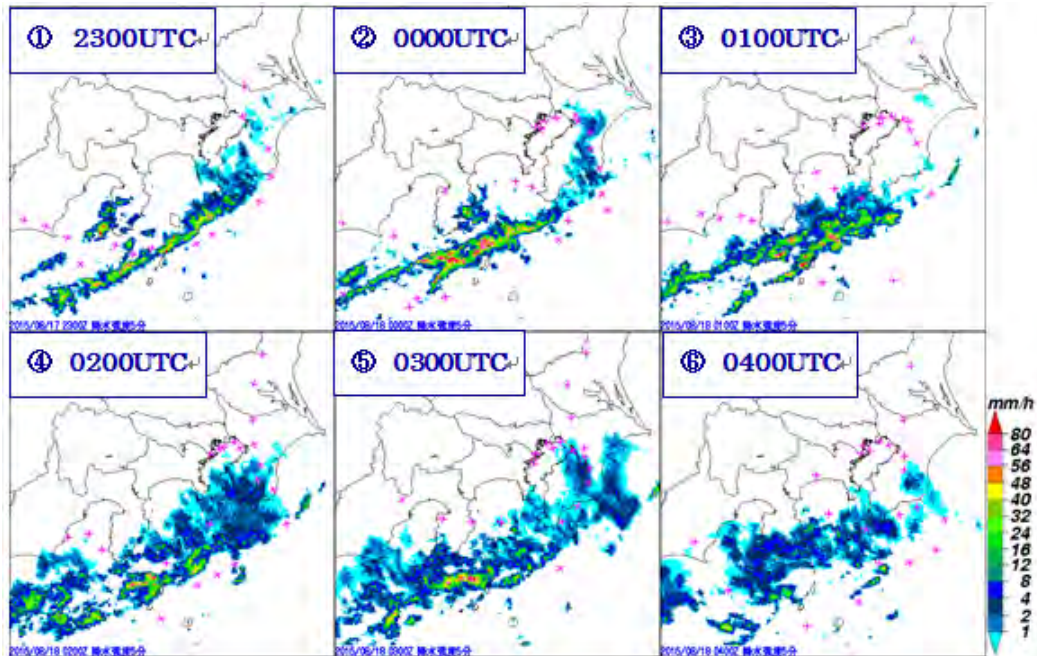


Figure 1 Radar echo intensity from 23:00 UTC 17th August to 04:00 UTC 18th August. Airplane-shaped marks indicate aircraft positions.

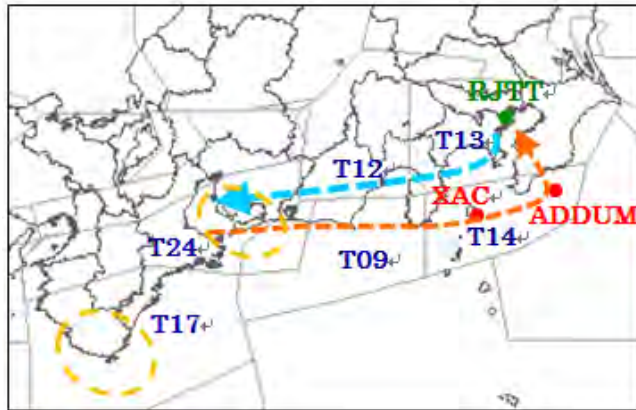


Figure 2 Name of ATC sectors (blue text) and reporting points (red text)

- Yellow circle: Holding area for aircraft flying to RJTT
- Orange arrow: Regular air-routes for aircraft approaching from western Japan to RJTT
- Light blue arrow: Regular air-routes for aircraft flying from RJTT to western Japan

## 2. MET/ATM collaboration

Described below is the collaborative actions taken by MET forecasters and ATM officers in this case (MET: Air Traffic Meteorology Center, Japan Meteorological Agency (ATMetC/JMA), ATM: Air Traffic Management Center, Japan Civil Aviation Bureau (ATMC/JCAB))

### 17th August 2015

20:00 UTC Special briefing was provided by MET

MET: "Echo top height of the CB clouds would reach more than FL460 in sector T09."

MET: "CB clouds will approach sector T14 around 21 UTC and then Tokyo Approach Control Area (ACA) around 22 UTC."

20:40 UTC Latest status of air traffic was reported by ATM

ATM: "Deviations have occurred in sector T17 and T09, because of CB clouds. We are now watching the situation of these CB clouds carefully."

21:00 UTC Special briefing was provided by MET

MET: "The CBs in sector T09 will approach XAC (reporting point) around 22 UTC and then ADDUM (reporting point) around 23 UTC "

ATM: "When will the CBs go away from Tokyo ACA?"

MET: "It will be after 00 UTC of 18th."

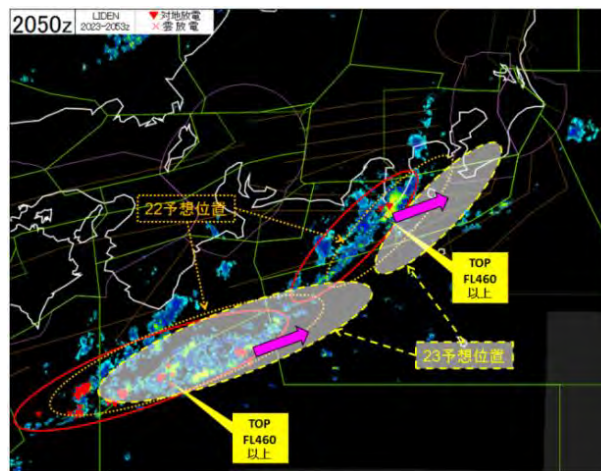


Figure 3 Material for non-regular briefing at 21:00 UTC on 17th August

21:20 UTC EDCT<sup>1</sup> was issued for flights heading to RJTT from west

22:00 UTC CAPA<sup>2</sup> was reduced to 93% in sector T09

22:10 UTC EDCT was issued for flights heading to RJTT through sector T09

23:08 UTC Special briefing was provided by MET

MET: "The CBs near XAC are now moving east and will approach ADDUM around 00 UTC."

MET: "The CBs newly developed around sector T09 will move to the eastward. Then it will be merged with CB cloud area of the east."

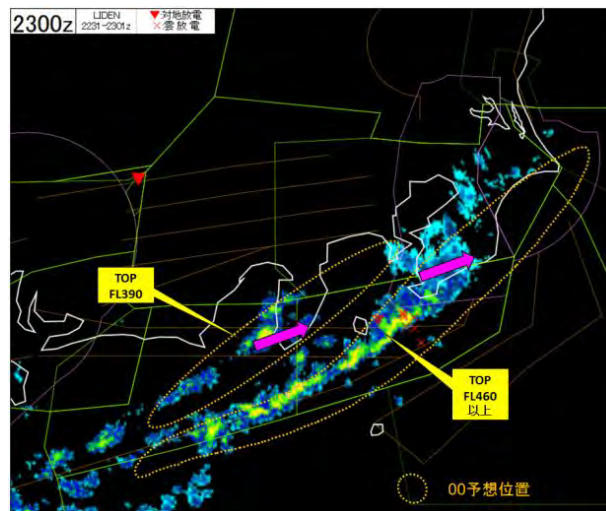


Figure 4 Material for non-regular briefing at 23:08 UTC on 17th August

<sup>1</sup> *Expected Departure Clearance Time (EDCT)* is assigned for the flights to certain aerodrome or airspace when air traffic volume is expected to exceed the ATC capacity of the aerodrome or the airspace.

<sup>2</sup> CAPA is an acronym for the ATC capacity of an aerodrome or an ATC sector.

- 23:10 UTC Entrance Interval was reduced for sector T09  
23:30 UTC CAPA was reduced to 88% in sector T12, 89% in sector T13  
23:35 UTC Departure Interval was reduced for sector T12  
23:40 UTC EDCT was cancelled for flights heading to RJTT through sector T09

### **18th August 2015**

- 01:10 UTC Special briefing provided by MET

*MET: "Developing CB area in T14 and T09 sectors will move to the northeast or the east-northeast and the peak of the development will continue until around 03 UTC."*

*MET: "A part of the CBs may spread to sector T12 and T13, but it would not be expected to spread largely to the north. CB clouds in T17 sector will move to the northeast or the east-northeast and spread into T09 sector around 09 UTC, but it will eventually weaken from around 06 UTC."*

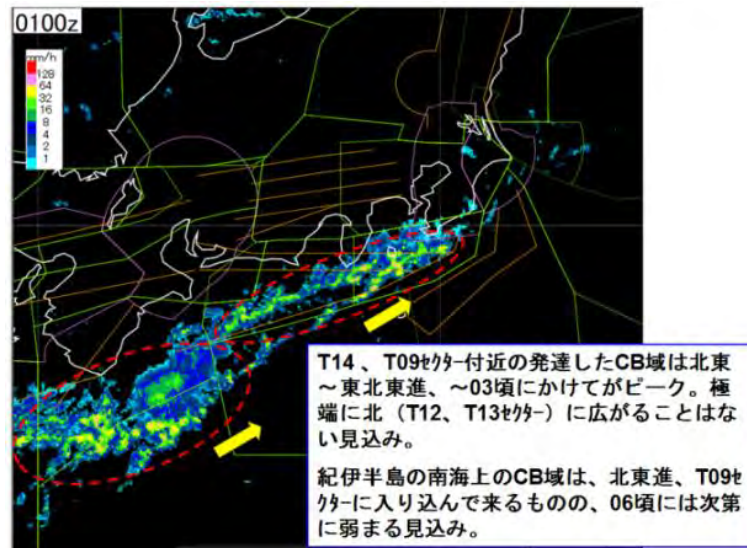


Figure 5 Material for non-regular briefing at 01:10 UTC on 18th August

- 02:00 UTC Entrance Interval was restored for T09 sector  
06:00 UTC Departure Interval was restored for T12 sector  
09:30 UTC EDCT was cancelled for flights heading to RJTT from west

### **3. Summary**

In this case, ATM officers shared the latest situation of air traffic flow with MET forecasters and on the other hand, MET forecasters provided special briefings for ATMC with regard to prediction of CB clouds which affected ATC sectors, such as T09 and T14. Additionally, MET forecasters paid attention also to the situation of CB clouds developed in T12 sector, because a number of westbound aircraft departed from RJTT flew into T12

and T13 sectors and, as a result, significant conflicts between eastbound and westbound aircraft were anticipated in those sectors. Based on such interactions, ATMC officers appropriately managed air traffic flow with frequent special briefings from MET forecasters.

This case shows how mutual coordination between MET forecasters and ATM officers will improve the efficiency and the safety of air traffic flow under adverse weather conditions.

## INTERNATIONAL CIVIL AVIATION ORGANIZATION



## ASIA/PACIFIC REGIONAL SIGMET GUIDE

**NINTH EDITION — XXX 2021**



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# 1. INTRODUCTION

## 1.1. General

- 1.1.1. The main purpose of this regional SIGMET guide is to provide guidance for standardization and harmonization of the procedures and formats related to the preparation and issuance of aeronautical meteorological information pertaining to specified en-route hazardous weather, and other phenomena in the atmosphere, which may affect safety of aircraft operations, known as SIGMET. The guidance is complementary to Annex 3 to the Convention on International Civil Aviation – *Meteorological Services for International Air Navigation*, the Standards and Recommended Practices (SARPs) contained therein regarding SIGMET, and to the SIGMET-related provisions in ICAO Regional Air Navigation Plans (ANPs).
- 1.1.2. Within this document, the term SIGMET stands for the message including the contained information.
- 1.1.3. This document includes guidance for SIGMET concerning significant en-route weather phenomenon. The guidance is provided for the provision of SIGMET in traditional alphanumeric code (TAC) form and in the ICAO Meteorological Information Exchange Model (IWXXM) form.
- 1.1.4. ICAO provisions concerning the preparation and issuance of SIGMET information are primarily contained in:
- Annex 3 - *Meteorological Service for International Air Navigation*, Part I, Chapters 3 and 7 and Part II, Appendix 6;
  - Annex 11 - *Air Traffic Services*, Chapter 4, 4.2.1 and Chapter 7, 7.1;
  - Regional Air Navigation Plans, Basic ANP, Part VI - Meteorology (MET);
  - Regional Air Navigation Plans, Volume II;
  - *Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM, Doc 4444)*, Chapter 9, 9.1.3.2;
  - Regional Supplementary Procedures (Doc 7030), Chapter 6, 6.13.2;
  - *ICAO Abbreviations and Codes* (Doc 8400);
  - *Handbook on the International Airways Volcano Watch (LAVW) – Operational Procedures and Contact List* (Doc 9766);
  - *Manual of Aeronautical Meteorological Practice* (Doc 8896), Chapters 1 and 4;
  - *Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services* (Doc 9377).
- 1.1.5. This regional SIGMET guide is primarily intended to assist meteorological watch offices (MWOs) in preparing and disseminating SIGMET information in conformance with the format prescribed in Annex 3. The explanations of the format to be used are accompanied by examples. The regional SIGMET guide also provides information regarding the necessary coordination between the MWOs, air traffic services (ATS), volcanic ash advisory centres (VAACs), tropical cyclone advisory centres (TCACs) and pilots, and their respective responsibilities.
- 1.1.6. To support regional management of SIGMET issuance and dissemination, Appendix C of the regional SIGMET guide contains guidance on the purpose, scope and procedures for conducting regional SIGMET tests.

## **2. RESPONSIBILITIES AND COORDINATION**

### **2.1. General**

- 2.1.1. SIGMET messages provide information on hazardous meteorological and other phenomena which may affect safety of aircraft operations; hence they are considered a high priority among other types of meteorological information provided to the aviation users. The primary purpose of SIGMET is for in-flight service, which requires timely transmission of the SIGMET messages to pilots by the ATS units and/or through VOLMET and D-VOLMET. Further information on the responsibilities of each party involved in the SIGMET process can be found in the *Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services* (Doc 9377).
- 2.1.2. Airlines are the main users of the SIGMET information. They contribute to the effectiveness of the SIGMET service through issuance of special air-reports reported by pilots to the ATS units. Special air-reports are among the most valuable sources of information for the MWOs in the preparation of SIGMET. The ATS units receiving special air-reports should forward them to their associated MWOs without delay.
- 2.1.3. In view of the foregoing, it should be well understood that the effectiveness of the SIGMET service depends strongly on the level of collaboration between the MWOs, ATS units, pilots, TCACs, VAACs and State volcano observatories. That is why, close coordination between these parties, as well as mutual understanding of their needs and responsibilities are essential for the successful implementation of the SIGMET service.
- 2.1.4. For the special cases of SIGMET for volcanic ash and tropical cyclones, the MWOs are provided with advisories from VAACs and TCACs respectively, as designated in the regional ANPs.
- 2.1.5. SIGMET is also used for flight planning. This requires global dissemination of SIGMET through the regional OPMET data banks (RODBs), the Internet-based SADIS FTP service and the WAFS Internet File Service (WIFS). SIGMET should also be distributed to the World Area Forecast Centres (WAFCs) London and Washington for use in the preparation of the significant weather (SIGWX) forecasts.

### **2.2. Meteorological watch office (MWO) responsibilities**

- 2.2.1. SIGMET is to be issued by the MWO in order to provide timely information on the occurrence or expected occurrence of specified en-route weather and other phenomena in the atmosphere affecting the safety of the flight operations in the MWO's area of responsibility. SIGMET provides information concerning the location, extent, intensity and expected evolution of the specified phenomena.
- 2.2.2. Information about the provision of the SIGMET service, including details on the designated MWO(s), is to be included in the State's Aeronautical Information Publication (AIP) as required by Annex 15 – *Aeronautical Information Service*, Appendix 1, GEN 3.5.8.
- 2.2.3. If a State is temporarily unable to meet its obligations for establishing MWO(s) and for provision of SIGMET, arrangements have to be made for another State to assume this responsibility. Such delegation of responsibilities is to be agreed by the meteorological authority of each State concerned and should be notified by a NOTAM, within the State's AIP and in a letter to the ICAO Regional Office concerned.

- 2.2.4. The meteorological authority concerned should ensure that the MWO obligations and responsibilities are clearly defined and assigned to the unit designated to serve the MWO. Corresponding operational procedures should be established and the meteorological staff should be trained accordingly.
- 2.2.5. In preparing SIGMET information MWOs should follow the format prescribed in Annex 3, Appendix 6, Table A6-1A. Whilst Table A6-1A is the authoritative source, Appendix A of this regional SIGMET guide, includes an enhanced SIGMET specific guidance based on Table A6-1A and provides more specific instructions on how SIGMET should be compiled. The aim is to ensure that SIGMET is produced reliably and consistently worldwide.
- 2.2.6. SIGMET must be issued only for those phenomena listed in Annex 3, Appendix 6, 1.1.4 and only when specified criteria for their intensity and spatial extent are met (section 3.2 below refers).
- 2.2.7. The MWOs should be adequately equipped in order to be able to identify, analyse and forecast those phenomena for which SIGMET is required. The MWO should make use of all available sources of information including:
- special air-reports passed to the MWO from ATS (voice communication);
  - special air-reports received from automated downlink;
  - Numerical Weather Prediction (NWP) data, especially high resolution models where available;
  - meteorological observations, including those from automatic weather stations and human observers;
  - upper wind information;
  - information from meteorological satellites;
  - weather radar (including Doppler radar);
  - State volcano observatories;
  - International Atomic Energy Agency (IAEA) through the relevant World Meteorological Organization (WMO) Regional Specialized Meteorological Centre (RSMC) for radioactive cloud;
  - local knowledge;
  - volcanic ash or tropical cyclone advisory messages.
- 2.2.8. On receipt of a special air-report from the associated ACC or FIC, the MWO shall:
- a) issue SIGMET information based on the special-air report; or
  - b) send the special air-report for onward transmission to MWOs, WAFCs and other meteorological offices in accordance with regional air navigation agreement in the case that the issuance of SIGMET information is not warranted (e.g., the phenomenon concerned is of transient nature).
- 2.2.9. Appropriate telecommunication means should be available at the MWO in order to ensure timely dissemination of SIGMET according to a dissemination scheme, which should include transmission to:
- local ATS users;
  - aerodrome MET offices within its area of responsibility, where SIGMET is required for briefing and/or flight documentation;
  - other MWOs in accordance with regional air navigation plans;
  - Centres designated for transmission of VOLMET or D-VOLMET where SIGMET is required for those transmissions;
  - responsible ROBEX centres and regional OPMET data bank (RODB). It should be arranged that, through the ROBEX scheme, SIGMETs are sent to

the designated RODB in the other ICAO regions, to the WAFCs and to the SADIS and WIFS providers;

- 2.2.10. In issuing SIGMET for tropical cyclones or volcanic ash, the MWOs should include as appropriate the advisory information received from the responsible TCAC or VAAC. In addition to the information received from the TCAC and VAAC, the MWOs may use the available complementary information from other reliable sources.

### **2.3. Air traffic service (ATS) unit responsibilities**

- 2.3.1. Close coordination should be established between the MWO and the corresponding ATS unit (ACC or FIC) and arrangements should be in place to ensure:

- receipt without delay and display at the relevant ATS units of SIGMET issued by the associated MWO;
- receipt and display at the ATS unit of SIGMETs issued by MWOs responsible for the adjacent FIRs/ACCs if these SIGMETs are required according to 2.3.4 below; and
- transmission without delay by the ATS unit of special air-reports received through voice communication to the associated MWO.

- 2.3.2. SIGMET information should be transmitted to aircraft with the least possible delay on the initiative of the responsible ATS unit, by the preferred method of direct transmission followed by acknowledgement or by a general call when the number of aircraft would render the preferred method impracticable.

- 2.3.3. SIGMET information transmitted to aircraft-in-flight should cover a portion of the route up to two hours flying time ahead of the aircraft. SIGMET should be transmitted only during the time corresponding to their period of validity.

- 2.3.4. Air traffic controllers should ascertain whether any of the currently valid SIGMETs may affect any of the aircraft they are controlling, either within or outside the FIR/CTA boundary, up to two hours flying time ahead of the current position of the aircraft. If this is the case, the controllers should at their own initiative transmit the SIGMET promptly to the aircraft-in-flight likely to be affected. If necessary, the controller should pass to the aircraft available SIGMETs issued for the adjacent FIR/CTA, which the aircraft will be entering, if relevant to the expected flight route.

- 2.3.5. The ATS units concerned should also transmit to aircraft-in-flight the special air-reports received, for which SIGMET has not been issued. Once a SIGMET for the weather phenomenon reported in the special air report is made available this obligation of the ATS unit expires.

### **2.4. Pilot responsibilities**

- 2.4.1. Timely issuance of SIGMET information is largely dependent on the prompt receipt by MWOs of special air-reports. It is essential that pilots prepare and transmit such reports to the ATS units whenever any of the specified en-route hazardous conditions are encountered or observed.

- 2.4.2. It should be emphasized that, even when automatic dependent surveillance (ADS) is being used for routine air-reports, pilots should continue to make special air-reports.

- 2.4.3. Pilots should compile special air-reports and disseminate to ATS by air-ground data link as per Annex 3, Appendix 4, 1.2 and *Procedures for Air Navigation Services – Air Traffic Management* (PANS-ATM, Doc 4444), 4.12.3.2, or by voice communication as per Annex 3, Appendix 4, 1.3 and PANS-ATM (Doc 4444), 4.12.3.3.

*Note. — The MWO will compile special air-reports for uplink as per Annex 3, Appendix 6, and as reported using the instructions given PANS-ATM, Appendix 1.*

## **2.5. Coordination between MWOs and ATS units**

- 2.5.1. To achieve the best service to aviation and as part of the collaborative decision-making process, close coordination between the MWO and the ATS units is required. This is of particular importance for the avoidance of hazardous weather.
- 2.5.2. A Letter of Agreement between the ATS authority and the meteorological authority is also recommended (as per Annex 3, 4.2) to outline the responsibilities and coordination processes between the MWOs and ATS units.

## **2.6. Coordination between MWOs, VAACs, TCACs and State volcano observatories**

- 2.6.1. Amongst the phenomena for which SIGMET information is required, volcanic ash and tropical cyclones are of particular importance.
- 2.6.2. Since the identification, analysis and forecasting of volcanic ash and tropical cyclones requires considerable scientific and technical resources, normally not available at each MWO, VAACs and TCACs have been designated to provide volcanic ash advisories and tropical cyclone advisories respectively to the users and assist the MWOs in the preparation of SIGMETs for those phenomena. Close coordination should be established between the MWO and its responsible VAAC and/or TCAC.
- 2.6.3. Information regarding the VAACs and TCACs areas of responsibility and lists of MWOs and ACC/FICs to which advisories are to be sent is provided in Appendix E and F. Volcanic ash advisories and tropical cyclone advisories are required for global exchange through SADIS and WIFS as they are used by the operators during the pre-flight planning. Nevertheless, it should be emphasized that SIGMET information is still required especially for in-flight re-planning. SIGMETs should be transmitted to aircraft-in-flight through voice communication, VOLMET or D-VOLMET, thus providing vital information for making in-flight decisions regarding large-scale route deviations due to volcanic ash clouds or tropical cyclones.
- 2.6.4. Information from State volcano observatories is an important part of the process for issuance of volcanic ash advisories and SIGMETs. Information from a State volcano observatory should be in the form of a Volcano Observatory Notification for Aviation (VONA) and include information on significant pre-eruption volcanic activity, volcanic eruptions or the presence of volcanic ash clouds. Guidance including responsibilities for the issuance of the VONA is given in the *Handbook on the International Airways Volcano Watch (IAVW) – Operational Procedures and Contact List* (Doc 9766); the format of the VONA is given in Appendix E of the Doc 9766.

## **2.7. SIGMET Coordination**

- 2.7.1. To ensure harmonization of SIGMET messages on en-route hazardous weather affecting or expected to affect more than one FIR, neighbouring MWOs should coordinate in SIGMET provision in accordance with Recommendation 3.4.4 of Annex 3 *Meteorological Service for International Air Navigation* effective on 5 November 2020. Guidelines on SIGMET coordination including planning and operational implementation are provided in Appendix L *Guidelines on Operational SIGMET Coordination* of this Guide.

### 3. PROCEDURES FOR PREPARATION OF SIGMET INFORMATION

#### 3.1. General

- 3.1.1. SIGMET is intended for transmission to aircraft in flight either by ATC or by VOLMET or D-VOLMET, and therefore, SIGMET messages should be kept concise. To this end, SIGMET information is prepared using approved ICAO abbreviations, a limited number of non-abbreviated words and, numerical values of a self-explanatory nature. In addition to the issuance of SIGMET in TAC format, MWOs should issue SIGMET information in the IWXXM format. For more information, please refer to APAC ROBEX Handbook, Guidelines for the Implementation of OPMET Data Exchange Using IWXXM and WMO-No. 306 Volume I.3.
- 3.1.2. The increasing use of automated systems for handling the aeronautical meteorological information by the users makes it essential that all types of OPMET information, including SIGMET messages, are prepared and issued in the prescribed standardized format. Therefore, the format of the SIGMET message, as specified in Annex 3, Appendix 6, should be strictly followed by the MWOs.
- 3.1.3. The MWO should maintain watch over the evolution of the phenomenon for which a SIGMET has been issued. If the phenomenon persists or is expected to persist beyond the period of validity of the SIGMET, another SIGMET message for a further period of validity should be issued with updated information. SIGMETs for volcanic ash and tropical cyclone should be updated at least every 6 hours, while SIGMET for all other phenomena should be updated at least every 4 hours.
- 3.1.4. SIGMET should be promptly cancelled when the phenomenon is no longer occurring or no longer expected to occur in the MWO's area of responsibility. In addition, correcting a SIGMET is not recommended as it is not specified in Annex 3 and not supported by IWXXM. If an incorrect SIGMET (e.g. error in FL) is issued, the incorrect SIGMET is recommended to be cancelled and a new SIGMET be issued with the corrected information.
- 3.1.5. Some SIGMET are generated using information from special air-reports (received by voice communications or data link (downlink)). The reporting of turbulence and icing used in special air-reports includes both moderate and severe categories (as per Doc 4444, Appendix 1).

*Note. — Although the categories for the reporting, by pilots, of moderate and severe turbulence in special air-reports is provided in PANS-ATM (Doc 4444), some pilots report turbulence as “moderate to severe”. A MWO is then faced with determining which category to use in a special air-report (uplink) or in a SIGMET message for severe turbulence. Some States elect to treat such “moderate to severe” observations as ‘severe’ in the context of using the report to prompt the issuance of a special air-report (uplink) or a SIGMET message.*

### 3.2. SIGMET phenomena

3.2.1. SIGMET shall only be issued for the phenomena listed in *Table 1* below and only using the abbreviations as indicated.

Phenomena Abbreviation	Description
OBSC TS	Thunderstorms that are obscured by haze or smoke or cannot be readily seen due to darkness.
EMBD TS	Thunderstorms that are embedded within cloud layers and cannot be readily recognized by the pilot in command
FRQ TS	Frequent thunderstorms where, within the area of thunderstorms, there is little or no separation between adjacent thunderstorms with a maximum spatial coverage greater than 75%.
SQL TS	A squall line indicating that a line of thunderstorms with little or no space between individual cumulonimbus clouds (CB).
OBSC TSGR	Thunderstorms with hail that are obscured by haze or smoke or cannot be readily seen due to darkness.
EMBD TSGR	Thunderstorms with hail that are embedded within cloud layers and cannot be readily recognized.
FRQ TSGR	Frequent thunderstorms with hail, within the area of thunderstorms, there is little or no separation between adjacent thunderstorms with a maximum spatial coverage greater than 75%.
SQL TSGR	A squall line indicating that a line of thunderstorms with hail with little or no space between cumulonimbus clouds (CB).
TC	A tropical cyclone with a 10 minute mean surface wind speed of 17m/s (34 kt) or more.
SEV TURB	Severe turbulence referring to: <ul style="list-style-type: none"> <li>● low-level turbulence associated with strong surface winds;</li> <li>● rotor streaming; or</li> <li>● clear air turbulence, whether in cloud or not in cloud.</li> </ul> <i>Note. — Turbulence should not be used in connection with convective clouds. Severe turbulence shall be considered whenever the peak value of EDR equals or exceeds 0.45.</i>
SEV ICE	Severe icing not associated with convective cloud.
SEV ICE (FZRA)	Severe icing caused by freezing rain and not associated with convective cloud.
SEV MTW	Severe mountain wave the accompanying downdraft is 3 m/s (600 ft/min) or more or when severe turbulence is observed or forecast.
HVY DS	Heavy duststorm where the visibility is below 200 m and the sky is obscured.
HVY SS	Heavy sandstorm where the visibility is below 200 m and the sky is obscured.
VA	Volcanic ash
RDOACT CLD	Radioactive cloud

*Table 1: SIGMET phenomena abbreviations and descriptions*

### 3.3. Allowable abbreviations

3.3.1. Abbreviations that can be used in the meteorological section of SIGMET are given in *Table 1* above and in *Table 2* below.

Abbreviation	Meaning	Abbreviation	Meaning
ABV	Above	NC	No change
APRX	Approximate or approximately	NE	North-east
AT	At (followed by time)	NNE	North-north-east
BLW	Below	NNW	North-north-west
BTN	Between	NM	Nautical miles
CB	Cumulonimbus cloud	NO	No
CLD	Cloud	NW	North-west
CNL	Cancel or cancelled	OBS	Observe or observed or observation
E	East or eastern longitude	PSN	Position
ENE	East-north-east	S	South or southern latitude
ESE	East-south-east	SE	South-east
EXER	Exercise	SFC	Surface
EXP	Expect or expected or expecting	SSE	South-south-east
FCST	Forecast	SSW	South-south-west
FIR	Flight information region	STNR	Stationary
FL	Flight level	SW	South-west
FT	Feet	TO	To
INTSF	Intensify or intensifying	TOP	Cumulonimbus cloud top (height)
KM	Kilometres	W	West or western longitude
KT	Knots	WID	Width or wide
M	Metres	WKN	Weaken or weakening
MOV	Move or moving or movement	WNW	West-north-west
MT	Mountain	WSW	West-south-west
N	North or northern latitude	Z	Coordinated Universal Time

*Table 2: SIGMET phenomena abbreviations and descriptions.*

### 3.4. SIGMET structure

3.4.1. A SIGMET message in TAC (Traditional Alphanumeric Code) format consists of:

- **WMO Abbreviated Heading Line (WMO AHL)** – all SIGMETs are preceded by an appropriate WMO AHL;
- **First line**, containing location indicators of the respective ATS unit and MWO, sequential number and period of validity;
- **SIGMET main body**, containing information concerning the observed or forecast phenomenon for which the SIGMET is issued together with its expected evolution within the period of validity, and a TEST or EXERCISE indicator when appropriate;

These elements are also part of a SIGMET message in IWXXM format, according to the IWXXM schema.

### 3.5. SIGMET format

*Note 1 — In the following text, square brackets - [ ] - are used to indicate an optional or conditional element, and angled brackets - < > - for symbolic representation of a variable element, which in a real SIGMET accepts a discrete numerical value.*

*Note 2 — The rules below apply for SIGMET in TAC format, as well as for SIGMET in IWXXM format. However, for the exact formatting of the messages in IWXXM, the XML schema and schematron rules can be found at the following URL: <http://schemas.wmo.int/iwxxm/>*

#### 3.5.1. WMO header

**T<sub>1</sub>T<sub>2</sub>A<sub>1</sub>A<sub>2</sub>ii CCCC YYGGgg [BBB]**

3.5.1.1. The group **T<sub>1</sub>T<sub>2</sub>A<sub>1</sub>A<sub>2</sub>ii** is the bulletin identification (WMO AHL) for the SIGMET message. It is constructed in the following way:

<b>T<sub>1</sub>T<sub>2</sub></b>	Data type designator	<p><b><u>For SIGMET in TAC format:</u></b>  <b>WS</b> – for SIGMET for phenomena other than volcanic ash cloud or tropical cyclone  <b>WC</b> – for SIGMET for tropical cyclone  <b>WV</b> – for SIGMET for volcanic ash</p> <p><b><u>For SIGMET in IWXXM format:</u></b>  <b>LS</b> – for SIGMET for phenomena other than volcanic ash cloud or tropical cyclone  <b>LY</b> – for SIGMET for tropical cyclone  <b>LV</b> – for SIGMET for volcanic ash</p>
<b>A<sub>1</sub>A<sub>2</sub></b>	Country or territory designators	Assigned according to Table C1, Part II of <i>Manual on the Global Telecommunication System, Volume I – Global Aspects</i> (WMO Publication No. 386)
<b>ii</b>	Bulletin number	Assigned on national level according to p 2.3.2.2, Part II of <i>Manual on the Global Telecommunication System, Volume I – Global Aspects</i> (WMO Publication No. 386)

**Table 3:** Specification of the WMO Abbreviated Header Line for SIGMET

*Note .1 — Tropical cyclone and volcanic ash cloud SIGMETs will be referred to hereafter as WC SIGMET (due to the T<sub>1</sub>T<sub>2</sub> section of the WMO AHL being set to WC) and WV SIGMET (due to the T<sub>1</sub>T<sub>2</sub> section of the WMO AHL being set to WV) respectively. All other SIGMET types will be referred to by WS (due to the T<sub>1</sub>T<sub>2</sub> section of the WMO AHL being set to WS).*

*Note 2. — WMO AHLs for SIGMET bulletins used by MWOs in APAC Region are listed in Appendix D to this SIGMET Guide.*

3.5.1.2. **CCCC** is the ICAO location indicator of the communication centre disseminating the message (this may be the same as the MWO location indicator).

3.5.1.3. **YYGGgg** is the date/time group; where **YY** is the day of the month and **GGgg** is the time of compilation of the SIGMET in hours and minutes UTC (normally this time is assigned by the disseminating (AFTN) centre, it may also be the time the forecast software compiles the SIGMET message).

Examples:

WSTH31 VTBS 121200

WVJP31 RJTD 010230

WCNG21 AYPY 100600

### 3.5.2. First line of TAC SIGMET

CCCC SIGMET [n][n]n VALID YYGGgg/YYGGgg CCCC-

3.5.2.1. The meaning of the groups in the first line of the SIGMET is as follows:

CCCC	ICAO location indicator of the ATS unit serving the FIR, UIR or CTA to which the SIGMET refers
SIGMET	Message identifier
[n][n]n	Daily sequence number (see 3.5.2.2)
VALID	Period of validity indicator
YYGGgg/YYGGgg	Validity period of the SIGMET given by date/time group of the beginning and date/time group of the end of the period (see 3.5.2.3)
CCCC	ICAO location indicator of the issuing MWO
-	Mandatory <b>hyphen</b> (without space) to separate the preamble from the text

*Table 4: Elements making up the first line of SIGMET*

3.5.2.2. The numbering of SIGMETs starts every day at 0001 UTC. The sequence number should consist of up to three alphanumeric characters and may be a combination of letters and numbers, such as:

- 1, 2, ...
- 01, 02, ...
- A01, A02, ...

Examples:

RPMM SIGMET 3 VALID 121100/121700 RPLL-  
WSJC SIGMET A04 VALID 202230/210430 WSSS-

*Note 1. — No other combinations should be used, like “CHARLIE 05” or “NR7”.*

*Note 2. — Correct numbering of SIGMET is very important since the number is used for reference in communication between ATC and pilots and in VOLMET and D-VOLMET.*

*Note 3. — In accordance with Annex 5 – Units of Measurement to be Used in Air and Ground Operations, when the validity period begins or ends at midnight, YY should be set for the following day and GGgg should be '0000'. i.e. SIGMET validity ending at midnight on the 23<sup>rd</sup> day of the month should be expressed as '240000'.*

*Note 4. - The sequence number is the sequence number for all SIGMET messages types (WS, WV and WC) for one flight information region*

3.5.2.3. The following regulations apply when determining the validity period:

- The period of validity of a **WS** SIGMET should not be more than 4 hours;
- The period of validity of a **WC** or **WV** SIGMET should not be more than 6 hours;
- In case of a SIGMET for an observed phenomenon, the filing time (date/time group in the WMO header) should be the same or very close to the time in the date/time group indicating the start of the SIGMET validity period;

- When the SIGMET is issued for a forecast phenomenon:
  - o the beginning of validity period should be the time of the expected commencement (occurrence) of the phenomenon in the MWO area of responsibility;
  - o the time of issuance of a **WS** SIGMET should not be more than 4 hours before the start of validity period (i.e., expected time of occurrence of the phenomenon); and for **WC** (tropical cyclone) and **WV** (volcanic ash) SIGMET the lead time should not be more than 12 hours.

3.5.2.4. The period of validity is that period during which the SIGMET information is valid for transmission to aircraft in flight.

Examples:

- 1) First two lines of a TAC SIGMET for an observed phenomenon:

**WSTH31 VTBS 241120  
VTBB SIGMET 3 VALID 241120/241500 VTBS-**

- 2) First two lines of a TAC SIGMET for a forecast phenomenon (expected time of occurrence 1530)

**WSSR20 WSSS 311130  
WSJC SIGMET 1 VALID 311530/311930 WSSS-**

### 3.5.3. Structure of the meteorological part of TAC SIGMET

3.5.3.1. The meteorological part of a SIGMET for the phenomena consists of elements as shown in the table below.

*Start of the second line of the message*

1	2	3	4	5	6
Name of the FIR/UIR or CTA (M)	Test or Exercise (C)	Phenomenon (M)	Observed or forecast phenomenon (M)	Location (C)	Level (C)
See 3.5.3.2	See 3.5.3.3	See 3.5.3.4	See 3.5.3.5	See 3.5.3.6	See 3.5.3.7

7	8	9	10	11	12
Movement <i>or</i> expected movement (C)	Changes in intensity (C)	Forecast time (C)	TC Forecast position (C)	Forecast position (C)	Repetition of elements (C)
See 3.5.3.8	See 3.5.3.9	See 3.5.3.10	See 3.5.3.11	See 3.5.3.12	See 3.5.3.13

**Table 5:** Elements making up the meteorological part of SIGMET.

Note 1) Item 2, ‘Test or Exercise’ element should only be used if the SIGMET message is for TEST or EXERCISE purposes – see section 3.5.3.3 below for more information.

Note 2) Item 7, ‘Movement or expected movement’ should not be used if the ‘forecast time’ and ‘forecast position’ elements are used.

Note 3) M = inclusion mandatory, part of every message. C = inclusion conditional, include whenever applicable.

3.5.3.2. Name of the FIR/UIR or CTA

**CCCC <name> FIR[ /UIR ]**  
or  
**CCCC <name> CTA**

The ICAO location indicator and the name of the FIR/CTA are given followed by the appropriate abbreviation: FIR, FIR/UIR or CTA.

Examples:

**VTBB BANGKOK FIR**

3.5.3.3. Test or Exercise

This field will only be used if the SIGMET message is intended to be used for Test or Exercise purposes. The omission of this field indicates that the SIGMET is intended for operational decision making.

TEST is generally employed in messages without meteorological information, to test the data dissemination. When TEST is used, the SIGMET message may end immediately after the word TEST.

EXER is generally used for international exercises where realistic meteorological information will be used to test coordination.

When used, the SIGMET message may either end immediately after the word TEST or abbreviation EXER. Alternatively after the word TEST or abbreviation EXER, depending on the nature of the test and under most exercise circumstances the SIGMET message may contain realistic, although not necessarily valid content (the nature of tests and exercises may require historical data to be used).

3.5.3.4. Phenomenon

The phenomenon description consists of a qualifier and a phenomenon abbreviation. SIGMET should be issued only for the following phenomena observed and forecast to persist for more than a transitory period.:

- thunderstorms – if they are **OBSC**, **EMBD**, **FRQ** or **SQL** with or without hail (**GR**);
- turbulence – only **SEV**
- icing – only **SEV** with or without **FZRA**
- mountain waves – only **SEV**
- dust storm – only **HVY**
- sand storm – only **HVY**
- radioactive cloud – **RDOACT CLD**

For volcanic ash SIGMET (WV) only, the following conventions should be used

- a) In the case when the eruption is from a previously unknown or un-named volcano.

**VA ERUPTION PSN Nnn[nn] or Snn[nn] Ennn[nn] or Wnnn[nn] VA  
CLD**

b) In the case when the eruption is from a known and named volcano. The name may be up to 10 alphanumeric characters.

**VA ERUPTION MT nnnnnnnnnn PSN Nnn[nn] or Snn[nn] Ennn[nn]  
or Wnnn[nn] VA CLD**

c) In the case when a region of volcanic ash cloud is known to exist, but the precise origin of its source is unknown (the ash cloud may be of large horizontal extent, and obscuring the precise vent from which it emanates, and is otherwise in an area sparse of observation to identify the source).

**VA CLD**

For tropical cyclone SIGMET (WC) only, the following conventions should be used

a) In the case when the tropical cyclone is known and named. The name may be up to 10 alphanumeric characters.

**TC nnnnnnnnnn PSN Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]  
CB**

b) In the case when the tropical cyclone is not yet named.

**TC NN PSN Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] CB**

The appropriate abbreviations and combinations, and their meaning are given in *Table 1*.

#### 3.5.3.5. Indication whether the phenomenon is observed or forecast

**OBS**  
or  
**OBS AT GGggZ**  
or  
**FCST**  
or  
**FCST AT GGggZ**

The indication whether the phenomenon is observed or forecast is given by using the abbreviations **OBS** or **FCST**. **OBS AT** and **FCST AT** may be used, in which case they are followed by a time group in the form **GGggZ**. If the phenomenon is observed, **GGggZ** is the time of the observation in hours and minutes UTC.

In the case of **OBS AT**, the time of the report/observation having triggered or confirmed the phenomenon should be considered. This is generally the case when **OBS AT** is used to have different times for the observation and the start of validity of the SIGMET. The observation can be the trigger for the forecaster to issue a SIGMET and the preparation time of the SIGMET will lead to a SIGMET start validity time later than the observation.

If the exact time of the observation is not known the time is not included. When the phenomenon is based on a forecast without a reported observation, the time given for **GGggZ** represents the time of commencement of the validity period.

Examples:

**OBS**

**OBS AT 0140Z**

**FCST**

**FCST AT 0200Z**

*Note. — In the case of volcanic ash cloud covering more than one area within the FIR or cumulonimbus clouds associated with a tropical cyclone covering more than one area within the FIR, when elements such as location and forecast position are repeated, each location and forecast position must be preceded by an observed or forecast time.*

#### 3.5.3.6. Location of the phenomenon

The location of the phenomenon is given with reference to geographical coordinates (latitude and longitude). Latitude and longitude may be reported in degrees, or in degrees and minutes. When reporting in degrees the format will be **Nnn** or **Snn** for latitude, and **Ennn** or **Wnnn** for longitude. When reporting in degrees and minutes the format will be **Nnnnn** or **Snnnn** for latitude, and **Ennnnn** or **Wnnnnn** for longitude. The MWOs should try to be as specific as possible in reporting the location of the phenomenon and, at the same time, to avoid overwhelming the SIGMET with too many coordinates, which may be difficult to process or follow when transmitted by voice radio.

The following are the possible ways to describe the location of the phenomenon:

- 1) An area of the FIR defined by a polygon. The end point should be a repeat of the start point.

For TAC SIGMET, the polygon should have a minimum of 4 coordinates, and not normally more than 7 coordinates. The points of a polygon should be provided in a clockwise order.

For IWXXM SIGMET, the number of polygon's vertices following "WI" can be greater than 7. Following conventions on spatial schemas (ISO 19107:2019), the coordinate information of the polygon should be provided in a counter-clockwise order.

The use of **WITHIN** in describing the location of the phenomenon is preferred operationally by users as it enables translation to machine-readable formats for ingestion into automated systems used by the airlines for flight planning and in-flight decision making.

Symbolically, this is indicated as:

WI <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or <Ennn[nn]> -  
 <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or <Ennn[nn]> -  
 <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or <Ennn[nn]> -  
 <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or <Ennn[nn]> -  
 <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or <Ennn[nn]> -  
 <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or <Ennn[nn]> -  
 <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or <Ennn[nn]>

For example:

**WI N6030 E02550 - N6055 E02500 - N6050 E02630 -  
 N6030 E02550**

**WI N60 E025 - N62 E027 - N58 E030 - N59 E026 - N60 E025**

*Note 1. — The location of phenomenon given at the beginning of the SIGMET is referring to the beginning of the validity period if the exact time group of Observed or Forecast phenomenon is not included.*

The following are additional ways to describe the location of the phenomenon. They can only be used for SIGMETs in TAC format and their use makes translating SIGMET in TAC form into IWXXM more complex.

***Use of polygons with complex FIR boundaries.***

*Annex 3 (19th Edition, July 2016 and 20<sup>th</sup> Edition, July 2018) specifies that the points of a polygon '... should be kept to a minimum and should not normally exceed seven'. However, some FIR boundaries are complex, and it would be unrealistic to expect that a polygon would be defined that followed such boundaries exactly. As such, some States have determined that the polygon points be chosen in relation to the complex boundary such that the FIR boundary approximates, but is wholly encompassed by, the polygon, and that any additional area beyond the FIR boundary be the minimum that can be reasonably and practically described. Caution should however be exercised in those instances where international aerodromes are located in close proximity to such a complex FIR boundary. **Appendix B** provides examples and advice with regard to describing such areas.*

- 2a) In a sector of the FIR defined relative to a specified line, or single series of up to three connected lines, with start and end points on the FIR boundary (or so close to the FIR boundary so as to leave no doubt that the intent is for the line to connect to the FIR boundary at that point).

Symbolically this is indicated as:

<N OF> or <NE OF> or <E OF> or <SE OF> or <S OF> or  
 <SW OF> or <W OF> or <NW OF> LINE <Nnn[nn]> or  
 <Snn[nn]> <Wnnn[nn]> or <Ennn[nn]> - <Nnn[nn]> or  
 <Snn[nn]> <Wnnn[nn]> or <Ennn[nn]>

For example:

**NE OF LINE N2500 W08700 - N2000 W08300**

**W OF LINE N20 E042 - N35 E045**

- 2b) In a sector of the FIR defined as being between two lines of latitude, or between two lines of longitude.

Symbolically this is indicated as:

<N OF> or <S OF> <Nnn[nn]> or <Snn[nn]> AND <N OF> or  
<S OF> <Nnn[nn]> or <Snn[nn]>

<W OF> or <E OF> <Wnnn[nn]> or <Ennn[nn]> AND <W OF>  
or <E OF> <Wnnn[nn]> or <Ennn[nn]>

Chosen so that the affected area is BETWEEN lines of latitude or BETWEEN  
lines of Longitude

For example:

**N OF N1200 AND S OF N2530**

**W OF W060 AND E OF W082**

- 2c) In a sector of the FIR defined as being **between** two specified lines, or **between** two series of up to three connected lines, each with start and endpoints on the FIR boundary (or start and endpoints so close to the FIR boundary so as to leave no doubt that the intent is for the line to connect to the FIR boundary at those points).

<N OF> or <NE OF> or <E OF> or <SE OF> or <S OF> or  
<SW OF> or <W OF> or <NW OF> LINE <Nnn[nn]> or  
<Snn[nn]> <Wnnn[nn]> or <Ennn[nn]> - <Nnn[nn]> or  
<Snn[nn]> <Wnnn[nn]> or <Ennn[nn]> [ - <Nnn[nn]> or  
<Snn[nn]> <Wnnn[nn]> or <Ennn[nn]> ] [ - <Nnn[nn]> or  
<Snn[nn]> <Wnnn[nn]> or <Ennn[nn]> ] AND <N OF> or <NE  
OF> or <E OF> or <SE OF> or <S OF> or <SW OF> or <W  
OF> or <NW OF> LINE <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]>  
or <Ennn[nn]> - <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or  
<Ennn[nn]> [ - <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or  
<Ennn[nn]> ] [ - <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or  
<Ennn[nn]> ]

For example:

**NE OF LINE N2500 W08700 - N2000 W08300 AND SW OF LINE  
N2800 W08500 - N2200 W08200**

**W OF LINE N20 E042 - N35 E045 AND E OF LINE N20 E039 -  
N35 E043**

- 2d) In a sector of the FIR defined relative to a line of latitude and a line of longitude (effectively a quadrant);

Symbolically this is indicated as:

<N OF> or <S OF> <Nnn[nn]> or <Snn[nn]> AND  
<E OF> or <W OF> <Wnnn[nn]> or <Ennn[nn]>

For example:

**N OF N1200 AND E OF W02530**

**S OF N60 AND W OF E120**

- 2e) In a sector of the FIR defined relative to a line of latitude or longitude (effectively a segment), where a coordinate of latitude (or longitude) defines a line, and the preceding descriptor defines on which side of the line the phenomena is expected

Symbolically, this is indicated as:

<N OF> or <S OF> <Nnn[nn]> or <Snn[nn]> or  
<E OF> or <W OF> <Wnnn[nn]> or <Ennn[nn]>

For example:

**N OF S2230**

**W OF E080**

- 3) Defined by a 'corridor' of specified width, centred upon a line, of up to three connected segments, described by;

APRX nnKM WID LINE BTN <Nnn[nn]> or <Snn[nn]>  
<Wnnn[nn]> or <Ennn[nn]> - <Nnn[nn]> or <Snn[nn]>  
<Wnnn[nn]> or <Ennn[nn]>[ - <Nnn[nn]> or <Snn[nn]>  
<Wnnn[nn]> or <Ennn[nn]>][ - <Nnn[nn]> or <Snn[nn]>  
<Wnnn[nn]> or <Ennn[nn]>]

or

APRX nnNM WID LINE BTN <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]>  
or <Ennn[nn]> - <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or  
<Ennn[nn]>[ - <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or  
<Ennn[nn]>][ - <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or  
<Ennn[nn]>]

For example:

**APRX 50KM WID LINE BTN S1500 E07348 - S1530 E07642**

- 4) At a specific point within the FIR, indicated by a single coordinate of latitude and longitude.

Symbolically, this is indicated as:

<Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or <Ennn[nn]>

For example:

**N5530 W02230**

**S23 E107**

- 5) Within a specified radius of the centre of a tropical cyclone.

Symbolically, this is indicated as:

WI nnnKM OF TC CENTRE

WI nnnNM OF TC CENTRE

- 6) Within a specified radius of the location of a radioactive release event.

Symbolically, this is indicated as:

WI nnKM OF <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or  
<Ennn[nn]>

WI nnNM OF <Nnn[nn]> or <Snn[nn]> <Wnnn[nn]> or  
<Ennn[nn]>

For example:

WI 30KM OF N5530 W02230

A radius of up to 30 kilometres (or 16 nautical miles) from the source and a vertical extent from surface (SFC) to the upper limit of the flight information region/upper flight information region (FIR/UIR) or control area (CTA) is to be applied.

*Note. - For SIGMET messages for radioactive cloud, only within (WI) is to be used for the location of phenomenon and must describe a cylinder centred on the location of the radioactive release event.*

- 7) A reference to the whole FIR, FIR/UIR, or CTA.

Symbolically, this is indicated as:

ENTIRE FIR

ENTIRE UIR

ENTIRE FIR/UIR

ENTIRE CTA

More detail on reporting the location of the phenomenon is given in the examples provided in **Appendix B** to this guide.

3.5.3.7. Flight level

Symbolically, the options permitted are:

**FLnnn**  
or  
**nnnnM**  
or  
**[n]nnnnFT**  
or  
**SFC/FLnnn**  
or  
**SFC/nnnnM**  
or  
**SFC/[n]nnnnFT**  
or  
**FLnnn/nnn**  
or  
**TOP FLnnn**  
or  
**ABV FLnnn**  
or  
**TOP ABV FLnnn or TOP ABV [n]nnnnFT**  
or  
**TOP BLW FLnnn (only to be used for tropical cyclone)**  
or  
**nnnn/nnnnM**  
or  
**[n]nnnn/[n]nnnnFT**  
or  
**nnnnM/FLnnn**  
or  
**[n]nnnnFT/FLnnn**

In more detail, the location or extent of the phenomenon in the vertical is given by one or more of the above methods, as follows:

1) reporting at a single flight level

For example: **FL320**

2) reporting at a single geometric level, in metres or feet

For example: **4500M or 8250FT or 12000FT**

3) reporting a layer extending from the surface to a given height in meters, feet or flight level

For example: **SFC/3000M or SFC/9900FT or SFC/11000FT or SFC/FL350**

4) reporting a layer extending from a given FL to a higher flight level

For example: **FL250/290**

5) reporting a layer where the base is unknown, but the top is given:

For example: **TOP FL350**

6) reporting phenomenon above a specified flight level, but where the upper limit is unknown:

For example: **ABV FL350**

7) reporting phenomenon that has an unknown lower limit, but has an upper limit that is known to extend above a known flight level:

For example: **TOP ABV FL350**

8) reporting phenomenon expected between a lower and upper geometric level expressed in metres or feet:

For example: **3500/9000M or 8000/12000FT or 11000/14000FT**

9) reporting phenomenon expected between a lower geometric level expressed in metres or feet and a higher flight level:

For example: **4000M/FL220 or 6000FT/FL140 or 11000FT/FL190**

10) reporting the CB upper limit for tropical cyclone SIGMET

For example: **TOP BLW FL450**

Additional examples:

**EMBD TS ... TOP ABV FL340**  
**SEV TURB ... FL180/210**  
**SEV ICE ... SFC/FL150**  
**SEV MTW ... FL090**

### 3.5.3.8. Movement

*Note. — Footnote 26 to Table A6-1A of ICAO Annex 3 states that “The elements ‘Forecast Time’ and ‘Forecast Position’ are not to be used in conjunction with the element ‘Movement or Expected Movement’”.*

Rate of movement is indicated in the following way:

**MOV <direction> <speed>KMH[KT]**  
or  
**STNR**

Direction of movement is given with reference to one of the sixteen points of compass (**N, NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW, NW, NNW**). Speed is given in **KMH** or **KT**. The abbreviation **STNR** is used if no significant movement is expected.

For example:

**MOV NNW 30KMH**

**MOV E 25KT**

**STNR**

*Note 1. – Movement information should not be provided when a forecast position is explicitly given*

*Note 2. – For SIGMET messages for radioactive cloud, only stationary (STNR) is to be used for the element “Movement or Expected movement”.*

*Note 3. – For SIGMET messages for tropical cyclone, “Movement or Expected Movement” solely refers to the movement of the centre of a tropical cyclone and not the associated cumulonimbus clouds.*

### 3.5.3.9. Expected changes in intensity

The expected evolution of the phenomenon’s intensity is indicated by one of the following abbreviations:

**INTSF**  
or  
**WKN**  
or  
**NC**

*Note. – For SIGMET messages for tropical cyclone, this element indicates the change of the maximum surface winds around a tropical cyclone and not the intensity of the associated cumulonimbus clouds.*

### 3.5.3.10. Forecast time

This section is used, with ‘Forecast position’ to explicitly provide a forecast of the position of the phenomena at the time specified. The format is fixed, and is of the form

**FCST AT <GGgg>Z**

For example

**FCST AT 1600Z**

Where the forecast time is the same as the SIGMET validity end time.

*Note. — In accordance with Annex 5 – Units of Measurement to be Used in Air and Ground Operations, when the validity period ends at midnight, YY should be set for the following day and GGgg should be '0000'. i.e. SIGMET validity ending at midnight on the 23<sup>rd</sup> day of the month should be expressed as '240000'.*

3.5.3.11. TC Forecast position

Only to be used for tropical cyclones, and used to indicate the location of the centre of the tropical cyclone.

The forecast centre position of a tropical cyclone is given by:

**TC CENTRE PSN Nnn[nn] or Snn[nn] Wnnn[nn] or  
Ennn[nn]**

or

**TC CENTRE PSN Nnn[nn] or Snn[nn] Wnnn[nn] or  
Ennn[nn] CB**

*Note. — The term CB is to be used when the forecast position for the cumulonimbus cloud is included.*

For example

**TC CENTRE PSN N2740 W07345**

**TC CENTRE PSN S1015 E15030 CB**

3.5.3.12. Forecast position of the hazardous phenomenon at the end of the validity period of the SIGMET message

The available methods of describing the forecast position of the phenomenon in the 'Forecast position' section is exactly as detailed in section 3.5.3.6 "Location of the phenomenon" with the addition of :

- a) For volcanic ash which is not expected to be present within the FIR at the end of the validity of the SIGMET, the following is permitted:

**NO VA EXP**

*Note. — Currently, there is no provision for indicating changes to the levels affected by phenomena between the initial position and the forecast position. As such, and as per footnote 27 to Table A6-1A of Annex 3 (21<sup>st</sup> Edition, July 2020), it should be assumed that the levels affected remain*

*the same for both initial and forecast positions. If levels differ significantly then separate SIGMET should be issued.*

### 3.5.3.13. Repetition of elements (volcanic ash and tropical cyclone SIGMET only)

Elements can be repeated when there are instances of more than one volcanic ash cloud, or more than one area of cumulonimbus cloud associated with a tropical cyclone.

*Note 1. — This must not be used for two separate tropical cyclones that are present in a FIR, or UIR.*

*Note 2. — For SIGMET messages for tropical cyclone, this should be used for areas of cumulonimbus clouds associated with a tropical cyclone, not all cumulonimbus clouds in a FIR.*

With regard to the portrayal of complex volcanic ash events (which implies areas of volcanic ash at different levels) guidance in this regard is provided in Appendix B, example 8.

With regard to the portrayal of more than one area of cumulonimbus cloud associated with a tropical cyclone, guidance is provided in Appendix B, example 10.

### 3.5.4. Cancellation of SIGMET

3.5.4.1. Annex 3, 7.1.2 requires that "*SIGMET information shall be cancelled when the phenomena are no longer occurring or are no longer expected to occur in the area*".

3.5.4.2. As such, it is mandatory for an MWO to cancel any SIGMET that is currently valid but for which the specified phenomena no longer exists or is expected to exist.

3.5.4.3. The cancellation is done by issuing the same type of SIGMET with the following structure in TAC format:

- WMO heading with the same data type designator;
- First line, including the next sequence number followed by a new validity period that represents the remaining time of the original period of validity, and
- Second line, which contains the name of the FIR or CTA, the combination CNL SIGMET, followed by the sequence number of the original SIGMET and its original validity period.

3.5.4.4. A cancellation SIGMET should have a unique sequence number, and should follow the format below.

As an example, an original TAC SIGMET of:

```
YMMM SIGMET A01 VALID 260300/260700 YMMC-  
YMMM MELBOURNE FIR EMBD TS FCST WI S4000 E12000 - S3830 E12200 -  
S4200 E12100 - S4000 E12000 TOP FL450 MOV SW 05KT INTSF=
```

If it were to be cancelled early (i.e. prior to 0700 UTC), then the following would be appropriate:

```
YMMM SIGMET A02 VALID 260600/260700 YMMC-  
YMMM MELBOURNE FIR CNL SIGMET A01 260300/260700=
```

Where:

- the sequence number will be the next incrementing, unique sequence number.
- the validity time will be the time remaining between issuance and the end time of the original SIGMET.
- the sequence number of the original (and to be cancelled) SIGMET shall follow 'CNL SIGMET '.
- the original validity time of the original (and to be cancelled) SIGMET shall be included in the message after the reference to the original SIGMET's sequence number.

For SIGMET for volcanic ash only, the following is permitted:

```
WSAU21 ADRM 202155  
YBBB SIGMET E03 VALID 202155/210000 YMMC  
YBBB BRISBANE FIR CNL SIGMET E01 202000/210000 VA MOV TO WXYZ  
FIR=
```

Where the FIR (WXYZ in the example) into which the volcanic ash has moved is indicated.

### 3.5.5. Amendment/correction of SIGMET

- 3.5.5.1. If it is known that an existing SIGMET no longer accurately describes the existing or expected future evolution of the phenomena a new SIGMET, correctly describing the hazard should be issued, followed immediately by a cancellation of the original, erroneous SIGMET. The new SIGMET should be issued before the cancellation in order to ensure there is always a SIGMET in force and that the cancellation is not mistakenly understood to mean that the hazard has completely dissipated.
- 3.5.5.2. Originally issued SIGMET, later determined to no longer be accurate (bold text identifies points that will be changed):

```
WSZZ21 YUSO 201855
YUDD SIGMET 1 VALID 202000/210000 YUSO-
YUDD SHANLON FIR SEV TURB FCST WI S1530 E13700 - S1900 E13730
S2000 E13130 - S1600 E13500 - S1530 E13700 SFC/FL120 MOV SE 12KT
WKN=
```

- 3.5.5.3. Updated SIGMET (bold text identifies points that have been changed):

```
WSZZ21 YUSO 202155
YUDD SIGMET 2 VALID 202155/210155 YUSO-
YUDD SHANLON FIR SEV TURB FCST WI S1530 E13700 - S2000 E13750 -
S2045 E13245 - S1600 E13500 - S1530 E13700 SFC/FL120 MOV SE 12KT
WKN=
```

*Note, the updated SIGMET can have not only validity of four hours (or six hours for a VA or TC SIGMET) but also a reduced validity period, either to retain the original end validity time of the SIGMET it replaced, or to reflect the expected duration of the phenomenon.*

- 3.5.5.4. Cancellation SIGMET (this cancels the original SIGMET):

```
WSZZ21 YUSO 202156
YUDD SIGMET 3 VALID 202155/210000 YUSO-
YUDD SHANLON FIR CNL SIGMET 1 202000/210000=
```

*Note, it is essential that the time of compilation of the updated (correct) SIGMET and of the cancellation are separated by at least one minute to prevent inadvertent suppression by message switches. However, it is also important that the minimum delay between issuance of the updated and the cancellation messages.*

### 3.6. Dissemination of SIGMET

- 3.6.1. SIGMET is part of operational meteorological (OPMET) information. According to Annex 3, the telecommunication facilities used for the exchange of the operational meteorological information should be the aeronautical fixed service (AFS).
- 3.6.2. The AFS consists of a terrestrial segment, AFTN or ATN (AMHS), as well as the Internet-based SADIS FTP and WIFS services provided by WAFC London and WAFC Washington respectively. Note that SIGMET priority indicator is **FF** for flight safety messages (Annex 10, Volume II, 4.4.1.1.3 refers).

3.6.3. Currently, AFS should be used by the MWOs to send the SIGMET, as follows:

- to the adjacent MWOs and ACCs<sup>1</sup> using direct AFTN addressing;
- when required for VOLMET or D-VOLMET, SIGMET should be sent to the relevant centre providing the VOLMET service;
- SIGMET should be sent to all regional OPMET Data Banks (RODB);
- it should be arranged that SIGMET is relayed to the SADIS and WIFS providers for satellite/public internet dissemination, as well as to the WAFCs London and Washington, either through the ROBEX scheme, or directly by the issuing MWO;
- SIGMET for volcanic ash should be disseminated to the responsible VAAC.

3.6.4. Through SADIS and WIFS, SIGMET is disseminated to all authorised users. In this way, SIGMET is available on a global basis, meeting the aeronautical requirements.

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<sup>1</sup> For this dissemination it is required that SIGMET is available at the ACCs for transmission to aircraft in flight for the route ahead up to a distance corresponding to two hours flying time.

## APPENDIX A

### ENHANCED SIGMET GUIDANCE TABLE DEVELOPED FROM ANNEX 3 TABLE A6-1A

*Note. — The table below seeks to provide more detailed guidance than that given in Table A6-1A of Annex 3 (21<sup>st</sup> Edition, July 2020). It does this by removing all references to the AIRMET message. Table A6-1A. The table below simplifies the available options and provides more specific expansion of the symbolic structure of SIGMET messages, with guidance sub-titles where appropriate. It should be noted that Annex 3, Appendix 6, Table A6-1A remains the authoritative reference.*

Ref No.	Element as specified in Chapter 5 and Appendix 6	Detailed Content	Expanded symbolic - These 'expanded' symbolic representations of the various SIGMET code elements represent the interpretation of Table A6-1A of Annex 3. MWOs are encouraged to align their SIGMETs with the guidelines below.	Examples. These examples of various SIGMET code elements represent the interpretation A6-1A of Annex 3. MWOs are encouraged to align their SIGMETs with the examples below.
1.1	Location indicator of FIR/CTA (M) <sup>1</sup>	ICAO location indicator of the ATS unit serving the FIR or CTA to which the SIGMET refers	nnnn	YUCC <sup>2</sup> YUDD <sup>2</sup>
1.2	Identification (M)	Message identification and sequence number <sup>3</sup>	SIGMET n SIGMET nn SIGMET nnn	SIGMET 1 SIGMET 01 SIGMET A01
1.3	Validity period (M)	Day-time groups indicating the period of validity in UTC	VALID nnnnnn/nnnnnn	VALID 010000/010400 VALID 221215/221600 VALID 101520/101800 VALID 251600/252200 VALID 152000/160000 VALID 192300/200300 VALID 122200/130400 (6 hour validity applicable to TC or VA only)
1.4	Location indicator of MWO (M)	Location indicator of MWO originating the message with a separating hyphen	nnnn-	YUDO <sup>-2</sup> YUSO <sup>-2</sup>
1.5	Name of the FIR/CTA (M)	Location indicator and name of the FIR/CTA <sup>4</sup> for which the SIGMET is issued	nnnn nnnnnnnnnn FIR nnnn nnnnnnnnnn UIR nnnn nnnnnnnnnn FIR/UIR nnnn nnnnnnnnnn CTA	YUCC AMSWELL FIR <sup>2</sup> YUDD SHANLON FIR/UIR <sup>2</sup> YUDD SHANLON FIR <sup>2</sup> YUCC AMSWELL CTA <sup>2</sup>
1.6	Status indicator	Indicator of test or exercise	TEST or	TEST EXER

	(C) <sup>5</sup>		EXER	
2.1	Phenomenon (M) <sup>6</sup>	Description of phenomenon causing the issuance of SIGMET	<p>OBSC<sup>7</sup> TS</p> <p>OBSC<sup>7</sup> TSGR<sup>8</sup></p> <p>EMBD<sup>9</sup> TS</p> <p>EMBD<sup>9</sup> TSGR<sup>8</sup></p> <p>FRQ<sup>10</sup> TS</p> <p>FRQ<sup>10</sup> TSGR<sup>8</sup></p> <p>SQL<sup>11</sup> TS</p> <p>SQL<sup>11</sup> TSGR<sup>8</sup></p> <p>TC nnnnnnnnnn PSN Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] CB</p> <p>TC NN<sup>12</sup> PSN Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] CB</p> <p>SEV TURB<sup>13</sup></p> <p>SEV ICE<sup>14</sup></p> <p>SEV ICE (FZRA)<sup>14</sup></p> <p>SEV MTW<sup>15</sup></p> <p>HVY DS</p> <p>HVY SS</p> <p>VA ERUPTION PSN Nnn[nn] or Snn[nn] Ennn[nn] or Wnnn[nn] VA CLD</p> <p>VA ERUPTION MT nnnnnnnnnn PSN Nnn[nn] or Snn[nn] Ennn[nn] or Wnnn[nn] VA CLD</p> <p>VA CLD</p> <p>RDOACT CLD</p>	<p>OBSC TS</p> <p>OBSC TSGR</p> <p>EMBD TS</p> <p>EMBD TSGR</p> <p>FRQ TS</p> <p>FRQ TSGR</p> <p>SQL TS</p> <p>SQL TSGR</p> <p>TC GLORIA PSN N2215 W07500 CB</p> <p>TC NN PSN S26 E150 CB</p> <p>SEV TURB</p> <p>SEV ICE</p> <p>SEV ICE (FZRA)</p> <p>SEV MTW</p> <p>HVY DS</p> <p>HVY SS</p> <p>VA ERUPTION PSN N27 W017 VA CLD</p> <p>VA ERUPTION PSN S1200 E01730 VA CLD</p> <p>VA ERUPTION MT ASHVAL<sup>2</sup> PSN S15 E073 VA CLD</p> <p>VA ERUPTION MT VALASH<sup>2</sup> PSN N2030 E02015 VA CLD</p> <p>VA CLD</p> <p>RDOACT CLD</p>
2.2	Observed or forecast phenomenon (M) <sup>20,21</sup>	Indication whether the information is observed and expected to continue, or forecast	<p>OBS</p> <p>OBS AT nnnnZ</p> <p>FCST</p> <p>FCST AT nnnnZ</p>	<p>OBS</p> <p>OBS AT 1210Z</p> <p>FCST</p> <p>FCST AT 1815Z</p>
2.3	Location (C) <sup>20,21,33</sup>	Location (referring to latitude and longitude (in degrees and minutes))	<p>1) An area of the FIR defined by a polygon. The end point shall be a repeat of the start point. Minimum 4 coordinates (including the last point as a repeat of the first), and not normally more than 7 coordinates.</p> <p>WI<sup>22,23</sup> Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] - Nnn[nn] or Snn[nn] Wnnn[nn] or</p>	<p>1) An area of the FIR defined by a polygon. The end point shall be a repeat of the start point. Minimum 4 coordinates (including the last point as a repeat of the first), and not normally more than 7 coordinates.</p> <p>WI N6030 E02550 - N6055 E02500 - N6050 E02630 - N6030 E02550</p> <p>WI N30 W067 - N32 W070 - N35 W068 - N30 W067</p>

		<p>Ennn[nn] [- Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [- Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]][ - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]]</p> <p>or</p> <p>2a) In a sector of the FIR defined relative to a specified line, or single series of up to three connected lines, with start and endpoints on the FIR boundary (or so close to the FIR boundary so as to leave no doubt that the intent is for the line to connect to the FIR boundary at those points).</p> <p>[N][NE][E][SE][S][SW][W][NW] OF LINE<sup>22</sup> Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] [- Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [- Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]]</p> <p>or</p> <p>2b) In a sector of the FIR defined as being between two lines of latitude, or between two lines of longitude.</p> <p>N OF Nnn[nn] or N OF Snn[nn] AND S OF Nnn[nn] or S OF Snn[nn]</p> <p>or</p> <p>W OF Wnnn[nn] or W OF Ennn[nn] AND E OF Wnnn[nn] or E OF Ennn[nn]</p> <p>or</p> <p>2c) In a sector of the FIR defined as being between two specified lines, or between two series of up to three connected lines, each with start and endpoints on the FIR boundary (or start and endpoints so close to the FIR boundary so as to leave no doubt that the intent is for the line to connect to the FIR boundary at those points).</p> <p>[N][NE][E][SE][S][SW][W][NW] OF LINE<sup>22</sup> Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] [- Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [- Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] AND [N][NE][E][SE][S][SW][W][NW] OF LINE Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]</p>	<p>or</p> <p>2a) In a sector of the FIR defined relative to a specified line, or single series of up to three connected lines, with start and endpoints on the FIR boundary (or so close to the FIR boundary so as to leave no doubt that the intent is for the line to connect to the FIR boundary at those points).</p> <p>NE OF LINE N2515 W08700 - N2000 W08330 S OF LINE S14 E150 - S14 E155</p> <p>or</p> <p>2b) In a sector of the FIR defined as being between two lines of latitude, or between two lines of longitude.</p> <p>N OF N45 AND S OF N50</p> <p>or</p> <p>W OF E04530 AND E OF E04000</p> <p>or</p> <p>2c) In a sector of the FIR defined as being between two specified lines, or between two series of up to three connected lines, each with start and endpoints on the FIR boundary (or start and endpoints so close to the FIR boundary so as to leave no doubt that the intent is for the line to connect to the FIR boundary at those points).</p> <p>SW OF LINE N50 W020 - N45 E010 AND NE OF LINE N45 W020 - N40 E010</p>
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		<p>Ennn[nn] [- Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [- Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]]</p> <p>or</p> <p>2d) In a sector of the FIR defined relative to a line of latitude and a line of longitude (effectively a quadrant);</p> <p>N OF Nnn[nn] AND W OF Wnnn[nn] or  N OF Nnn[nn] AND E OF Wnnn[nn] or  S OF Nnn[nn] AND W OF Wnnn[nn] or  S OF Nnn[nn] AND E OF Wnnn[nn] or  N OF Nnn[nn] AND W OF Ennn[nn] or  N OF Nnn[nn] AND E OF Ennn[nn] or  S OF Nnn[nn] AND W OF Ennn[nn] or  S OF Nnn[nn] AND E OF Ennn[nn] or  N OF Snn[nn] AND W OF Wnnn[nn] or  N OF Snn[nn] AND E OF Wnnn[nn] or  S OF Snn[nn] AND W OF Wnnn[nn] or  S OF Snn[nn] AND E OF Wnnn[nn] or  N OF Snn[nn] AND W OF Ennn[nn] or  N OF Snn[nn] AND E OF Ennn[nn] or  S OF Snn[nn] AND W OF Ennn[nn] or  S OF Snn[nn] AND E OF Ennn[nn] or</p> <p>or</p> <p>2e) In a sector of the FIR defined relative to a line of latitude or longitude (effectively a segment);</p> <p>N OF Nnn[nn] or  S OF Nnn[nn] or  N OF Snn[nn] or  S OF Snn[nn] or  W OF Wnnn[nn] or  E OF Wnnn[nn] or  W OF Ennn[nn] or  E OF Ennn[nn]</p> <p>or</p>	<p>or</p> <p>2d) In a sector of the FIR defined relative to a line of latitude and a line of longitude (effectively a quadrant);</p> <p>S OF N3200 AND E OF E02000  S OF S3215 AND W OF E10130  S OF N12 AND W OF E040  N OF N35 AND E OF E078</p> <p>or</p> <p>2e) In a sector of the FIR defined relative to a line of latitude or longitude (effectively a segment);</p> <p>N OF S2230  S OF S43  E OF E01700  E OF W005</p> <p>or</p> <p>3) Defined by a 'corridor' of specified width, centred upon a line, of up to three connected segments, described by:</p>
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		<p>3) Defined by a 'corridor' of specified width, centred upon a line, of up to three connected segments, described by:</p> <p>APRX nnKM WID LINE<sup>22</sup> BTN Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] [ - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [ - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]]</p> <p>APRX nnNM WID LINE<sup>22</sup> BTN Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] [ - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [ - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]]</p> <p>or</p> <p>4) At a specific point within the FIR;</p> <p>Nnn[nn] Wnnn[nn] or Nnn[nn] Ennn[nn] or Snn[nn] Wnnn[nn] or Snn[nn] Ennn[nn]</p> <p>or</p> <p>5) tropical cyclone;</p> <p>WI nnnKM (or nnnNM) OF TC CENTRE<sup>24</sup></p> <p>or</p> <p>6) A cylinder of specified radius;<sup>25</sup></p> <p>WI nnKM (or nnNM) OF Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]</p> <p>or</p> <p>7) A reference to the whole FIR, FIR/UIR, or CTA</p> <p>ENTIRE FIR ENTIRE FIR/UIR</p>	<p>APRX 50KM WID LINE BTN N64 W017 - N60 W010 - N57 E010 - N60 E015</p> <p>APRX 50NM WID LINE BTN S1530 W09500 - S1815 W10130 - S2000 W10300</p> <p>or</p> <p>4) At a specific point within the FIR;</p> <p>N5530 W02230 S12 E177</p> <p>or</p> <p>5) tropical cyclone;</p> <p>WI 400KM OF TC CENTRE WI 250NM OF TC CENTRE</p> <p>or</p> <p>6) A cylinder of specified radius;</p> <p>WI 30 KM OF N6030 E02550 WI 50 NM OF S2000 E04000</p> <p>or</p> <p>7) A reference to the whole FIR, FIR/UIR, or CTA</p> <p>ENTIRE FIR ENTIRE FIR/UIR ENTIRE UIR</p>
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			ENTIRE UIR ENTIRE CTA	ENTIRE CTA
2.4	Level (C) <sup>20,21</sup>	Flight level or altitude	<p>1) Generic height/range descriptors to be used when 'Location' descriptors above are used.</p> <p>FLnnn [n]nnnnFT nnnnM SFC/FLnnn SFC/nnnnM SFC/nnnnFT SFC/nnnnnFT FLnnn/nnn TOP FLnnn ABV FLnnn TOP ABV FLnnn ABV [n]nnnnFT TOP ABV [n]nnnnFT nnnn/nnnnM [n]nnnn/[n]nnnnFT nnnnM/FLnnn [n]nnnnFT/FLnnn</p> <p><i>or</i><sup>24</sup></p> <p>TOP FLnnn TOP BLW FLnnn TOP ABV FLnnn</p>	<p>1) Generic height/range descriptors to be used when 'Location' descriptors above are used.</p> <p>FL180 7000FT 10000FT 600M 1200M SFC/FL070 SFC/9000FT SFC/10000FT SFC/2500M FL050/080 FL310/450 TOP FL390 ABV FL280 ABV 7000FT TOP ABV FL100 TOP ABV 9000FT TOP ABV 10000FT 3000M 2000/3000M 8000FT 6000/12000FT 11000/14000FT 2000M/FL150 8000FT/FL190 10000FT/FL250</p> <p><i>or</i></p> <p>TOP FL500 TOP BLW FL450 TOP ABV FL360</p>
2.5	Movement <i>or</i> expected movement (C) <sup>20, 26,34</sup>	Movement <i>or</i> expected movement (direction and speed) with reference to one of the sixteen points of compass, <i>or</i> stationary	<p>MOV N [nnKMH (or nnKT)] <i>or</i> MOV NNE [nnKMH (or nnKT)] <i>or</i> MOV NE [nnKMH (or nnKT)] <i>or</i> MOV ENE [nnKMH (or nnKT)] <i>or</i> MOV E [nnKMH (or nnKT)] <i>or</i> MOV ESE [nnKMH (or nnKT)] <i>or</i> MOV SE [nnKMH (or nnKT)] <i>or</i> MOV SSE [nnKMH (or nnKT)] <i>or</i> MOV S [nnKMH (or nnKT)] <i>or</i> MOV SSW [nnKMH (or nnKT)] <i>or</i> MOV SW [nnKMH (or nnKT)] <i>or</i> MOV WSW [nnKMH (or nnKT)] <i>or</i> MOV W [nnKMH (or nnKT)] <i>or</i> MOV WNW [nnKMH (or nnKT)] <i>or</i> MOV NW [nnKMH (or nnKT)] <i>or</i> MOV NNW [nnKMH (or nnKT)]</p> <p><i>or</i></p>	<p>MOV E 40KMH MOV E 20KT MOV SE 20KT</p>

			STNR	STNR
2.6	Changes in intensity (C) <sup>20</sup>	Expected changes in intensity	INTSF  or  WKN  or  NC	INTSF    WKN    NC
2.7	Forecast time (C) <sup>20,21,26</sup>	Indication of the forecast time of the phenomena	FCST AT nnnnZ	FCST AT 2200Z FCST AT 0000Z
2.8	TC forecast position (C) <sup>24</sup>	Forecast position of TC centre	TC CENTRE PSN Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]  or <sup>31</sup>  TC CENTRE PSN Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] CB	TC CENTRE PSN N1030 E16015    TC CENTRE PSN N1015 E15030 CB
2.9	Forecast position (C) <sup>20, 21, 26, 27, 33</sup>	Forecast position of phenomenon at the end of the validity period of the SIGMET message <sup>32</sup>	1) An area of the FIR defined by a polygon. The end point shall be a repeat of the start point. Minimum 4 coordinates (including the last point as a repeat of the first), and not normally more than 7 coordinates.  WI <sup>22,23</sup> Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] [- Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [- Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]][ - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]]  or  2a) In a sector of the FIR defined relative to a specified line, or single series of up to three connected lines, with start and endpoints on the FIR boundary (or so close to the FIR boundary so as to leave no doubt that the intent is for the line to connect to the FIR boundary at those points).  [N][NE][E][SE][S][SW][W][NW] OF LINE <sup>22</sup> Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] - Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] [- Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [- Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]]  or  2b) In a sector of the FIR defined as being between two lines of latitude, or between two lines of longitude.	1) An area of the FIR defined by a polygon. The end point shall be a repeat of the start point. Minimum 4 coordinates (including the last point as a repeat of the first), and not normally more than 7 coordinates.  WI N6030 E02550 - N6055 E02500 - N6050 E02630 - N6030 E02550  WI N30 W067 - N32 W070 - N35 W068 - N30 W067  or  2a) In a sector of the FIR defined relative to a specified line, or single series of up to three connected lines, with start and endpoints on the FIR boundary (or so close to the FIR boundary so as to leave no doubt that the intent is for the line to connect to the FIR boundary at those points).  NE OF LINE N2515 W08700 - N2000 W08330  S OF LINE S14 E150 - S14 E155  or  2b) In a sector of the FIR defined as being between two lines of latitude, or between two lines of longitude.

		<p>2b) In a sector of the FIR defined as being between two lines of latitude, or between two lines of longitude.</p> <p>N OF Nnn[nn] or N OF Snn[nn] AND S OF Nnn[nn] or S OF Snn[nn]</p> <p><i>or</i></p> <p>W OF Wnnn[nn] or W OF Ennn[nn] AND E OF Wnnn[nn] or E OF Ennn[nn]</p> <p><i>or</i></p> <p>2c) In a sector of the FIR defined as being between two specified lines, or between two series of up to three connected lines, each with start and endpoints on the FIR boundary (or start and endpoints so close to the FIR boundary so as to leave no doubt that the intent is for the line to connect to the FIR boundary at those points).</p> <p>[N][NE][E][SE][S][SW][W][NW] OF LINE<sup>22</sup> Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn] - Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn] [- Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn]] [- Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn]] AND [N][NE][E][SE][S][SW][W][NW] OF LINE Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn] - Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn] [- Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn]] [- Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn]]</p> <p><i>or</i></p> <p>2d) In a sector of the FIR defined relative to a line of latitude and a line of longitude (effectively a quadrant):</p> <p>N OF Nnn[nn] AND W OF Wnnn[nn] <i>or</i>  N OF Nnn[nn] AND E OF Wnnn[nn] <i>or</i>  S OF Nnn[nn] AND W OF Wnnn[nn] <i>or</i>  S OF Nnn[nn] AND E OF Wnnn[nn] <i>or</i>  N OF Nnn[nn] AND W OF Ennn[nn] <i>or</i>  N OF Nnn[nn] AND E OF Ennn[nn] <i>or</i>  S OF Nnn[nn] AND W OF Ennn[nn] <i>or</i>  S OF Nnn[nn] AND E OF Ennn[nn] <i>or</i>  N OF Snn[nn] AND W OF Wnnn[nn] <i>or</i>  N OF Snn[nn] AND E OF Wnnn[nn] <i>or</i>  S OF Snn[nn] AND W OF Wnnn[nn] <i>or</i></p>	<p>N OF N45 AND S OF N50</p> <p>W OF E04530 AND E OF E04000</p> <p><i>or</i></p> <p>2c) In a sector of the FIR defined as being between two specified lines, or between two series of up to three connected lines, each with start and endpoints on the FIR boundary (or start and endpoints so close to the FIR boundary so as to leave no doubt that the intent is for the line to connect to the FIR boundary at those points).</p> <p>SW OF LINE N50 W020 - N45 E010 AND NE OF LINE N45 W020 - N40 E010</p> <p><i>or</i></p> <p>2d) In a sector of the FIR defined relative to a line of latitude and a line of longitude (effectively a quadrant):</p> <p>S OF N3200 AND E OF E02000  S OF S3215 AND W OF E10130  S OF N12 AND W OF E040  N OF N35 AND E OF E078</p>
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		<p>S OF Snn[nn] AND E OF Wnnn[nn] <i>or</i>  N OF Snn[nn] AND W OF Ennn[nn] <i>or</i>  N OF Snn[nn] AND E OF Ennn[nn] <i>or</i>  S OF Snn[nn] AND W OF Ennn[nn] <i>or</i>  S OF Snn[nn] AND E OF Ennn[nn] <i>or</i></p> <p><i>or</i></p> <p>2e) In a sector of the FIR defined relative to a line of latitude or longitude (effectively a segment);</p> <p>N OF Nnn[nn] <i>or</i>  S OF Nnn[nn] <i>or</i>  N OF Snn[nn] <i>or</i>  S OF Snn[nn] <i>or</i>  W OF Wnnn[nn] <i>or</i>  E OF Wnnn[nn] <i>or</i>  W OF Ennn[nn] <i>or</i>  E OF Ennn[nn]</p> <p><i>or</i></p> <p>3) Defined by a 'corridor' of specified width, centred upon a line, of up to three connected segments, described by:</p> <p>APRX nnKM WID LINE<sup>22</sup> BTN Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn] - Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn] [ - Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn]] [ - Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn]]</p> <p>APRX nnNM WID LINE<sup>22</sup> BTN Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn] - Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn] [ - Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn]] [ - Nnn[nn] <i>or</i> Snn[nn] Wnnn[nn] <i>or</i> Ennn[nn]]</p> <p><i>or</i></p> <p>4) At a specific point within the FIR;</p> <p>Nnn[nn] Wnnn[nn] <i>or</i>  Nnn[nn] Ennn[nn] <i>or</i>  Snn[nn] Wnnn[nn] <i>or</i></p>	<p><i>or</i></p> <p>2e) In a sector of the FIR defined relative to a line of latitude or longitude (effectively a segment);</p> <p>N OF S2230  S OF S43  E OF E01700  E OF W005</p> <p><i>or</i></p> <p>3) Defined by a 'corridor' of specified width, centred upon the line described;</p> <p>APRX 50KM WID LINE BTN N64 W017 - N60 W010 - N57 E010 - N60 E015</p> <p>APRX 50NM WID LINE BTN S1530 W09500 - S1815 W10130 - S2000 W10300</p> <p><i>or</i></p> <p>4) At a specific point within the FIR;</p> <p>N5530 W02230  S12 E177</p> <p><i>or</i></p> <p>5) tropical cyclone;</p>
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			<p>Snn[nn] Ennn[nn]</p> <p><i>or</i></p> <p>5) tropical cyclone:</p> <p>WI nnnKM (or nnnNM) OF TC CENTRE<sup>24</sup></p> <p><i>or</i></p> <p>6) A cylinder of specified radius;<sup>25</sup></p> <p>WI nnKM OF Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]</p> <p>WI nnNM OF Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]</p> <p><i>or</i></p> <p>7) A reference to the whole FIR, FIR/UIR, or CTA</p> <p>ENTIRE FIR</p> <p>ENTIRE FIR/UIR</p> <p>ENTIRE UIR</p> <p>ENTIRE CTA</p> <p><i>or</i></p> <p>8) No volcanic ash expected<sup>28</sup></p> <p>NO VA EXP</p>	<p>WI 150NM OF TC CENTRE</p> <p><i>or</i></p> <p>6) A cylinder of specified radius:</p> <p>WI 30 KM OF N6030 E02550</p> <p>WI 16 NM OF S2000 E04000</p> <p><i>or</i></p> <p>7) A reference to the whole FIR, FIR/UIR, or CTA</p> <p>ENTIRE FIR</p> <p>ENTIRE FIR/UIR</p> <p>ENTIRE UIR</p> <p>ENTIRE CTA</p> <p><i>or</i></p> <p>8) No volcanic ash expected</p> <p>NO VA EXP</p>
3.0	Repetition of elements (C) <sup>29</sup>	Repetition of elements included in a SIGMET message for volcanic ash cloud or tropical cyclone	[AND] <sup>29</sup>	AND
4.0	Cancellation of SIGMET (C) <sup>30</sup>	Cancellation of SIGMET referring to its identification	<p>CNL SIGMET n nnnnnn/nnnnnn</p> <p>CNL SIGMET nn nnnnnn/nnnnnn</p>	<p>CNL SIGMET 2 102000/110000</p> <p>CNL SIGMET 12 101200/101600</p>

			CNL SIGMET nnn nnnnnn/nnnnnn  <i>or</i>  CNL SIGMET n nnnnnn/nnnnnn VA MOV TO nnnn FIR <sup>28</sup>  CNL SIGMET nn nnnnnn/nnnnnn VA MOV TO nnnn FIR <sup>28</sup>  CNL SIGMET nnn nnnnnn/nnnnnn VA MOV TO nnnn FIR <sup>28</sup>	CNL SIGMET A12 031600/032000  <i>or</i>  CNL SIGMET 3 251030/251630 VA MOV TO YUDO FIR  CNL SIGMET 06 191200/191800 VA MOV TO YUDO FIR  CNL SIGMET B10 030600/031200 VA MOV TO YUDO FIR
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**Table A-1:** Expanded SIGMET template

Footnotes to table: (note, in order to ensure consistency between this document and ICAO Annex 3, Table 6-1A, any footnote in Table 6-1A that refers to AIRMET only is identified as such below.

1. See 4.1. “**Recommendation.**— *In cases where the airspace is divided into a flight information region (FIR) and an upper flight information region (UIR), the SIGMET should be identified by the location indicator of the air traffic services unit serving the FIR. Note.— The SIGMET message applies to the whole airspace within the lateral limits of the FIR, i.e. to the FIR and to the UIR. The particular areas and/or flight levels affected by the meteorological phenomena causing the issuance of the SIGMET are given in the text of the message.*”
2. Fictitious location.
3. In accordance with 1.1.3 “The sequence number referred to in the template in Table A6-1A shall correspond with the number of SIGMET messages issued for the flight information region since 0001 UTC on the day concerned. The meteorological watch offices whose area of responsibility encompasses more than one FIR and/or control area (CTA) shall issue separate SIGMET messages for each FIR and/or CTA within their area of responsibility.”
4. AIRMET only – not SIGMET
5. Only used when a message is issued to indicate that a test or exercise taking place. When the word “TEST” or the abbreviation “EXER” is included, the message may contain information that should not be used operationally or will otherwise end immediately after the word “TEST”.
6. As per 1.1.4 “In accordance with the template in Table A6-1A, only one of the following phenomena shall be included in a SIGMET message, using the abbreviations as indicated below [list of SIGMET phenomena follows in section 1.1.4 – see section]”
7. In accordance with 4.2.1 a) “*obscured (OBSC) if it is obscured by haze or smoke or cannot be readily seen due to darkness*”.
8. In accordance with 4.2.4 “*Hail (GR) should be used as a further description of the thunderstorm, as necessary*”
9. accordance with 4.2.1 b) “*embedded (EMBD) if it is embedded within cloud layers and cannot be readily recognized*”
10. In accordance with 4.2.2 “**Recommendation.**— An area of thunderstorms should be considered frequent (FRQ) if within that area there is little or no separation between adjacent thunderstorms with a maximum spatial coverage greater than 75 per cent of the area affected, or forecast to be affected, by the phenomenon (at a fixed time or during the period of validity)”
11. In accordance with 4.2.3 “**Recommendation.**— Squall line (SQL) should indicate a thunderstorm along a line with little or no space between individual clouds.”
12. Used for unnamed tropical cyclones.
13. In accordance with 4.2.5 and 4.2.6 “**Recommendation.**— Severe turbulence (TURB) should refer only to: low-level turbulence associated with strong surface winds; rotor streaming; or turbulence whether in cloud or not in cloud (CAT). Turbulence should not be used in connection with convective clouds.” and “Turbulence shall be considered: a) severe whenever the peak value of the cube root of EDR exceeds 0.7”
14. In accordance with 4.2.7 “**Recommendation.**— Severe icing (ICE) should refer to icing in other than convective clouds. Freezing rain (FZRA) should refer to severe icing conditions caused by freezing rain”.

15. In accordance with 4.2.8 “**Recommendation.**— A mountain wave (MTW) should be considered: a) severe whenever an accompanying downdraft of 3.0 m/s (600 ft/min) or more and/or severe turbulence is observed or forecast; and b) *moderate whenever an accompanying downdraft of 1.75–3.0 m/s (350–600 ft/min) and/or moderate turbulence is observed or forecast.*”
16. AIRMET only – not SIGMET
17. AIRMET only – not SIGMET
18. AIRMET only – not SIGMET
19. AIRMET only – not SIGMET
20. In the case of volcanic ash cloud covering more than one area within the FIR, these elements can be repeated, as necessary. Each location and forecast position is to be preceded by an observed or forecast time.
21. In the case of cumulonimbus clouds associated with a tropical cyclone covering more than one area within the FIR, these elements can be repeated as necessary. Each location and forecast position must be preceded by an observed or forecast time.
22. A straight line is to be used between two points drawn on a map in the Mercator projection or between two points which crosses lines of longitude at a constant angle.
23. The number of coordinates are to be kept to a minimum and should not normally exceed seven.
24. Only for SIGMET messages for tropical cyclones.
25. Only for SIGMET messages for radioactive cloud. A radius of up to 30 kilometres (or 16 nautical miles) from the source and a vertical extent from surface (SFC) to the upper limit of the flight information region/upper flight information region (FIR/UIR) or control area (CTA) is to be applied.
26. The elements “forecast time” and “forecast position” are not to be used in conjunction with the element “movement or expected movement”.
27. The levels of the phenomena remain fixed throughout the forecast period.
28. Only for SIGMET messages for volcanic ash.
29. To be used for more than one volcanic ash clouds or cumulonimbus clouds associated with a tropical cyclone simultaneously affecting the FIR concerned.
30. End of the message (as the SIGMET message is being cancelled).
31. The term CB is to be used when the forecast position for the cumulonimbus cloud is included.
32. The forecast position for cumulonimbus (CB) cloud occurring in connection with tropical cyclones relate to the forecast time of the tropical cyclone centre position, not to the end of the validity period of the SIGMET message.
33. For SIGMET messages for radioactive cloud, only within (WI) is to be used for the elements “location” and “forecast position”.
34. For SIGMET messages for radioactive cloud, only stationary (STNR) is to be used for the element “movement or expected movement”.

Additional notes (not specifically identified in footnotes to Table A6-1A):

In accordance with 4.2.9 of Appendix 6 of Annex 3, “Sandstorm/duststorm should be considered: a) heavy whenever the visibility is below 200 m and the sky is obscured; and b) moderate whenever the visibility is: 1) below 200 m and the sky is not obscured; or 2) between 200 m and 600 m.” (no footnote in Annex 3, but this is applicable reference)

## APPENDIX B

### SIGMET EXAMPLES

*Note. — The figures used in this appendix are intended simply to clarify the intent of the SIGMET message in abbreviated plain language (TAC), and therefore how each SIGMET should be constructed by MWOs and also interpreted by users. The figures used are not intended to give guidance on how a SIGMET in graphical format should be produced.*

Examples of 'ws' SIGMET. See the sections for SIGMET for volcanic ash only (wv) and SIGMET for tropical cyclone only (wc) for examples specific to those phenomena.

#### Contents

##### General

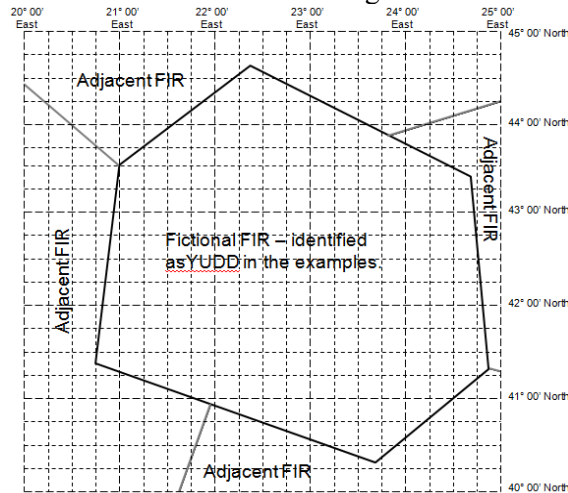
- 1) An area of the FIR defined by a polygon.  
Use of polygons with complex FIR boundaries.
- 2a) In a sector of the FIR defined relative to a specified line, or single series of up to three connected lines, with start and end points on the FIR boundary
- 2b) In a sector of the FIR defined as being between two lines of latitude, or between two lines of longitude
- 2c) In a sector of the FIR defined as being *between* two specified lines, or *between* two series of up to three connected lines, each with start and endpoints on the FIR boundary
- 2d) In a sector of the FIR defined relative to a line of latitude and a line of longitude (effectively a segment)
- 2e) In a sector of the FIR defined relative to a line of latitude or longitude (effectively a segment)
- 3) Defined by a 'corridor' of specified width, centred upon the line described;
- 4) At a specific point within the FIR
- 5) A vertical cylinder of specified radius
- 6) Covering entire FIR.
- 7) Additional examples using volcanic ash references applicable to volcanic ash SIGMET only
- 8) Additional examples using volcanic ash references applicable to multiple areas in SIGMET for volcanic ash.
- 9) Additional example illustrating use of "WI nnnKM (or nnnNM) OF TC CENTRE " in Tropical Cyclone SIGMET only.
- 10) Additional example with multiple CB areas in SIGMET for tropical cyclone
- 11) Additional examples of SIGMETs relating to 'concave' or 'horseshoe' shaped FIRs
- 12) Examples of Test and Exercise SIGMET indicators

## General

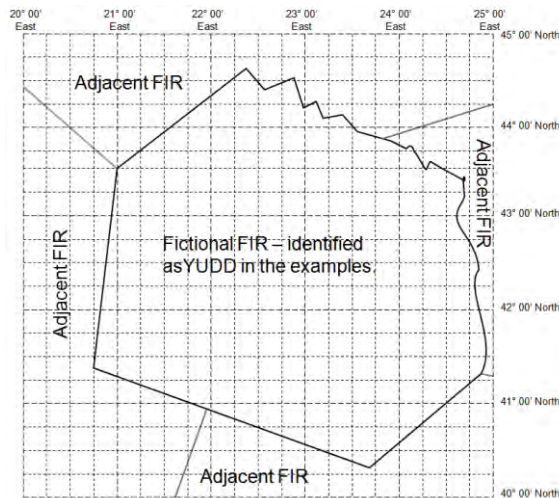
In the following paragraphs, some examples of SIGMET are provided in TAC format.

Explanation of “fictional FIR”.

In each of the examples below, a fictional FIR area is indicated, with portions of adjacent fictional FIRs also indicated. The FIR areas are overlaid on a coordinate grid, in order that the example plain language SIGMETs can be explicitly related to the intended meaning.



For some cases, examples are given where the FIR has boundaries that are complex (country borders for example, especially when defined by rivers)



Fictional FIR ‘Shanlon = YUDD’ is used for the examples.

Repetition of start point as last coordinate.

In accordance with practices and procedures laid down for other aeronautical bulletins (i.e. NOTAM), it is recommended that the last point of a polygon is a repeat of the first point of the polygon. This will ensure that the polygon has been closed, and that no points have been accidentally omitted.

'Direction' of encoding of the points of a polygon

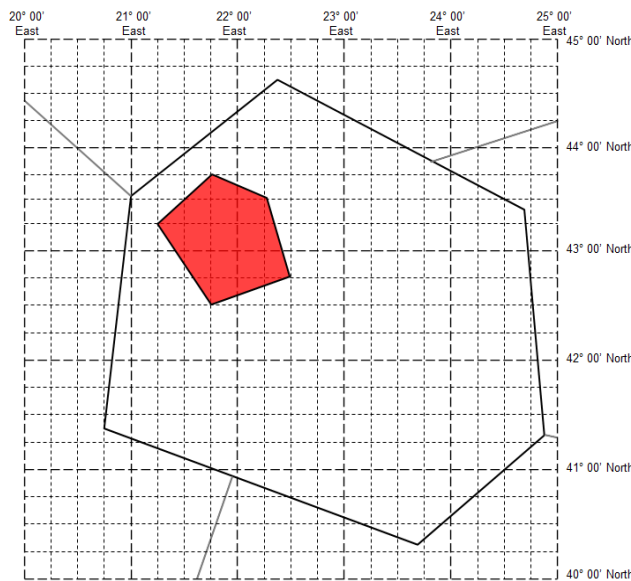
In accordance with practices and procedures laid down for other aeronautical bulletins and international practice (e.g. BUFR encoding of WAFS significant weather (SIGWX) forecasts), it is recommended that the points of a polygon are provided in a 'clockwise' sense. This assists automated systems in determining the 'inside' of polygons.

Use of 'Expected Movement' and 'Forecast Position'/'Forecast Time'.

The 'Expected Movement' element of SIGMET should not be used if the 'Forecast Position'/'Forecast Time' element is being used, and vice versa. This is to prevent duplication at best and inconsistencies at worst.

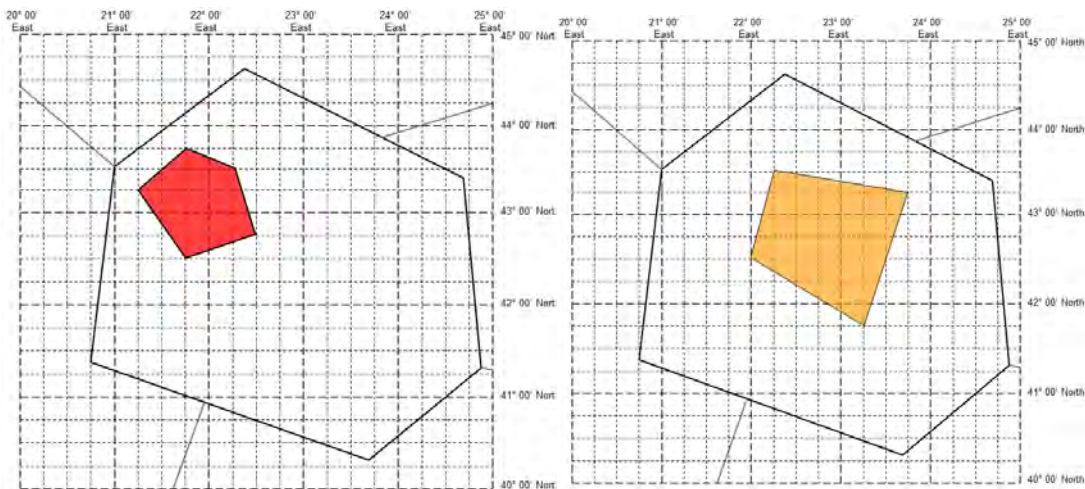
1) An area of the FIR defined by a polygon. The end point should be a repeat of the start point. Points of a polygon are provided in a 'clockwise' manner.

When the SIGMET does not include a 'forecast position' section.



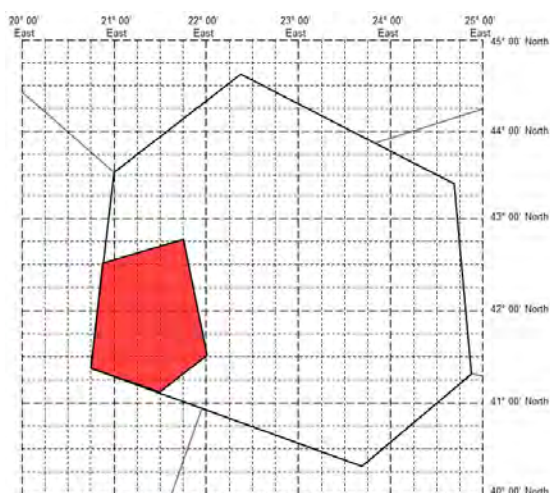
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
 YUDD SHANLON FIR/UIR SEV TURB FCST WI N4230 E02145 - N4315 E02115 -  
 N4345 E02145 - N4330 E02215 - N4245 E02230 - N4230 E02145 FL250/370  
 MOV ESE 20KT INTSF=

With an explicit forecast position:



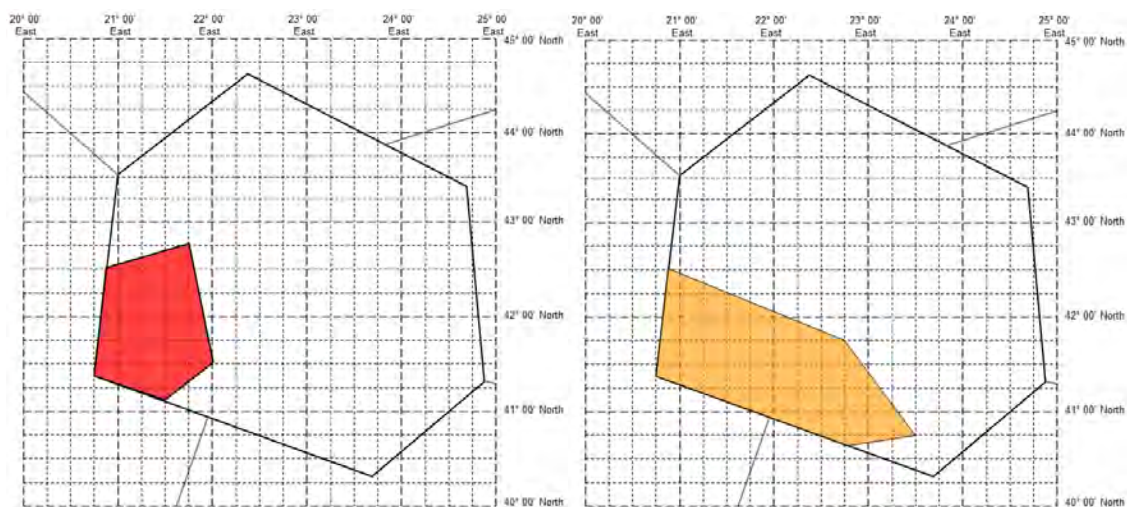
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
 YUDD SHANLON FIR/UIR SEV TURB FCST WI N4230 E02145 - N4315 E02115 -  
 N4345 E02145 - N4330 E02215 - N4245 E02230 - N4230 E02145 FL250/370  
 INTSF FCST AT 1600Z WI N4145 E02315 - N4230 E02200 - N4330 E02215 -  
 N4315 E02345 - N4145 E02315=

When the SIGMET does not include a 'forecast position' section.



YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR/UIR SEV TURB FCST WI N4230 E02052 - N4245 E02145 -  
N4130 E02200 - N4107 E02130 - N4123 E02045 - N4230 E02052 FL250/370  
MOV SE 30KT WKN=

With an explicit forecast position:



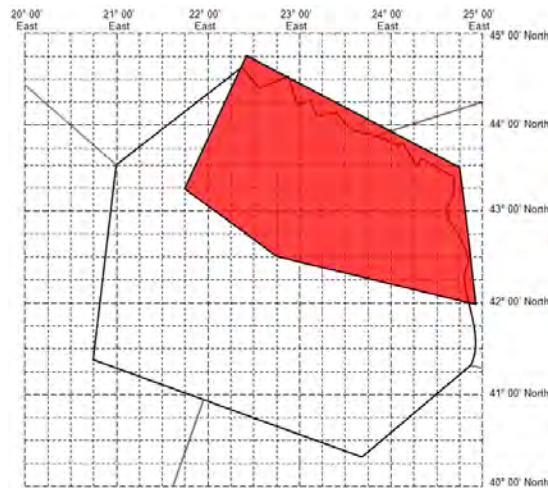
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR/UIR SEV TURB FCST WI N4230 E02052 - N4245 E02145 -  
N4130 E02200 - N4107 E02130 - N4123 E02045- N4230 E02052 FL250/370 WKN  
FCST AT 1600Z WI N4230 E02052 - N4145 E02245 - N4045 E02330 - N4040  
E02248 - N4123 E02045- N4230 E02052=

***Use of polygons with complex FIR boundaries.***

*Annex 3 (21<sup>st</sup> Edition, July 2020) specifies that the points of a polygon '... are to be kept to a minimum and should not normally exceed seven'. However, some FIR boundaries are complex, and it would be unrealistic to expect that a polygon would be defined that followed such boundaries precisely. As such, some States have determined that the polygon points be chosen in relation to the complex boundary such that the FIR boundary approximates, but is wholly encompassed by, the polygon, and that any additional area beyond the FIR boundary be the minimum that can be reasonably and practically described. Caution should however be exercised in those instances where international aerodromes are located in close proximity to such a complex FIR boundary.*

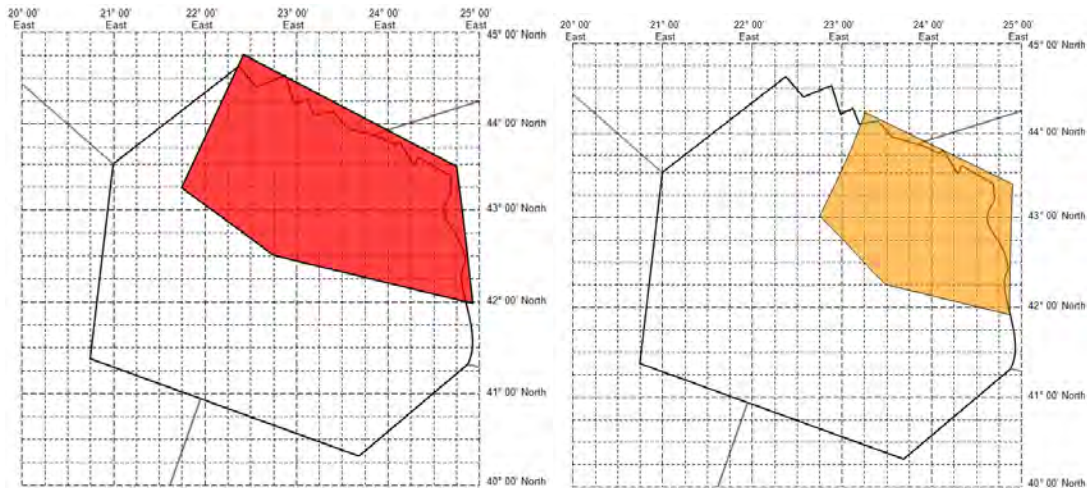
In the examples below, it would not be practical to follow the northeastern boundary of the FIR exactly. The point close to N4330 E02245 is obviously a 'major' turning point along the FIR boundary, but the other, numerous and complex turning points can only be approximated when constrained to seven points.

When the SIGMET does not include a 'forecast position' section.



```
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR/UIR SEV TURB FCST WI N4315 E02145 - N4445 E02225 -  
N4330 E02445 - N4200 E02455 - N4230 E02245 - N4315 E02145 FL250/370  
MOV SE 20KT WKN=
```

With an explicit forecast position:

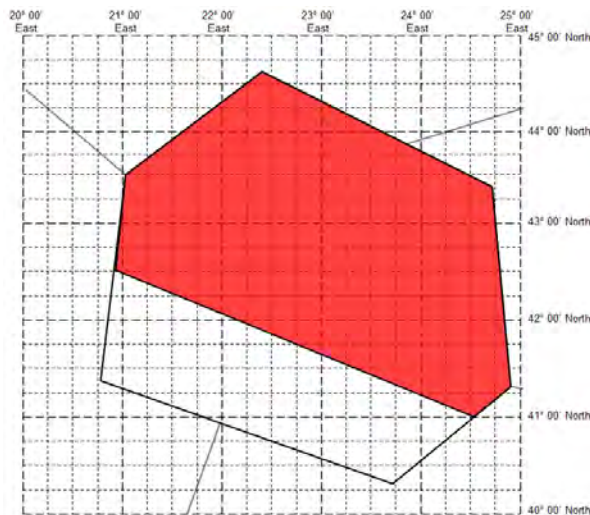


```
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR/UIR SEV TURB FCST WI N4315 E02145 - N4445 E02245 -  
N4330 E02445 - N4200 E02455 - N4230 E02245- N4315 E02145 FL250/370 WKN  
FCST AT 1600Z WI N4300 E02245 - N4415 E02315 - N4322 E02452 - N4155  
E02445 - N4215 E02330- N4300 E02245=
```

**2a) In a sector of the FIR defined relative to a specified line, or single series of up to three connected lines, with start and end points on the FIR boundary (or so close to the FIR boundary so as to leave no doubt that the intent is for the line to connect to the FIR boundary at that point).**

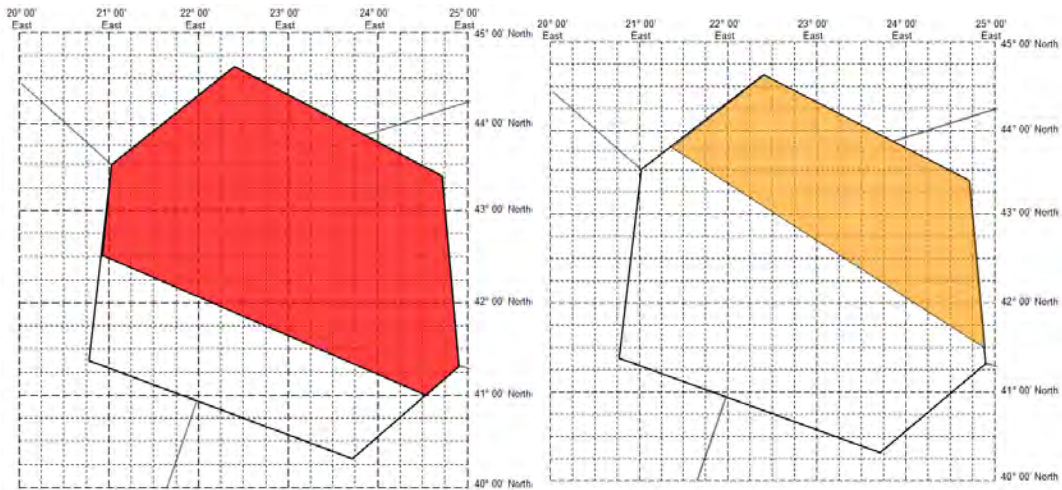
The specified points shall be on the FIR boundary (or so close to the FIR boundary so as to leave no doubt that the intent is for the line to connect to the FIR boundary at that point)

When the SIGMET does not include a 'forecast position' section.



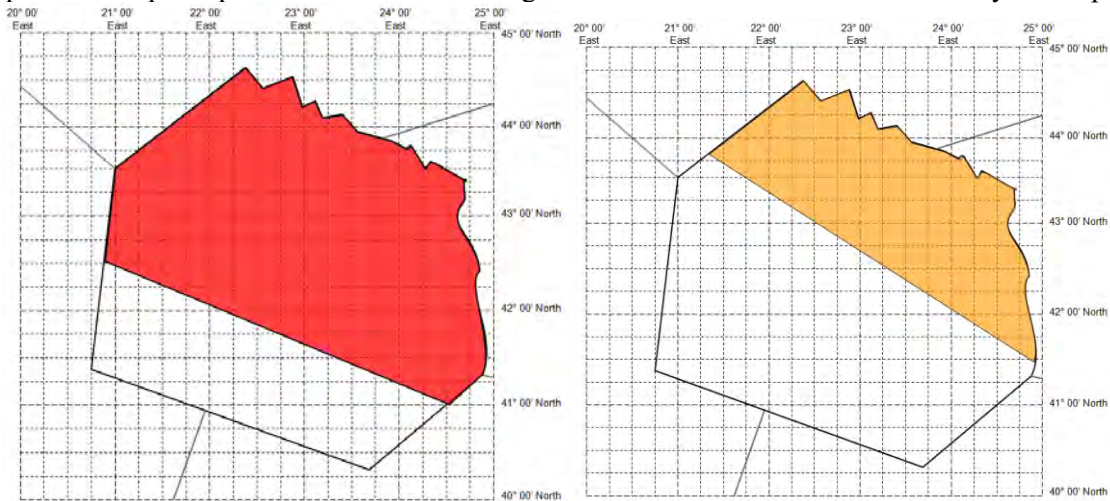
```
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR SEV TURB FCST NE OF LINE N4230 E02052 - N4100 E02430  
FL250/370 MOV NE 15KT WKN=
```

With an explicit forecast position:



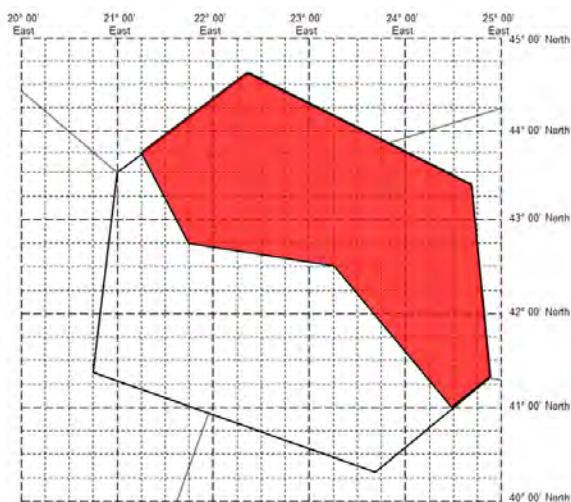
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR SEV TURB FCST NE OF LINE N4230 E02052 - N4100 E02430  
FL250/370 WKN FCST AT 1600Z NE OF LINE N4346 E02122 - N4130 E02452=

A separate example is provided below illustrating a case where the northeastern boundary is complex.



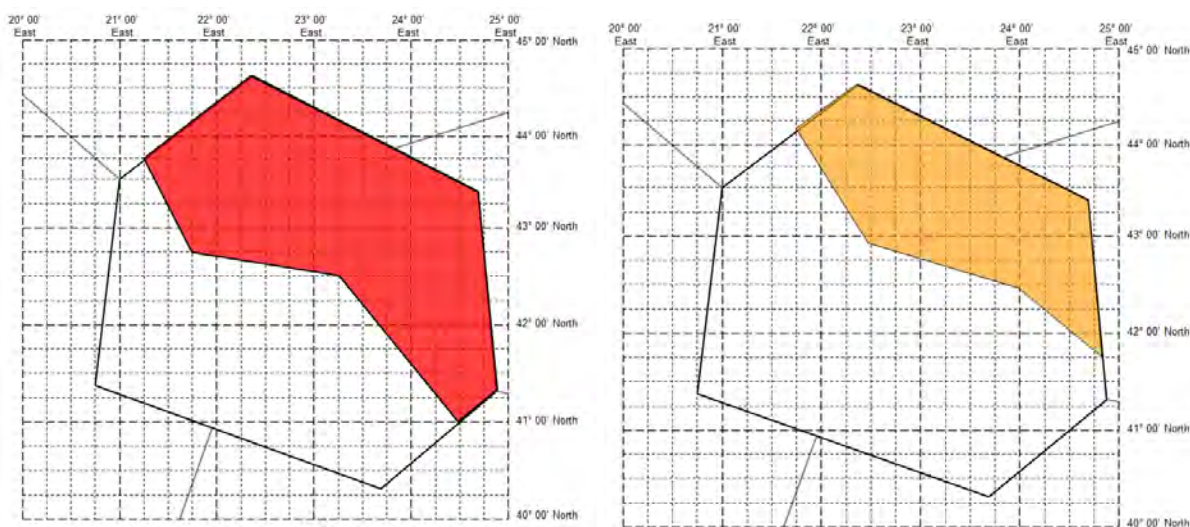
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR SEV TURB FCST NE OF LINE N4230 E02052 - N4100 E02430  
FL250/370 WKN FCST AT 1600Z NE OF LINE N4346 E02122 - N4130 E02457=

For a series of connected lines when the SIGMET does not include a 'forecast position' section.



YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR SEV TURB FCST NE OF LINE N4345 E02115 - N4245 E02145  
- N4230 E02315 - N4100 E02430 FL250/370 MOV NE 20KT WKN=

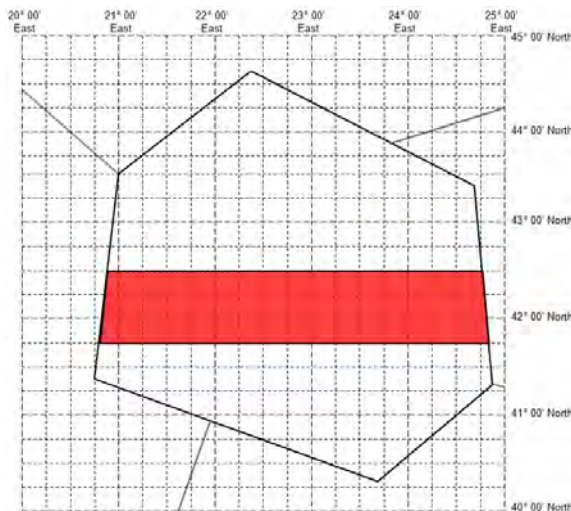
With an explicit forecast position:



YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR SEV TURB FCST NE OF LINE N4345 E02115 - N4245 E02145  
- N4230 E02315 - N4100 E02430 FL250/370 WKN FCST AT 1600Z NE OF LINE  
N4411 E02145 - N4255 E02228 - N4228 E02400 - N4145 E02450=

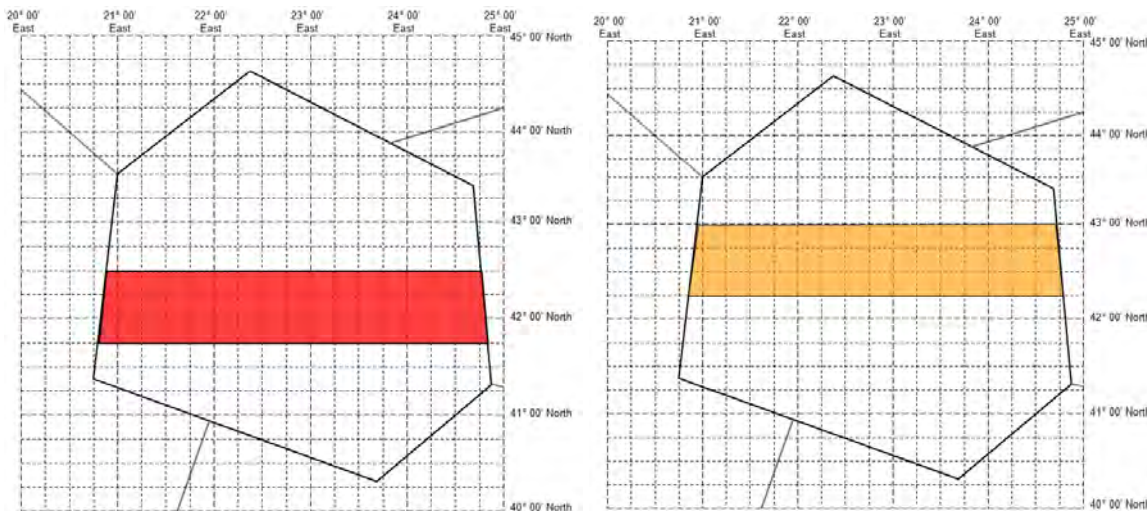
2b) In a sector of the FIR defined as being *between* two lines of latitude, or between two lines of longitude.

When the SIGMET does not include a ‘forecast position’ section.



YUDD SIGMET 2 VALID 101200/101600 YUSO-  
 YUDD SHANLON FIR SEV TURB FCST N OF N4145 AND S OF N4230 FL250/370 MOV  
 N 30KT WKN=

With an explicit forecast position:



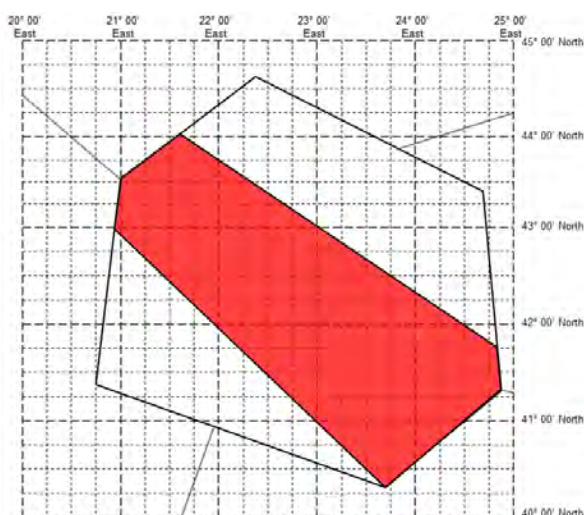
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
 YUDD SHANLON FIR SEV TURB FCST N OF N4145 AND S OF N4230 FL250/370 WKN  
 FCST AT 1600Z N OF N4215 AND S OF N4300=

*(similar constructions can be used for specifying areas between lines of longitude)*

2c) In a sector of the FIR defined as being *between* two specified lines, or *between* two series of up to three connected lines, each with start and endpoints on the FIR boundary (or start and endpoints so close to the FIR boundary so as to leave no doubt that the intent is for the line to connect to the FIR boundary at those points).

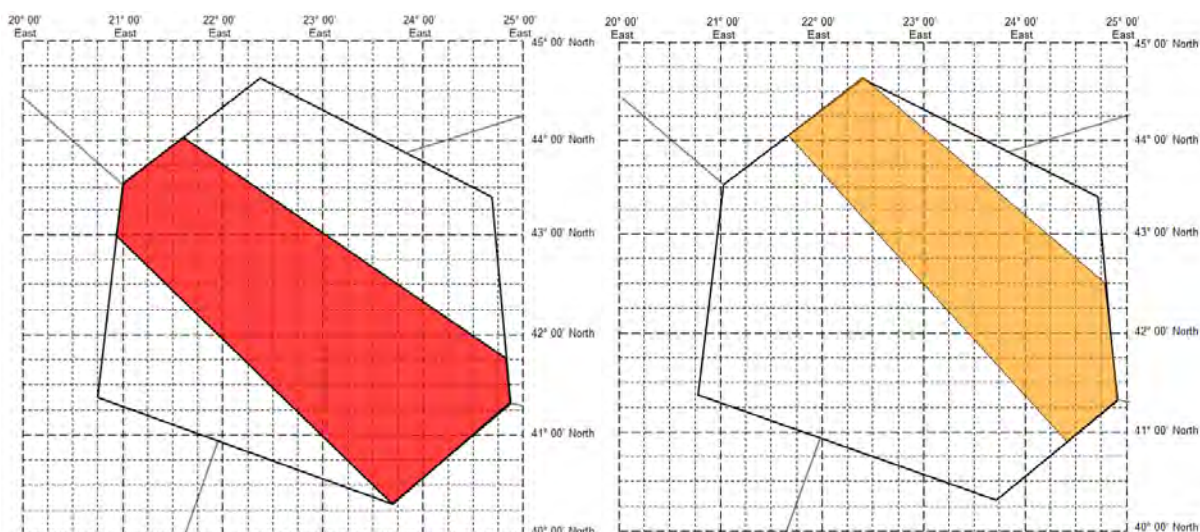
The specified points shall be on the FIR boundary (or so close to the FIR boundary so as to leave no doubt that the intent is for the line to connect to the FIR boundary at that point)

When the SIGMET does not include a ‘forecast position’ section.



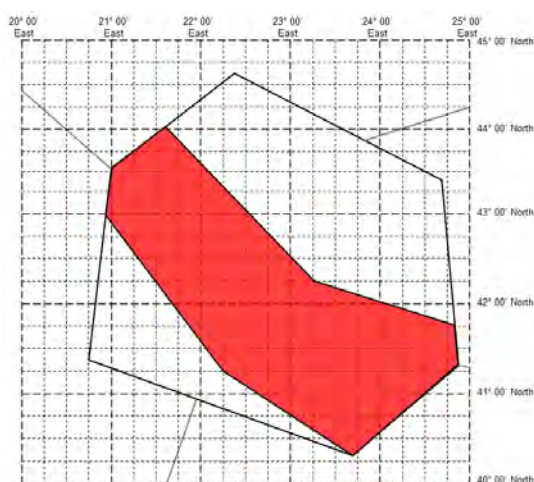
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
 YUDD SHANLON FIR SEV TURB FCST NE OF LINE N4300 E02057 - N4020 E02340  
 AND SW OF LINE N4402 E02142 - N4145 E02450 FL250/370 MOV NE 20KT WKN=

With an explicit forecast position:



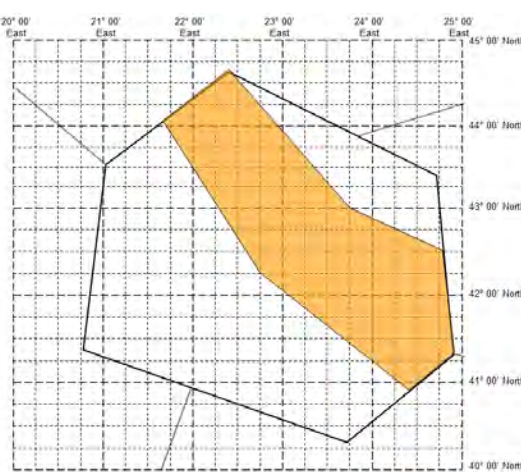
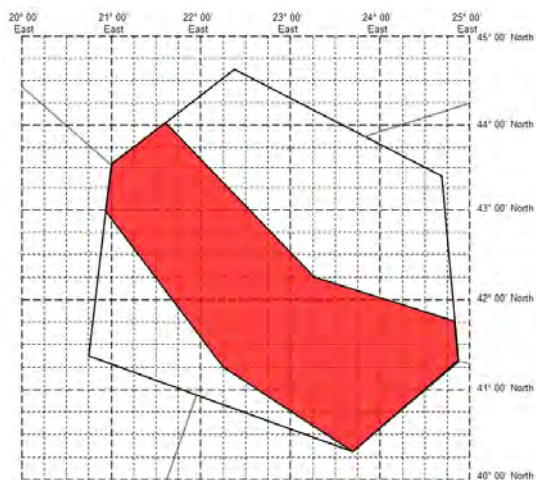
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
 YUDD SHANLON FIR SEV TURB FCST NE OF LINE N4300 E02057 - N4020 E02340  
 AND SW OF LINE N4402 E02142 - N4145 E02450 FL250/370 WKN FCST AT 1600Z  
 NE OF LINE N4403 E02140 - N4055 E02422 AND SW OF LINE N4437 E02222 -  
 N4230 E02447=

For a series of connected lines when the SIGMET does not include a 'forecast position' section.



YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR SEV TURB FCST NE OF LINE N4300 E02057 - N4115 E02215  
- N4020 E02340 AND SW OF LINE N4402 E02137 - N4215 E02315 - N4145  
E02450 FL250/370 MOV NE 20KT WKN=

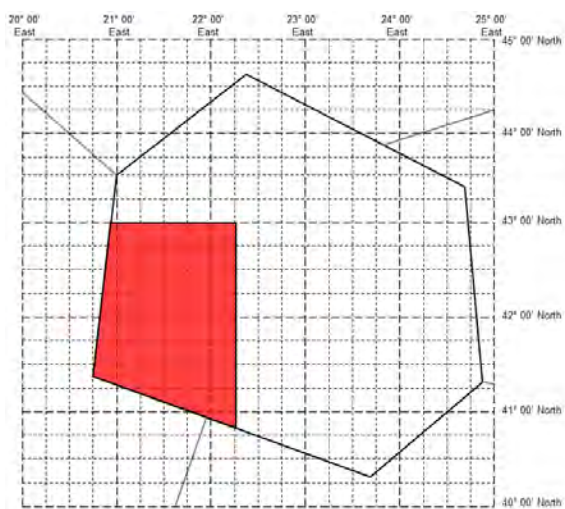
With an explicit forecast position:



YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR SEV TURB FCST NE OF LINE N4300 E02057 - N4115 E02215  
- N4020 E02340 AND SW OF LINE N4402 E02137 - N4215 E02315 - N4145  
E02450 FL250/370 WKN FCST AT 1600Z NE OF LINE N4403 E02140 - N4215  
E02245 - N4055 E02422 AND SW OF LINE N4437 E02222 - N4300 E02345 -  
N4230 E02447=

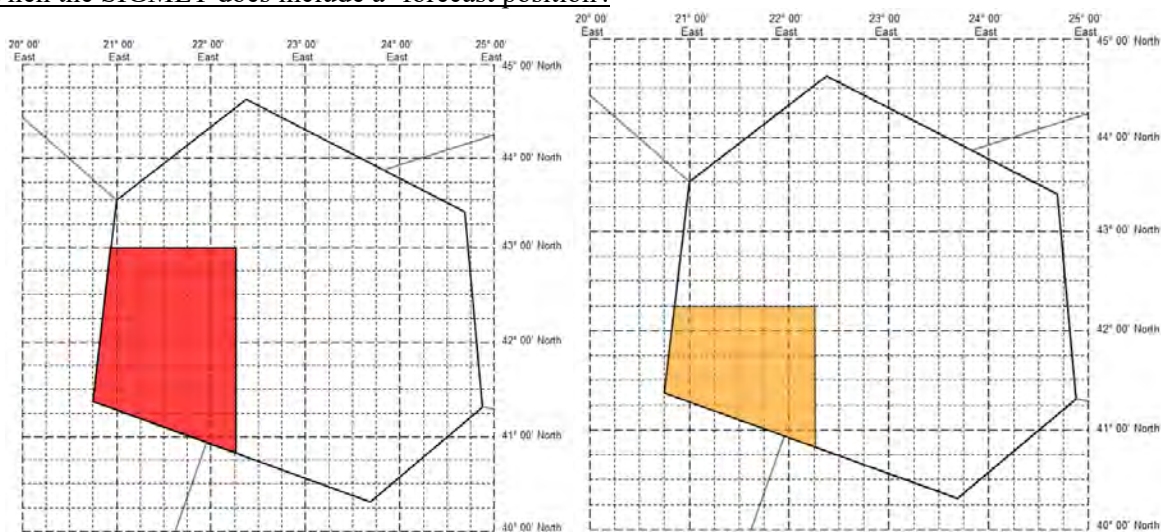
**2d) In a sector of the FIR defined relative to a line of latitude and a line of longitude (effectively a quadrant)**

When the SIGMET does not include a ‘forecast position’ section.



YUDD SIGMET 2 VALID 101200/101600 YUSO-  
 YUDD SHANLON FIR/UIR SEV TURB FCST S OF N4300 AND W OF E02215 FL250/370  
 MOV S 12KT WKN=

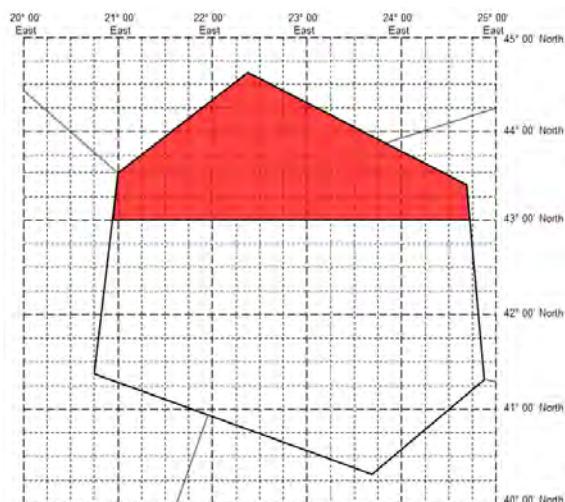
When the SIGMET does include a ‘forecast position’!



YUDD SIGMET 2 VALID 101200/101600 YUSO-  
 YUDD SHANLON FIR/UIR SEV TURB FCST S OF N4300 AND W OF E02215 FL250/370  
 WKN FCST AT 1600Z S OF N4215 AND W OF E02215=

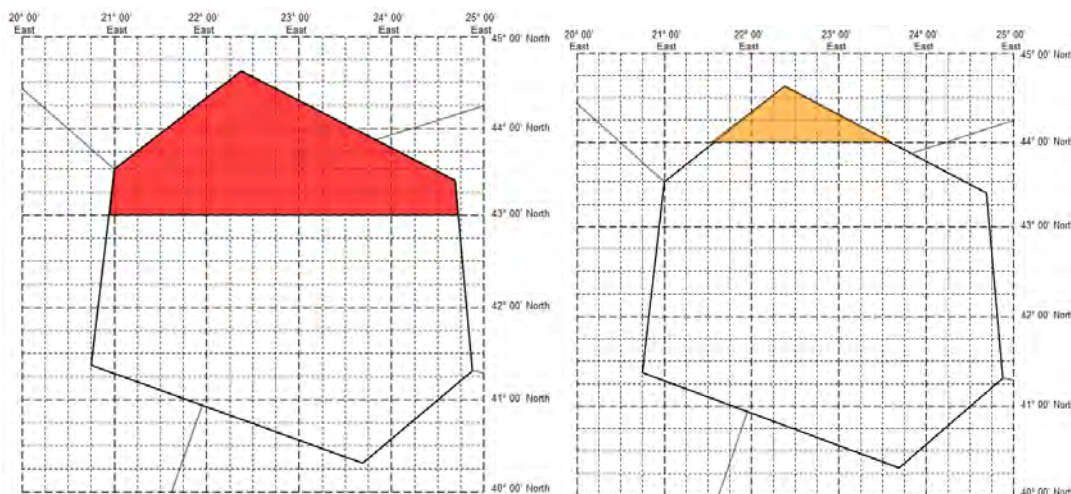
**2e) In a sector of the FIR defined relative to a line of latitude or longitude (effectively a segment)**

When the SIGMET does not include a ‘forecast position’ section.



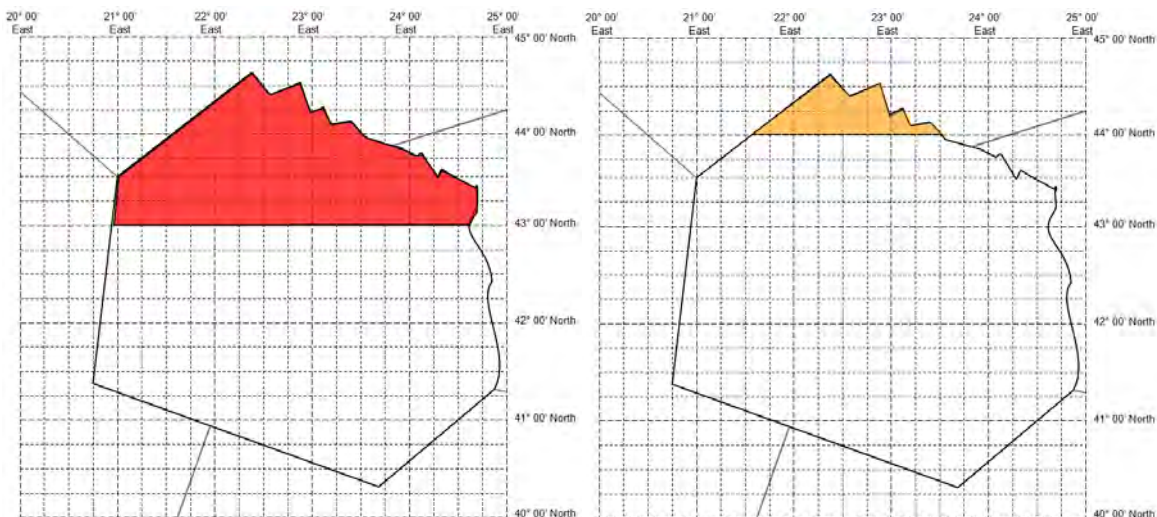
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
 YUDD SHANLON FIR/UIR SEV TURB FCST N OF N43 FL250/370 MOV N 15KT WKN=

When the SIGMET does include a ‘forecast position’ section.



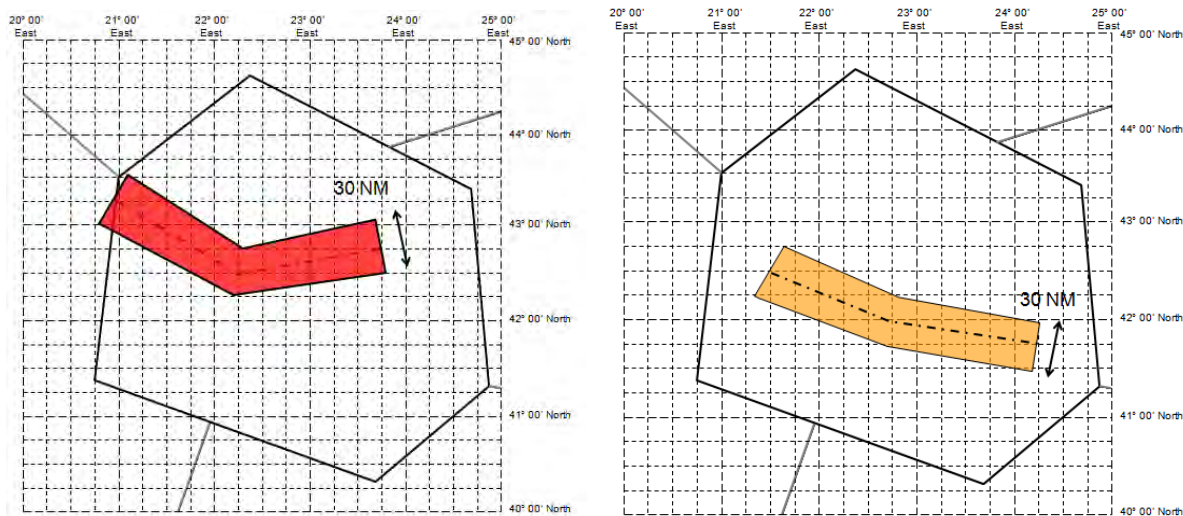
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
 YUDD SHANLON FIR/UIR SEV TURB FCST N OF N43<sup>2</sup> FL250/370 WKN FCST AT  
 1600Z N OF N44=

<sup>2</sup> It would be equally valid to use 'N4300'.



YUDD SIGMET 2 VALID 101200/101600 YUSO-  
 YUDD SHANLON FIR/UIR SEV TURB FCST N OF N43<sup>3</sup> FL250/370 WKN FCST AT  
 1600Z N OF N44=

**3) Defined by a 'corridor' of specified width, centred upon the line described;**



YUDD SIGMET 2 VALID 101200/101600 YUSO-  
 YUDD SHANLON FIR/UIR SEV TURB FCST APRX 30NM WID LINE BTN N4315 E02100  
 - N4230 E02215 - N4245 E02345 FL250/370 WKN FCST AT 1600Z APRX 30NM  
 WID LINE BTN N4230 E02130 - N4200 E02245 - N4145 E02415=

*Note: The nature of this option means that, as at N4315 E02100, it is inferred that there is some encroachment into the neighbouring FIR.*

<sup>3</sup> It would be equally valid to use 'N4300'.

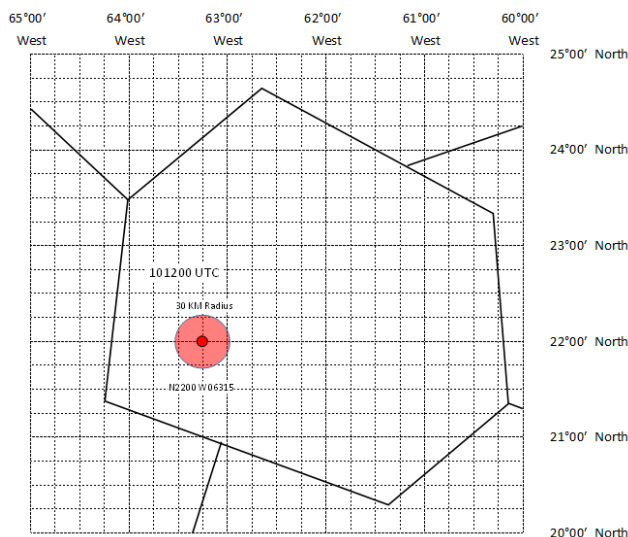
**4) At a specific point within the FIR;**

When the SIGMET does not include a 'forecast position' section.

YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR/UIR SEV TURB OBS N4245 E02230 FL250/370 STNR WKN=

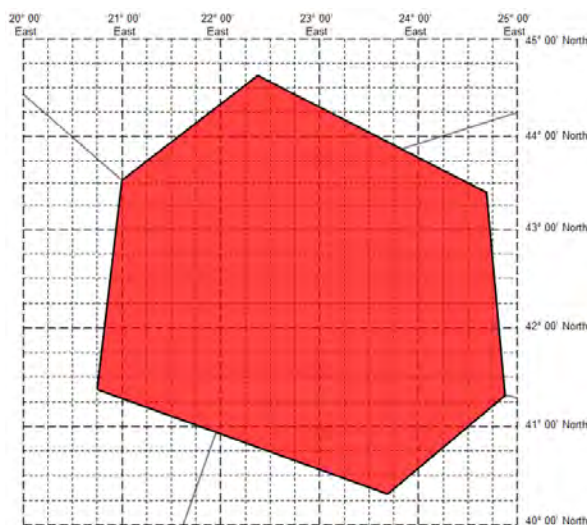
**5) A vertical cylinder of specified radius.**

For SIGMET messages for radioactive cloud, a cylinder of specified radius is used.



YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR/UIR RDOACT CLD OBS AT 1200Z WI 30KM OF N2200 W06315  
SFC/3000FT NC FCST AT 1600Z WI 30KM OF N2200 W06315=

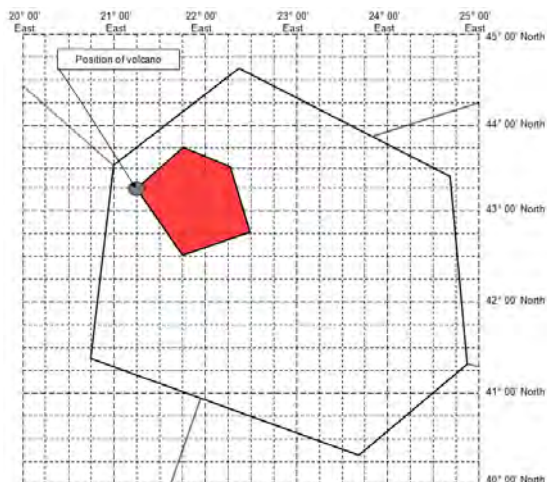
**6) Covering entire FIR.**



YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR/UIR VA CLD FCST AT 1200Z ENTIRE FIR FL250/370 STNR  
WKN=

**7) Additional examples using volcanic ash references applicable to volcanic ash SIGMET only**

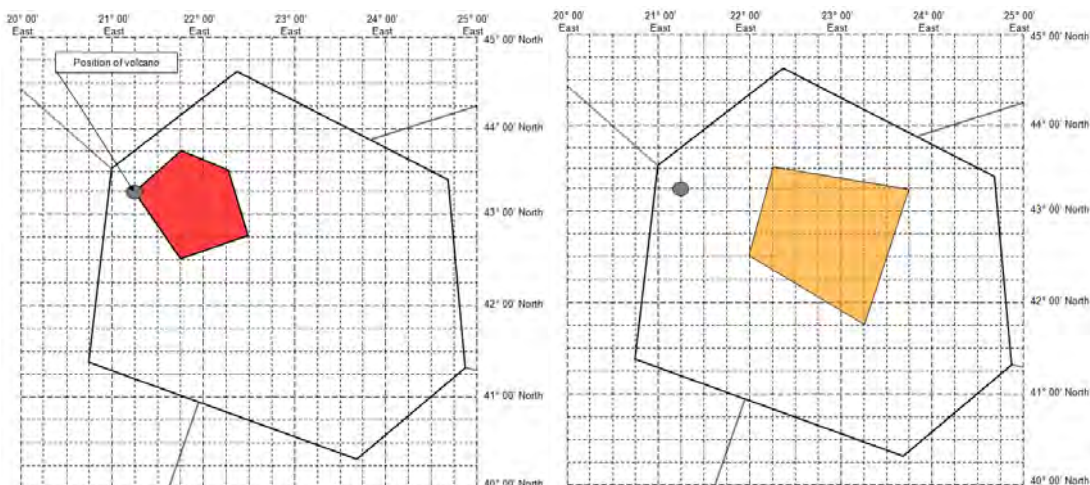
When the VA SIGMET does not include a ‘forecast position’ section.



YUDD SIGMET 2 VALID 101200/101600 YUSO-  
 YUDD SHANLON FIR VA ERUPTION MT ASHVAL PSN N4315 E02115 VA CLD OBS AT  
 1200Z WI N4315 E02115 - N4345 E02145 - N4330 E02215 - N4245 E02230 -  
 N4230 E02145 - N4315 E02115 FL250/370 MOV ESE 20KT NC=

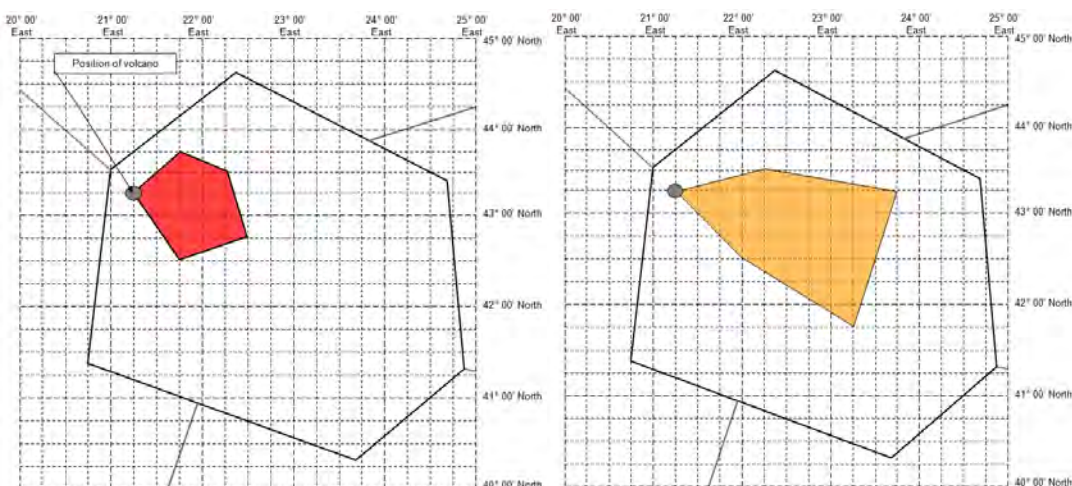
When the SIGMET does include a ‘forecast position’ section (no rate of movement).

For VA (eruption ceased, ash cloud persists downwind):



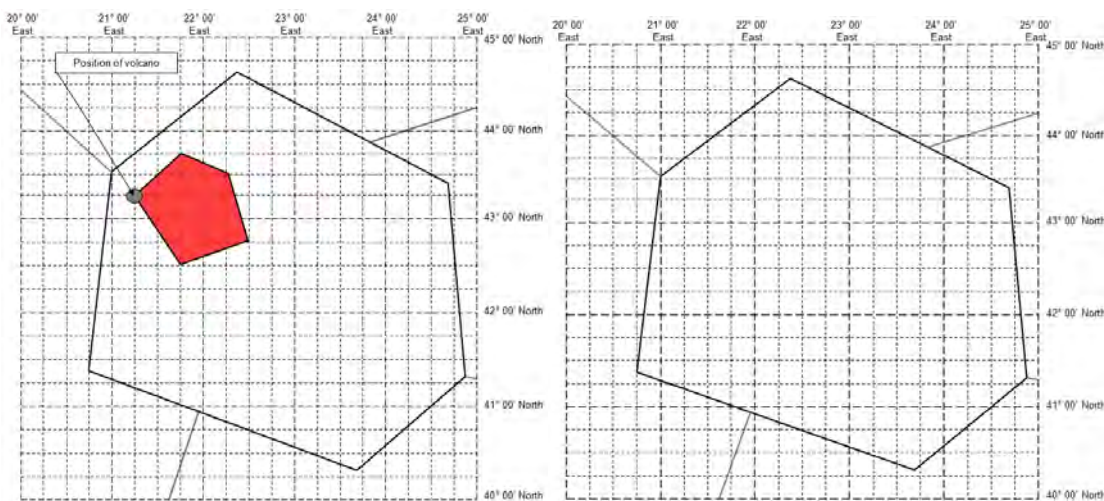
YUDD SIGMET 2 VALID 101200/101800 YUSO-  
 YUDD SHANLON FIR/UIR VA ERUPTION MT ASHVAL PSN N4315 E02115 VA CLD OBS  
 AT 1200Z WI N4315 E02115 - N4345 E02145 - N4330 E02215 - N4245 E02230  
 - N4230 E02145 - N4315 E02115 FL250/370 NC FCST AT 1800Z WI N4330  
 E02215 - N4315 E02345 - N4145 E02315 - N4230 E02200 - N4330 E02215=

For VA (eruption on-going):



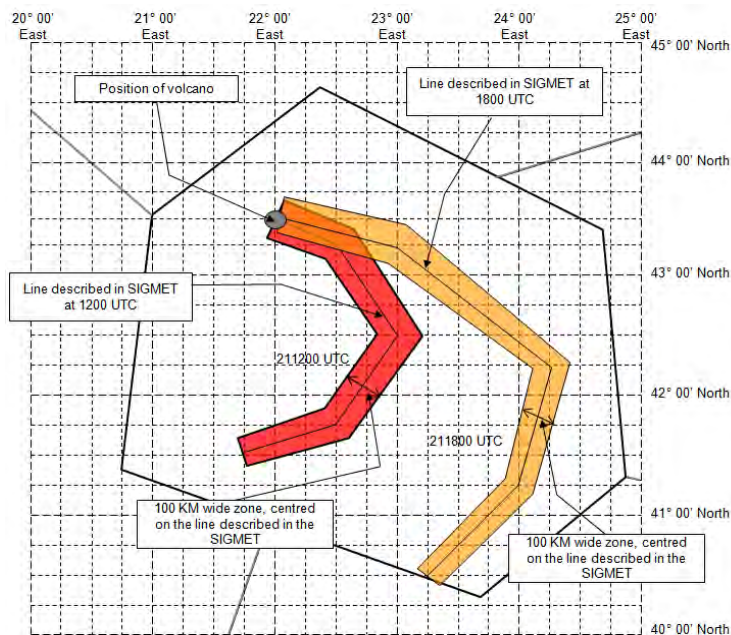
YUDD SIGMET 2 VALID 101200/101800 YUSO-  
 YUDD SHANLON FIR VA ERUPTION MT ASHVAL PSN N4315 E02115 VA CLD OBS AT  
 1200Z WI N4315 E02115 - N4345 E02145 - N4330 E02215 - N4245 E02230 -  
 N4230 E02145 - N4315 E02115 FL250/370 NC FCST AT 1800Z WI N4315 E02115  
 - N4330 E02215 - N4315 E02345 - N4145 E02315 - N4230 E02200 - N4315  
 E02115=

For VA (eruption ceasing, ash dispersing):



YUDD SIGMET 2 VALID 101200/101800 YUSO-  
 YUDD SHANLON FIR VA ERUPTION MT ASHVAL PSN N4315 E02115 VA CLD OBS AT  
 1200Z WI N4315 E02115 - N4345 E02145 - N4330 E02215 - N4245 E02230 -  
 N4230 E02145 - N4315 E02115 FL250/370 WKN FCST AT 1800Z NO VA EXP=

For VA (eruption on-going), defining the area affected as a corridor of specified width;

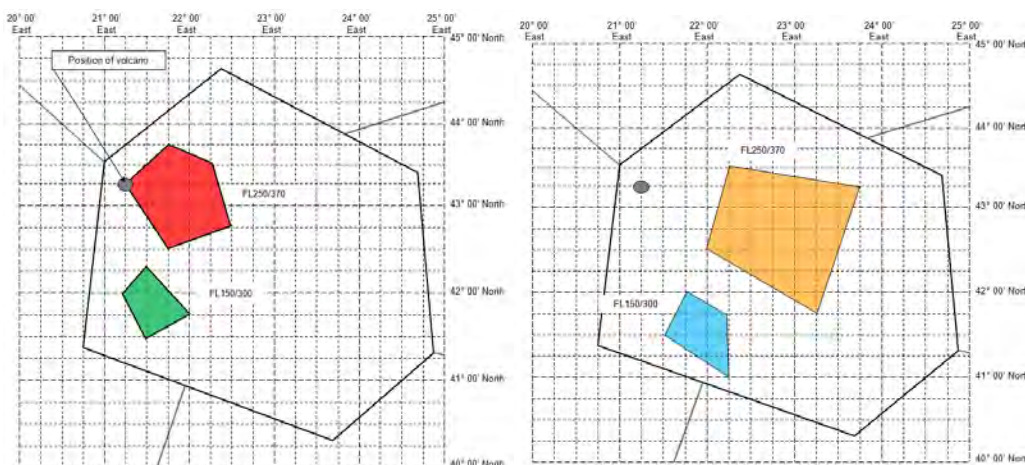


YUDD SIGMET 2 VALID 211200/211800 YUSO-  
 YUDD SHANLON FIR/UIR VA ERUPTION MT ASHVAL PSN N4330 E02200 VA CLD  
 FCST AT 1200Z APRX 100KM WID LINE BTN N4330 E02200 - N4315 E02230 -  
 N4230 E02300 - N4145 E02230 - N4130 E02145 FL310/450 NC FCST AT 1800Z  
 APRX 100KM WID LINE BTN N4330 E02200 - N4315 E02300 - N4215 E02415 -  
 N4115 E02400 - N4030 E02315=

**8) Additional examples using volcanic ash references applicable to multiple areas in SIGMET for volcanic ash.**

The only way to include a second instance of a volcanic ash cloud in a SIGMET message is to use the 'AND' option after the 'Forecast position' section.

In the example below, two areas of volcanic ash cloud (at different levels) are forecast to move as described. The normal courier font refers to the northernmost areas of ash, and the italicised font refers to the southernmost areas of ash during the period. 'AND' is highlighted in **bold** to identify the separation of the two features.

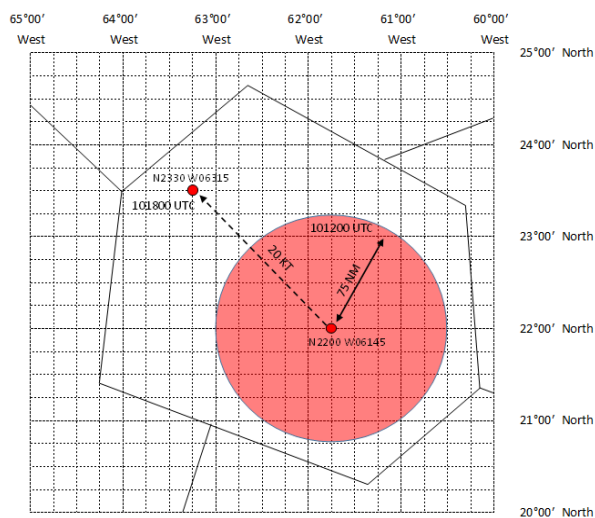


```
YUDD SIGMET 2 VALID 101200/101800 YUSO-
YUDD SHANLON FIR VA ERUPTION MT ASHVAL PSN N4315 E02115 VA CLD OBS AT
1200Z WI N4315 E02115 - N4345 E02145 - N4330 E02215 - N4245 E02230 -
N4230 E02145 - N4315 E02115 FL250/370 NC FCST AT 1800Z WI N4330 E02215
- N4315 E02345 - N4145 E02315 - N4230 E02200 - N4330 E02215 AND OBS AT
1200Z WI N4200 E02115 - N4217 E02130 - N4145 E02200 - N4130 E02130 -
N4200 E02115 FL150/300 NC FCST AT 1800Z WI N4200 E02145 - N4145 E02215
- N4100 E02215 - N4130 E02130 - N4200 E02145=
```

The above only works if there are two instances of ash at the start and end of the period. If the number of ash areas is different at the start and end, it is recommended that separate SIGMETs be issued as necessary.

**9) Additional example illustrating use of "WI nnnKM (or nnnNM) OF TC CENTRE " in Tropical Cyclone SIGMET only**

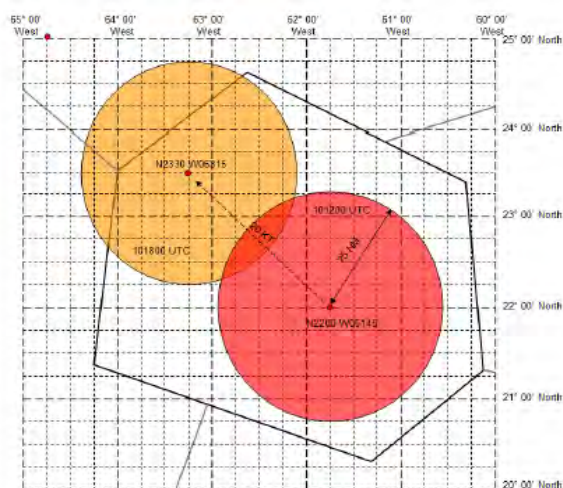
When the SIGMET does not include a 'forecast position' section.



YUDD SIGMET 2 VALID 101200/101800 YUSO-  
 YUDD SHANLON FIR TC GLORIA PSN N2200 W06145 CB OBS AT 1200Z WI 075NM  
 OF TC CENTRE TOP BLW FL500 MOV NW 20KT WKN=

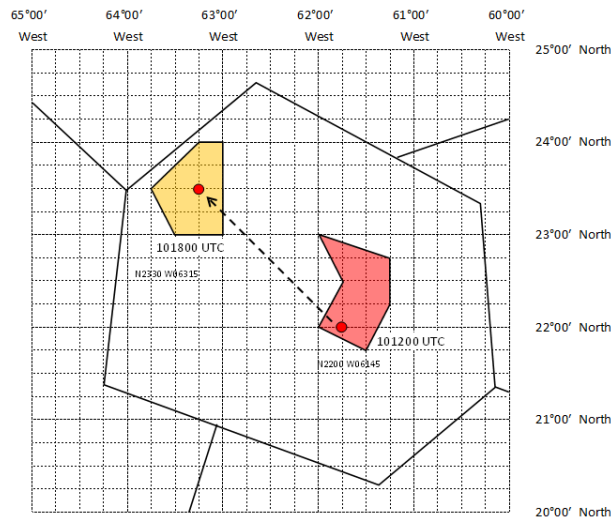
YUDD SIGMET 2 VALID 101200/101800 YUSO-  
 YUDD SHANLON FIR TC GLORIA PSN N2200 W06145 CB OBS AT 1200Z WI 075NM  
 OF TC CENTRE TOP BLW FL500 WKN FCST AT 1800Z TC CENTRE PSN N2330  
 W06315=

When the SIGMET does include 'TC forecast position' and 'Forecast position' sections.



YUDD SIGMET 2 VALID 101200/101800 YUSO-  
 YUDD SHANLON FIR TC GLORIA PSN N2200 W06145 CB OBS AT 1200Z WI 075NM  
 OF TC CENTRE TOP BLW FL500 WKN FCST AT 1800Z TC CENTRE PSN N2330 W06315  
 CB WI 075NM OF TC CENTRE=

It is acceptable to use the other 'Location' options to describe the area affected by the CB of a Tropical Cyclone:



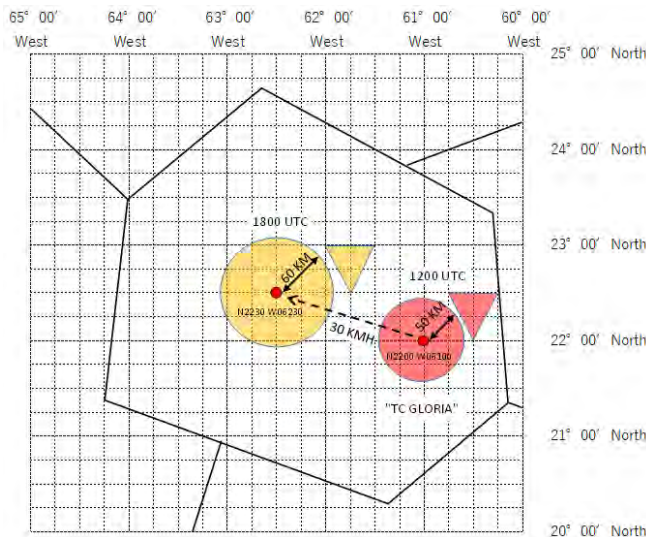
```
YUDD SIGMET 2 VALID 101200/101800 YUSO-
YUDD SHANLON FIR TC GLORIA PSN N2200 W06145 CB OBS AT 1200Z WI N2200
W06200 - N2230 W06145 - N2300 W06200 - N2245 W06115 - N2215 W06115 -
N2145 W06130 - N2200 W06200 TOP BLW FL500 WKN FCST AT 1800Z TC CENTRE
PSN N2330 W06315 CB WI N2300 W06300 - N2400 W06300 - N2400 W06315 -
N2330 W06345 - N2300 W06330 - N2300 W06300=
```

**10) Additional example with multiple CB areas in SIGMET for tropical cyclone.**

The only way to include a second instance of a tropical cyclone in a SIGMET is to use the 'AND' option after the 'Forecast position' section.

In the example below, two areas of CB cloud associated with a TC can be described. The normal courier font refers to the CB within a specified radius of a TC, and the italicised font refers to the northeast CB areas of a TC. 'AND' is highlighted in **bold** to identify the separation of the two features.

*Note 1: If the number of cumulonimbus areas is different at the start and end, separate SIGMETs can be issued as necessary. For example, one SIGMET for the tropical cyclone and a separate SIGMET for the frequent or embedded cumulonimbus cloud.*



When the WC SIGMET does include a 'TC forecast position' section and 'forecast position' sections of both of two CB areas.

YUDD SIGMET 3 VALID 251230/251830 YUSO-  
YUDD SHANLON FIR TC GLORIA PSN N22 W061 CB OBS AT 1200Z WI 050KM OF TC  
CENTRE TOP FL500 INTSF FCST AT 1800Z TC CENTRE PSN N2230 W06230 CB WI  
060KM OF TC CENTRE **AND** OBS AT 1220Z WI N2230 W06045 - N2230 W06015 -  
N2200 W06030 - N2230 W06045 TOP ABV FL500 FCST AT 1800Z WI N2300 W06200  
- N2300 W06130 - N2230 W06145 - N2300 W06200=

For the above case, referring to Note 1 of this section, an alternative is to use WS SIGMET to describe the CB. An example of pairing use of WS with WC SIGMET below:

YUDD SIGMET 3 VALID 251230/251830 YUSO-  
YUDD SHANLON FIR TC GLORIA PSN N22 W061 CB OBS AT 1200Z WI 050KM OF TC  
CENTRE TOP FL500 INTSF FCST AT 1800Z TC CENTRE PSN N2230 W06300 CB WI  
060KM OF TC CENTRE=

YUDD SIGMET 4 VALID 251230/251600 YUSO-  
YUDD SHANLON FIR EMBD TS OBS AT 1220Z WI N2230 W06045 - N2230 W06015  
- N2200 W06030 - N2230 W06045 TOP ABV FL500 **FCST AT 1600Z** WI N2245  
W06130 - N2245 W06120 - N2230 W06125 - N2245 W06130=

When the WC SIGMET does not include a 'TC forecast position' section and 'forecast position' sections of both of two CB areas.

Although a second instance of a CB cloud is to use the 'AND' option after the 'Forecast position' section, 'Forecast position' is omitted.

YUDD SIGMET 3 VALID 251230/251830 YUSO-  
YUDD SHANLON FIR TC GLORIA PSN N22 W061 CB OBS AT 1200Z WI 050KM OF TC  
CENTRE TOP FL500 MOV WNW 30KMH INTSF **AND** OBS AT 1220Z WI N2230 W06045  
- N2230 W06015 - N2200 W06030 - N2230 W06045 TOP ABV FL500=

When the WC SIGMET does not include a 'TC forecast position' section and 'forecast position' section of the first instance of CB area but include a 'forecast position' section of the second instance of CB area.

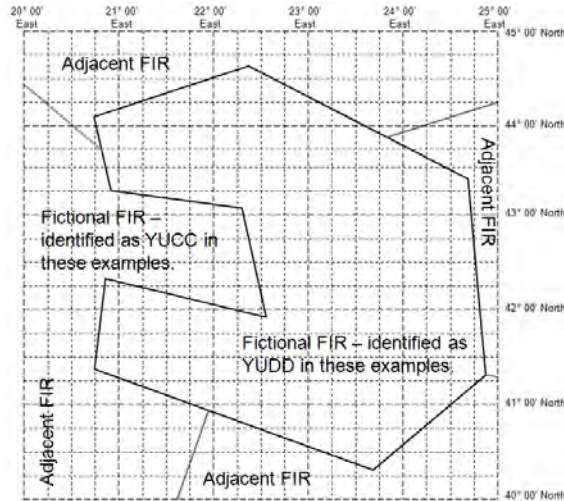
YUDD SHANLON SIGMET 3 VALID 251230/251830 YUSO-  
YUDD SHANLON FIR TC GLORIA PSN N22 W061 CB OBS AT 1200Z WI 050KM OF TC  
CENTRE TOP FL500 MOV WNW 30KMH INTSF **AND** OBS AT 1220Z WI N2230 W06045  
- N2230 W06015 - N2200 W06030 - N2230 W06045 TOP ABV FL500 FCST AT  
1800Z WI N2300 W06200 - N2300 W06130 - N2230 W06145 - N2300 W06200=

*Note 2: In the case that 'forecast position' is available, including 'forecast position' is recommended instead of 'movement'.*

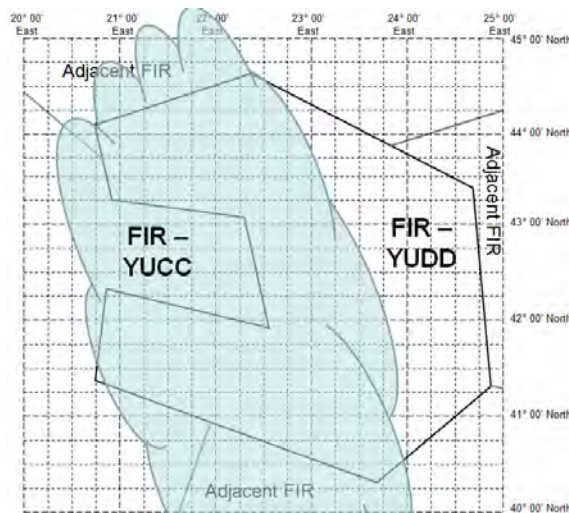
## 11) Additional examples of SIGMETs relating to ‘concave’ or ‘horseshoe’ shaped FIR’s

There are examples of FIRs that partially surround adjacent FIRs and are what might be described as concave or 'horseshoe' shaped. An example is given below.

a) Considering a concave, ‘horseshoe’ shaped FIR partially surrounding another FIR with ‘legs’ of similar different size



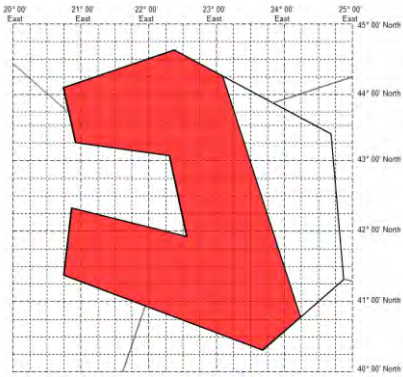
The question arises as to how to encode a SIGMET under circumstances where the hazard affects the outer FIR (YUDD in this case) and the FIR that is partially enclosed (YUCC in this case).



With due regard to removing any possible ambiguity, and also with regard to consistency with protocols for IWXXM versions of SIGMET, the following best practice is provided.

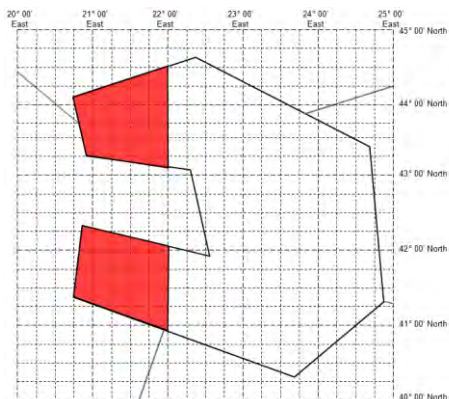
In the examples below, the area indicated in red is taken as representing the meteorological hazard.

Example 1) In this example, it is considered that the situation below could be encoded as a single, simple SIGMET. Users would be expected to interpret the SIGMET as indicating the area identified in red was affected by the hazard within the YUDD FIR.



YUDD SIGMET 2 VALID 101200/101600 YUSO–  
YUDD SHANLON FIR/UIR SEV TURB FCST SW OF LINE N4415 E02305 – N4045 E02415  
FL250/370 MOV SW 15KT WKN=

Example 2) In this example, in order to prevent any possible ambiguity and to prevent complications and inconsistencies with equivalent IWXXM versions of SIGMET then two separate SIGMETs should be issued.



In this case, the following is recommended:

One SIGMET (northern extension of the 'horseshoe' shape)

YUDD SIGMET 2 VALID 101200/101600 YUSO-

YUDD SHANLON FIR/UIR SEV TURB FCST W OF LINE N4430 E02200 – N4307 E02200

FL250/370 MOV W 15KT WKN=

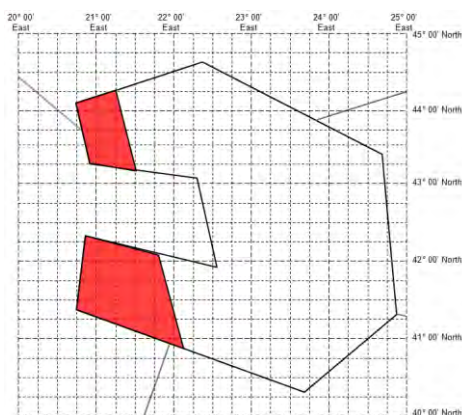
AND a second SIGMET (southern extension of the 'horseshoe' shape)

YUDD SIGMET 3 VALID 101200/101600 YUSO-

YUDD SHANLON FIR/UIR SEV TURB FCST W OF LINE N4203 E02200 – N4058 E02200

FL250/370 MOV W 15KT WKN=

Where the line delineating the hazard is not a line of latitude or longitude, a similar process should be followed



One SIGMET (northern extension of the 'horseshoe' shape)

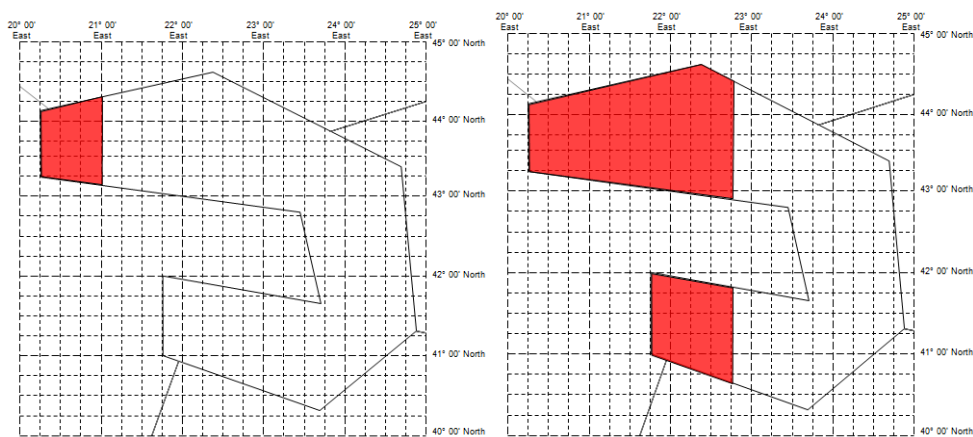
YUDD SIGMET 2 VALID 101200/101600 YUSO–  
YUDD SHANLON FIR/UIR SEV TURB FCST SW OF LINE N4415 E02115 – N4312 E02130  
FL250/370 MOV W 15KT WKN=

AND a second SIGMET (southern extension of the 'horseshoe' shape)

YUDD SIGMET 3 VALID 101200/101600 YUSO–  
YUDD SHANLON FIR/UIR SEV TURB FCST SW OF LINE N4205 E02147 – N4052 E02206  
FL250/370 MOV W 15KT WKN=

b) Considering a concave, 'horseshoe' shaped FIR partially surrounding another FIR with 'legs' of very different size.

If the southern 'leg' is expected to be affected during the forecasted validity period, as the example below then 2 SIGMETs should be issued.



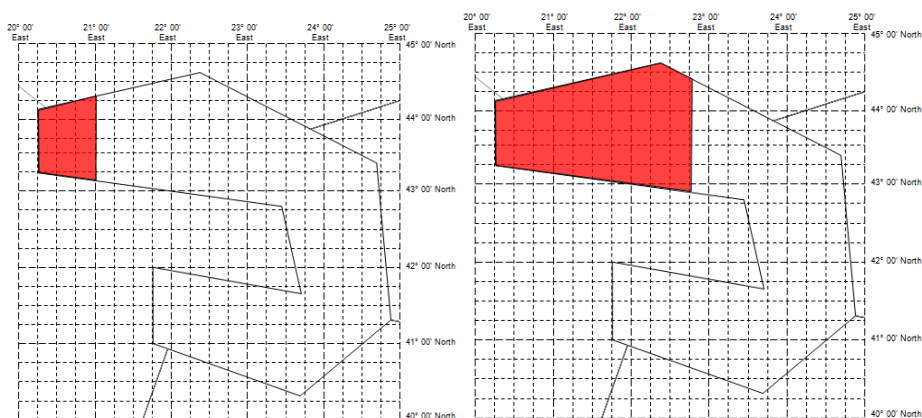
YUDD SIGMET 2 VALID 101200/101600 YUSO–  
YUDD SHANLON FIR/UIR SEV TURB FCST AT 1200Z W OF LINE N4416 E02100 – N4307  
E02100 FL250/370 WKN FCST AT 1600Z W OF LINE N4427 E02245 – N4252 E02245=

**AND** a second SIGMET

YUDD SIGMET 3 VALID 101330/101600 YUSO–  
YUDD SHANLON FIR/UIR SEV TURB FCST AT 1330Z W OF LINE N4200 E02145 – N4100  
E02145 FL250/370 WKN FCST AT 1600Z W OF LINE N4147 E02245 – N4038 E02245=

Note, the validity time (highlighted) of the second SIGMET commences sometime after that of the first since the southern extension of the horseshoe shape is not as far west.

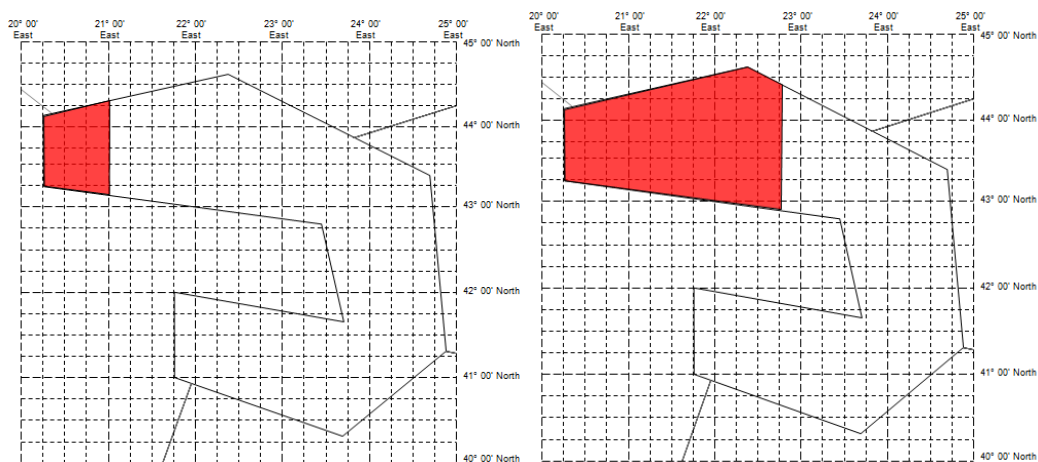
If the southern leg of the FIR is not expected to be affected, as in the example below,



Then a single SIGMET could be issued.

YUDD SIGMET 2 VALID 101200/101600 YUSO–  
 YUDD SHANLON FIR/UIR SEV TURB FCST AT 1200Z W OF LINE N4415 E02100 – N4307  
 E02100 FL250/370 MOV E 25KT WKN=

However, to remove any possible doubt it is better to include an explicit forecast position,



YUDD SIGMET 2 VALID 101200/101600 YUSO–  
 YUDD SHANLON FIR/UIR SEV TURB FCST AT 1200Z W OF LINE N4415 E02100 – N4307  
 E02100 FL250/370 WKN FCST AT 1600Z W OF LINE N4427 E02245 – N4252 E02245=

It should also be noted that in all of these examples relating to concave, horseshoe shaped FIRs, polygons could also be used to explicitly define the areas affected. The above examples are intended to show that the principle under such circumstances is that two SIGMETs should be issued. This, as noted, will prevent ambiguity and will permit straightforward translation of alphanumeric SIGMET into IWXXM versions of SIGMET.

## 12) Examples of Test and Exercise SIGMET indicators.

The principles of using the Test or Exercise indicators are straightforward.

The fundamental and overriding principle is that SIGMET bulletins with the Test or Exercise indicators MUST NOT be used for operational decision making.

When using Test indicator, depending on the circumstances, the SIGMET may be truncated immediately after the word TEST, and this approach may be useful when simply testing routing of messages.

Alternatively, and again depending on the circumstances, realistic (although not necessarily valid) data may be included.

When using the Exercise indicator, it is expected that the SIGMET will contain realistic although not necessarily valid data. This will permit exercises at national or regional level to be undertaken.

In all instances, by including the TEST or EXER at a specified point in the SIGMET message, users and systems can immediately identify if the message should be used for operational decision making.

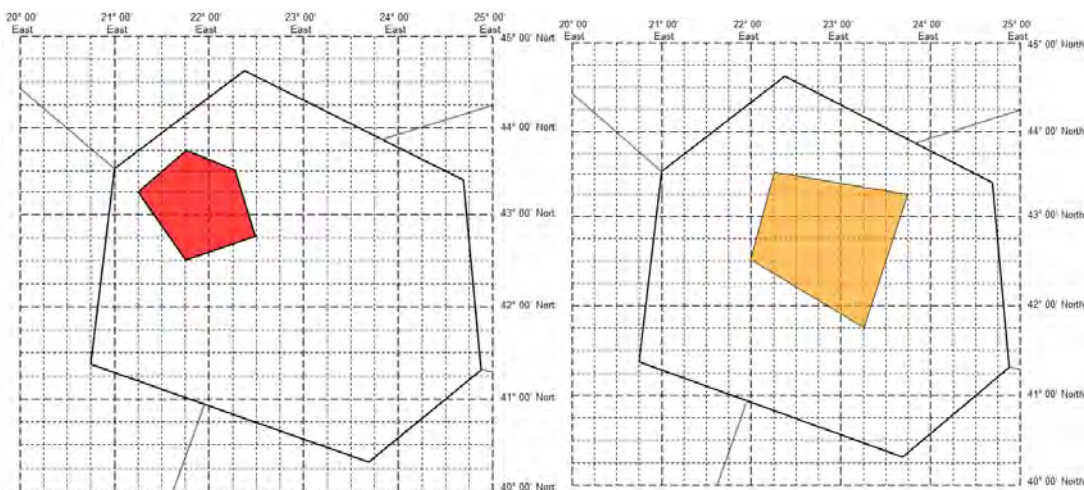
**THIS DOES NOT REMOVE THE REQUIREMENT FOR ALL STAKEHOLDERS TO APPLY APPROPRIATE RIGOUR AND QUALITY CONTROL WITH REGARD TO CORRECT IDENTIFICATION AT ORIGINATION AND CORRECT USE ON RECEIPT/PROCESSING**

### Test SIGMET message, with minimum content:

The example below may be used for ad hoc testing of routing, or for regional SIGMET routing tests.

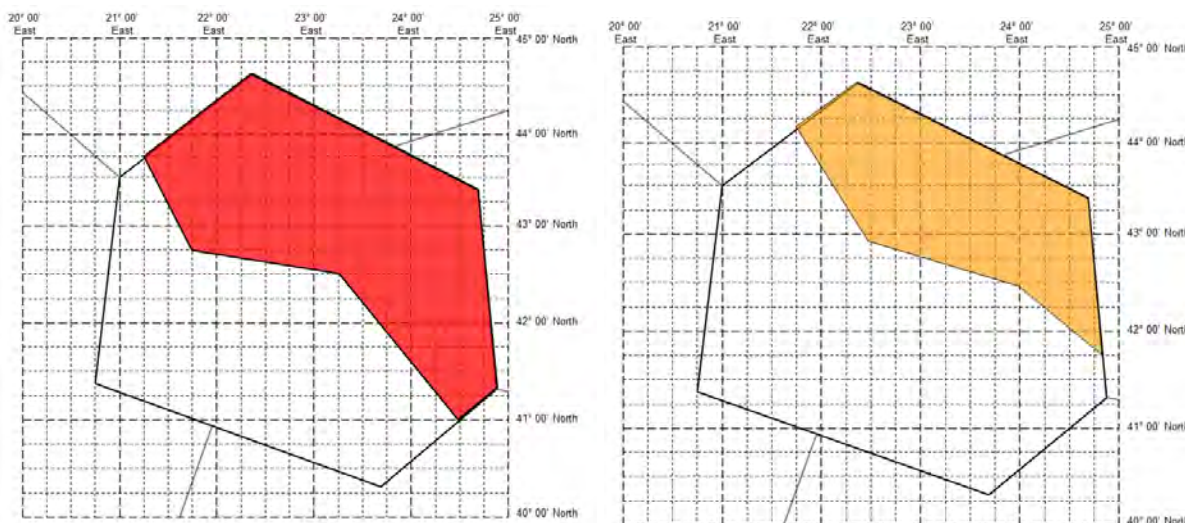
```
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR/UIR TEST=
```

### Test SIGMET message, with realistic (though not necessarily valid) content:



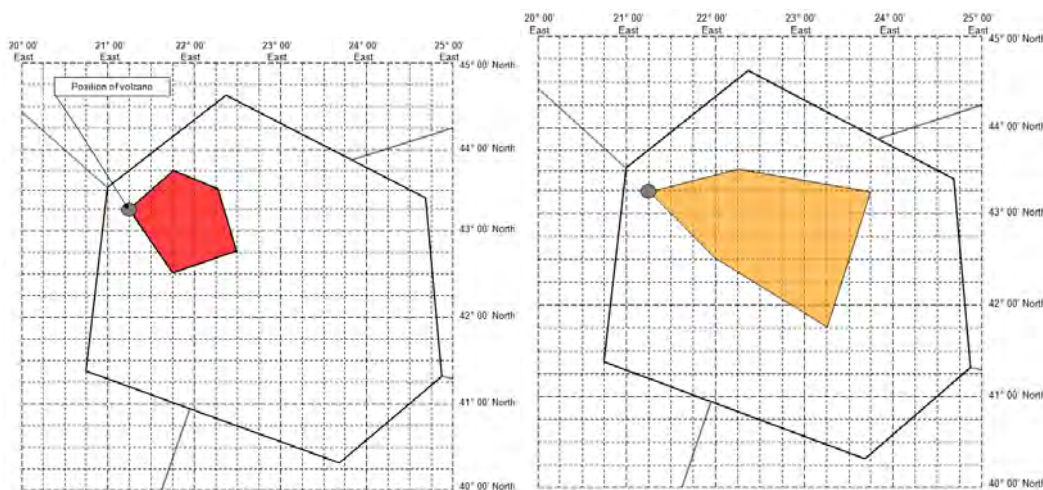
```
YUDD SIGMET 2 VALID 101200/101600 YUSO-  
YUDD SHANLON FIR/UIR TEST SEV TURB FCST WI N4230 E02145 - N4315 E02115  
- N4345 E02145 - N4330 E02215 - N4245 E02230 - N4230 E02145 FL250/370  
INTSF FCST AT 1600Z WI N4145 E02315 - N4230 E02200 - N4330 E02215 -  
N4315 E02345 - N4145 E02315=
```

**Exercise SIGMET message, with realistic (though not necessarily valid) content:**



YUDD SIGMET 2 VALID 101200/101600 YUSO-  
 YUDD SHANLON FIR **EXER** SEV TURB FCST NE OF LINE N4345 E02115 - N4245  
 E02145 - N4230 E02315 - N4100 E02430 FL250/370 WKN FCST AT 1600Z NE OF  
 LINE N4411 E02145 - N4255 E02228 - N4228 E02400 - N4130 E02450=

The most common, organised Exercise – especially at regional level – is likely to be related to volcanic ash. On such occasions, 'historical' data is used in order to practice procedures over specific areas.



YUDD SIGMET 2 VALID 101200/101800 YUSO -  
 YUDD SHANLON FIR **EXER** VA ERUPTION MT ASHVAL PSN N4315 E02115 VA CLD  
 OBS AT 1200Z WI N4315 E02115 - N4345 E02145 - N4330 E02215 - N4245  
 E02230 - N4230 E02145 - N4315 E02115 FL250/370 NC FCST AT 1800Z WI  
 N4315 E02115 - N4330 E02215 - N4315 E02345 - N4145 E02315 - N4230  
 E02200 - N4315 E02115=

# APPENDIX C

## SIGMET TEST PROCEDURES

*Note: While care is taken to ensure these instructions are correct, the instructions are for illustration only and may not be up to date. When participating in the annual SIGMET test, please follow the instructions supplied by ICAO specifically for that year's test.*

### 1. INTRODUCTION

1.1. The Meteorology Divisional Meeting (2002) formulated Recommendation 1/12 b), *Implementation of SIGMET requirements*, which called, *inter alia*, for the relevant planning and implementation regional groups (PIRGs) to conduct periodic tests of the issuance and reception of SIGMET messages, especially those for volcanic ash.

1.2. This document describes the procedures for conducting regional SIGMET tests. The test procedures encompass all the three types of SIGMET messages, as follows:

- SIGMET messages for tropical cyclone (WC SIGMET);
- SIGMET messages for volcanic ash (WV SIGMET); and
- SIGMET messages for weather and other phenomena apart from tropical cyclone and volcanic ash (WS SIGMET).

1.3. The requirements for dissemination of SIGMET messages are specified in Annex 3 to the Convention on International Civil Aviation - *Meteorological Service for International Air Navigation*, Appendix 6, para. 1.2, and in this Guide, Section 3, para. 3.6 – 3.6.4.

1.4. SIGMET messages for tropical cyclone and volcanic ash cloud will be referred to hereafter as **WC** SIGMET (due to the **T<sub>1</sub>T<sub>2</sub>** section of the WMO AHL being set to **WC**) and **WV** SIGMET (due to the **T<sub>1</sub>T<sub>2</sub>** section of the WMO AHL being set to **WV**), respectively. All other types of SIGMET messages will be referred to as **WS** SIGMET (due to the **T<sub>1</sub>T<sub>2</sub>** section of the WMO AHL being set to **WS**).

### 2. PURPOSE AND SCOPE OF REGIONAL SIGMET TESTS

2.1. The purpose of the regional SIGMET tests is to check the awareness of participating MWOs of the ICAO requirements for the issuance of SIGMET messages and the compliance of the States' procedures for preparation and dissemination of SIGMET messages with the relevant ICAO Standards and Recommended Practices (SARPs) and regional procedures.

2.2. An MWO is at liberty to issue SIGMET *test* messages for local reasons (e.g., testing of local systems/routing etc.). It is recommended that MWO's consider issuing SIGMET test messages following upgrades to operational SIGMET or dissemination systems. Whilst such tests may not involve other MWOs or agencies directly, it is recommended that the general principles of this Guide be followed with regard to local, ad hoc testing.

2.3. For the purposes of this document, hereafter, references to 'SIGMET tests' or 'tests' should be understood to refer to regional SIGMET tests.

2.4. The scope of the tests is to check also the interaction (where appropriate, depending on regional requirements) between the tropical cyclone/volcanic ash advisory centres (TCACs/VAACs) and the MWOs located within the TCACs/VAACs' respective areas of responsibility. Therefore, where the issuance of **WC** and **WV** SIGMET messages is being tested, the SIGMET *test* messages initiated by the

MWOs should normally be triggered by an advisory *test* message, issued by the responsible TCAC/VAAC.

2.5. The regional OPMET data banks (RODBs) will monitor the dissemination by filing all advisory and SIGMET test-messages and the corresponding reception times. The participating RODBs will provide the monitoring results from the [WC/WV/WS] SIGMET tests in the form of summaries to the two SIGMET test focal points (given in para. 6.4 of this document), with a copy to the ICAO APAC Office.

2.6. The SIGMET test focal points will prepare a consolidated summary report and submit to the ICAO APAC Office. The report will include recommendations for improvement of the SIGMET message exchange and availability. The results of the tests should be reported to the appropriate regional OPMET bulletin exchange/data management group and MET Sub-group meetings (i.e., in the APAC Region: MET/IE WG and APAC MET SG)<sup>4</sup>.

2.7. The ICAO APAC Office will advise participating States of any discrepancies with respect to SIGMET issuance procedures or other findings identified by the tests and request the States concerned to take necessary corrective action.

### 3. PROCEDURES FOR WC/WV SIGMET TEST

#### Participating units

3.1. Participating units include the following:

- **Meteorological Watch Offices (MWOs)\*** listed in para. 9.3, **Table 1** of this document with a ‘WC’ or ‘WV’ required SIGMET test task indicated;
- **Regional OPMET Data Banks (RODBs)** listed in para. 9.3, **Table 2** of this document;
- **Tropical Cyclone Advisory Centres (TCACs)** listed in para. 9.3, **Table 3** of this document;
- **Volcanic Ash Advisory Centres (VAACs)** listed in para. 9.3, **Table 4** of this document; and
- **World Area Forecast Centres (WAFCs)** listed in para. 9.3, **Table 5** of this document.

*\*Note. - The participation of MWOs of States outside APAC region should be coordinated through the ICAO Regional Office concerned.*

#### Issuance of the advisory test message

3.2. On the specified date for the test, each participating TCAC/VAAC should issue a single advisory test message (to trigger the associated MWOs to issue the WC/WV SIGMET test messages) at **0200 UTC**, apart from TCAC New Delhi and TCAC La Réunion (see below) \*.

*\*Notes. –*

- i. To accommodate the ICAO Middle East (MID) Region in the WC SIGMET test, TCAC New Delhi should issue the advisory test message at 0200 UTC (to MWOs in the Asia Region, only) followed by another advisory test message at 0800 UTC (to MWOs in the MID Region, only), as indicated in para 9.3, Table 3 and Table 6 of this document; and*

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<sup>4</sup> Meteorological Information Exchange Working Group (MET/IE WG) and Meteorology Sub-group (MET SG)

- ii. *To accommodate TCAC La Réunion in the WC SIGMET test, TCAC La Réunion should issue one advisory test message at 0500 UTC (to MWOs in the Asia Region, only), as indicated in para. 9.3, Table 3 and Table 6 of this document.*

### **Dissemination of advisory test message**

3.3. The participating TCAC/VAAC should send the advisory test message to the recipient units\*\* specified in the Regional Air Navigation Plan. Region specific documentation should identify the relevant AFTN addresses.

*\*\*Note. - The RODBs, MWOs and WAFCs to which the participating TCAC/VAAC should send the advisory test message are indicated in para. 9.3, Tables 2, 3, 4 and 5 of this document.*

### **Format of advisory test message**

3.4. The structure of the TC/VA advisory test message should follow the standard format given in ICAO Annex 3, Appendix 2, Table A2-1 and A2-2, as shown in para. 7.1 and 7.2 of this document. Use of the status indicator, **TEST**, at the appropriate position of the advisory message, provides recipients with an indication that it is a test message.

### **Issuance of WC/WV SIGMET test message**

3.5. Upon receipt\*\*\* of the advisory test message (from the TCAC/VAAC), the participating MWO should issue a WC/WV SIGMET test message accordingly, including sending it to all participating RODBs. See the examples of WC/WV SIGMET test messages in para. 7.3/7.4 of this document.

*\*\*\*Note. - If the MWO does not receive the advisory test message from its associated TCAC/VAAC within 30-minutes of the commencement time of the SIGMET test, the MWO should still issue a SIGMET test message, indicating that it did not receive the advisory test message.*

### **Special case for the non-issuance of WC/WV SIGMET test message**

3.6. To avoid any possible risk of confusion during genuine tropical cyclone/volcanic ash events, in the case where at the time of the test there is a valid WC/WV SIGMET message for the MWO's area of responsibility, the MWO should not send a SIGMET test message of the same type. However, in this case, the MWO should notify the [WC/WV] SIGMET test focal point (as listed in para. 6.4 of this document) in order to be excluded, accordingly, from the analysis of the SIGMET test messages.

## **4. PROCEDURES FOR WS SIGMET TEST**

*Note. — The WS SIGMET test message is initiated by the MWO at the designated time in para. 4.2 of this document. It is not initiated by an advisory test message as in the WC/WV SIGMET tests.*

### **Participating units**

4.1. Participating units include the following:

- **Meteorological Watch Offices** (MWOs) listed in para. 9.3, **Table 1** of this document with a 'WS' required SIGMET test task indicated (i.e., all MWOs in the APAC Region);
- **Regional OPMET Data Banks** (RODBs) listed in para. 9.3, **Table 2** of this document; and

- **World Area Forecast Centres (WAFCs)** listed in para. 9.3, **Table 5** of this document.

#### **Issuance of WS SIGMET test message**

4.2. The participating MWO should issue a WS SIGMET test message during the 10-minute period between 0200 UTC and 0210 UTC. See an example of WS SIGMET test message in para. 7.5 of this document.

### **5. COMMON PROCEDURES FOR WC/WV/WS SIGMET TEST**

#### **Date and time of SIGMET test**

5.1. The ICAO APAC Office will set a date and time for each SIGMET test after consultation with the participating VAACs, TCACs and RODBs. The information about the agreed date and time will be sent to all States concerned by a State letter and copied to the States' SIGMET test focal points.

5.2. Tests for different types (i.e., WC, WV and WS) of SIGMET messages should preferably be conducted on separate dates.

5.3. **WC/WV/WS** SIGMET tests should be conducted at least yearly.

#### **Duration of SIGMET test**

5.4. A SIGMET test should be terminated within 2-hours of the test start time. Exceptionally, where the test requires SIGMET messages to be valid for longer than 2-hours, the test may be extended to a maximum of 4-hours (for WS SIGMET) or 6-hours (for WC/WV SIGMET).

#### **Validity period of SIGMET test message**

5.5. The SIGMET test message should normally have a short validity period (i.e., 10-minutes), however, where appropriate it may be issued with a validity period up to the maximum allowed (i.e., 4-hours for WS SIGMET, 6-hours for WC/WV SIGMET).

#### **Content and format of SIGMET test message**

5.6. In accordance with ICAO Annex 3, Appendix 6, Table A6-1A, all the elements in the first line of the WC/WV/WS SIGMET test message, as well as the first element of the second line, should be valid entries. The remainder of the body of the message should contain only the status indicator, TEST, and may contain additional information that should not be used operationally, informing recipients in plain language that the message is a test. For example, the WC/WV SIGMET test message should contain information on the receipt or non-receipt of the relevant TC/VA advisory test message. See the examples of WC/WV/WS SIGMET test messages in para. 7.3/7.4/7.5 of this document.

#### **Special procedure to avoid overwriting of a valid SIGMET message**

5.7. The proper use in the SIGMET test message of the status indicator, TEST, and the next sequence number\* for the flight information region (FIR), will ensure that the SIGMET test message is correctly processed (i.e., not used for operational decision making) and avoid over-writing of a previously issued and valid SIGMET message.

*For example, a [WS] SIGMET test is scheduled for 0200 UTC on the 29th. The MWO has already issued three valid SIGMET messages for the FIR since 0001 UTC. Therefore, in this*

*case the sequence number of the SIGMET test message, which will correspond with the number of SIGMET messages issued for the FIR since 0001 UTC on the day of the test, will be 4, as follows:*

```
WSAU01 YBRF 290200  
YBBB SIGMET 4 VALID 290200/290210 YBRF-  
YBBB BRISBANE FIR TEST=
```

*\*Note. - If required by local procedures, States may choose to continue the practice of replacing the next sequence number for the FIR with the special sequence number for SIGMET test messages: **Z99**.*

#### **Heading of meteorological bulletin for advisory/SIGMET test message**

5.8. In accordance with ICAO Annex 3, Appendix 10, para. 2.1.3, the meteorological bulletin originating from a participating unit containing an advisory or SIGMET test message, should contain a valid heading (also known as the World Meteorological Organization abbreviated heading line (WMO AHL)).

5.9. The APAC Regional SIGMET Guide, Appendix D and E, lists the WMO AHLs for the meteorological bulletins containing SIGMET and TC/VA advisory messages used by the MWOs and TCACs/VAACs in the APAC Region.

#### **Dissemination of SIGMET test message**

5.10. The participating MWO should send the SIGMET test message to the recipient units\*\* specified in the Regional Air Navigation Plan. Region specific documentation should identify the relevant AFTN addresses.

*\*\*Note. - The RODBs and WAFCs to which the MWO should send the SIGMET test message are listed in para. 9.3, Table 2 and Table 5 of this document.*

5.11. In accordance with ICAO Annex 10, Vol. II, 4.4.1.1.3, the priority indicator of flight safety messages (which includes TC/VA advisory messages and SIGMET messages) disseminated by the aeronautical fixed telecommunication network (AFTN) is FF.

5.12. An RODB that is also nominated as an Inter-Regional OPMET Gateway (IROG)<sup>52</sup> will relay the bulletins containing SIGMET test messages to its corresponding IROG.

#### **Coordination with air traffic services (ATS) units**

5.13. In accordance with Annex 3, 3.4, each participating MWO should inform its associated ATS unit/s by a suitable advanced notice of the forthcoming SIGMET test/s.

## **6. PROCESSING THE SIGMET TEST RESULTS**

#### **Role of the RODBs**

6.1. Each participating RODB should file all incoming meteorological bulletins containing advisory/SIGMET test messages and perform an analysis of the availability and timeliness of arrival of the test messages and the correctness of the bulletin headings (WMO AHLs).

---

<sup>52</sup> The IROGs designated in the APAC Region are indicated in the ICAO (APAC) ROBEX Handbook

6.2. Each participating RODB should prepare a SIGMET test summary table, as shown in para. 8.1 of this document, and send it to the relevant SIGMET test focal point, as given in para. 6.4 of this document, with a copy to the ICAO APAC Office (E-mail: [apac@icao.int](mailto:apac@icao.int)).

### **SIGMET test focal points**

6.3. The designated SIGMET test focal points, as given in para. 6.4 below, should prepare the final report of the SIGMET test/s and send it to the ICAO APAC Office for submission to the next meeting of the regional OPMET bulletin exchange/data management group and MET Sub-group (i.e., APAC MET/IE WG and APAC MET SG).

6.4. The current SIGMET test focal points for the APAC Region are as follows:

**Focal point for WC/WV SIGMET test:**

Mr. Kentaro Tsuboi  
Japan Meteorological Agency  
Information and Communications Technology Division / Information Infrastructure  
Department  
3-6-9 Toranomon, Minato City  
Tokyo 105-8431 JAPAN  
Tel: +81 (3) 3434 9098  
Fax: +81 (3) 3434 9097 E-mail: [k-tsuboi@met.kishou.go.jp](mailto:k-tsuboi@met.kishou.go.jp)

**Focal point for WS SIGMET test:**

Mr. CHOW Kwok Wah  
Principal Meteorologist (Public and Agencies)  
Weather Services Department  
Meteorological Service Singapore  
P.O. Box 8, Singapore Changi Airport Post Office  
SINGAPORE 918141  
Tel: +65 (3) 6542 4715  
Fax: +65 (3) 6542 2915  
E-mail: [chow\\_kwok\\_wah@nea.gov.sg](mailto:chow_kwok_wah@nea.gov.sg)

## **7. FORMAT OF TEST MESSAGES**

### **TC advisory test message**

7.1. Format of the advisory test message for tropical cyclone:

```
TC ADVISORY
STATUS: TEST
DTG: YYYYMMDD/hhmmZ
TCAC: <location indicator or name of TCAC>
TC: TEST ADVISORY NR: YYYY/nn (actual number)
OBS PSN: NIL
CB: NIL MOV: NIL
C: NIL MAX WIND: NIL FCST PSN +6HR: NIL
FCST MAX WIND +6HR: NIL
FCST PSN +12HR: NIL FCST MAX WIND +12HR: NIL
```

```

FCST PSN +18HR: NIL FCST MAX WIND +18HR: NIL
FCST PSN +24HR: NIL FCST MAX WIND +24HR: NIL
RMK: THIS IS A TC ADVISORY TEST MSG. MWO SHOULD NOW ISSUE A
SIGMET TEST MSG FOR TC. PLEASE REF LETTER FROM ICAO ASIA AND
PACIFIC OFFICE DATED YYYYMMDD.
NXT MSG: NIL=

```

### VA advisory test message

#### 7.2. Format of the advisory test message for volcanic ash:

```

VA ADVISORY
STATUS: TEST
DTG: YYYYMMDD/hhmmZ
VAAC: <name of VAAC>
VOLCANO: TEST [999999]
PSN: UNKNOWN
AREA: <name of VAAC> VAAC AREA
SUMMIT ELEV: UNKNOWN
ADVISORY NR: YYYY/nn
INFO SOURCE: NIL
AVIATION COLOUR CODE: NIL
ERUPTION DETAILS: NIL
OBS VA DTG: DD/GGggZ
OBS VA CLD: VA NOT IDENTIFIABLE FM SATELLITE DATA
FCST VA CLD +6 HR: NO VA EXP
FCST VA CLD +12 HR: NO VA EXP
FCST VA CLD +18 HR: NO VA EXP
RMK: THIS IS A VA ADVISORY TEST MSG. MWO SHOULD NOW ISSUE A
SIGMET TEST MSG FOR VA. PLEASE REF LETTER FROM ICAO ASIA AND
PACIFIC OFFICE DATED YYYYMMDD.
NXT ADVISORY: NO FURTHER ADVISORIES=

```

### WC SIGMET test message

#### 7.3. Format of the WC SIGMET test message for tropical cyclone:

```

WCA1A2ii CCCC YYGGgg
CCCC SIGMET [n][n]n VALID YYGGgg/YYGGgg CCCC-
CCCC <name> FIR TEST=

```

#### Example:

```

WCJP31 RJTD 130205
RJJJ SIGMET 1 VALID 130205/130215 RJTD-
RJJJ FUKUOKA FIR TEST=

```

or

To indicate receipt of the associated TC advisory test message:

```

WCA1A2ii CCCC YYGGgg
CCCC SIGMET [n][n]n VALID YYGGgg/YYGGgg CCCC-

```

```
CCCC <name> FIR TEST. TC ADVISORY TEST MSG NUMBER YYYY/nn  
RECEIVED FM TCAC <name> AT YYGGggZ=
```

Example:

```
WCJP31 RJTD 130205  
RJJJ SIGMET 1 VALID 130205/130215 RJTD-  
RJJJ FUKUOKA FIR TEST. TC ADVISORY TEST MSG NUMBER 2019/01  
RECEIVED FM TCAC TOKYO AT 130200Z=
```

or

To indicate non-receipt of the associated TC advisory test message:

```
WCA1A2ii CCCC YYGGgg  
CCCC SIGMET [n][n]n VALID YYGGgg/YYGGgg CCCC-  
CCCC <name> FIR TEST. TC ADVISORY TEST MSG NOT RECEIVED FM  
TCAC <name>=
```

Example:

```
WCJP31 RJTD 130230  
RJJJ SIGMET 1 VALID 130230/130240 RJTD-  
RJJJ FUKUOKA FIR TEST. TC ADVISORY TEST MSG NOT RECEIVED FM  
TCAC TOKYO=
```

### WV SIGMET test message

7.4. Format of the WV SIGMET test message for volcanic ash:

```
WVA1A2ii CCCC YYGGgg  
CCCC SIGMET [n][n]n VALID YYGGgg/YYGGgg CCCC-  
CCCC <name> FIR TEST=
```

Example:

```
WVJP31 RJTD 200205  
RJJJ SIGMET 1 VALID 200205/200215 RJTD-  
RJJJ FUKUOKA FIR TEST=
```

or

To indicate receipt of the associated VA advisory test message:

```
WVA1A2ii CCCC YYGGgg  
CCCC SIGMET [n][n]n VALID YYGGgg/YYGGgg CCCC-  
CCCC <name> FIR TEST. VA ADVISORY TEST MSG NUMBER YYYY/nn  
RECEIVED FM VAAC <name> AT YYGGggZ=
```

Example:

```
WVJP31 RJTD 200205  
RJJJ SIGMET 1 VALID 200205/200215 RJTD-  
RJJJ FUKUOKA FIR TEST. VA ADVISORY TEST MSG NUMBER 2019/01  
RECEIVED FM VAAC TOKYO AT 200200Z=
```

or

To indicate non-receipt of the associated VA advisory test message:

```
WVA1A2ii CCCC YYGGgg
CCCC SIGMET [n][n]n VALID YYGGgg/YYGGgg CCCC-
CCCC <name> FIR TEST. VA ADVISORY TEST MSG NOT RECEIVED FM
VAAC <name>=
```

Example:

```
WVJP31 RJTD 200230
RJJJ SIGMET 1 VALID 200230/200240 RJTD-
RJJJ FUKUOKA FIR TEST. VA ADVISORY TEST MSG NOT RECEIVED FM
VAAC TOKYO=
```

### WS SIGMET test message

7.5. Format of the WS SIGMET test message for weather and other phenomena apart from tropical cyclone and volcanic ash:

```
WSA1A2ii CCCC YYGGgg
CCCC SIGMET [n][n]n VALID YYGGgg/YYGGgg CCCC-
CCCC <name> FIR TEST=
```

Example:

```
WSJP31 RJTD 270205
RJJJ SIGMET A2 VALID 270205/270215 RJTD-
RJJJ FUKUOKA FIR TEST=
```

## 8. SIGMET TEST SUMMARY

### SIGMET test summary table

8.1. Example of SIGMET test summary table used by RODBs:

Name of RODB: Tokyo

Date of Test: 2011/11/17

Target (VA or TC): VA

VA advisory test messages (FV)				
TTAAii	CCCC	YYGGgg	Received Time(UTC)	Comments/Remarks
FVAK23	PAWU	170159	01:59:29	
FVAU01	ADRM	170201	02:01:53	
FVFE01	RJTD	170200	02:00:09	
FVPS01	NZKL	170207	02:08:27	
FVXX02	LFPW	170202	02:02:41	
FVXX25	KNES	170200	02:02:01	

WV SIGMET test message						
TTAAii	CCCC	YYGGgg	Received Time(UTC)	MWO	FIR	Comments/Remarks
WVAK01	PAWU	170200	02:00:11	PAWU	PAZA	

WVAU01	ADRM	170201	02:02:04	YDRM	YBBB	
WVCI31	RCTP	170205	02:04:58	RCTP	RCAA	
WVCI33	ZBAA	170205	02:05:26	ZBAA	ZBPE	
WVCI34	ZSSS	170205	02:02:34	ZSSS	ZSHA	
WVCI35	ZJHK	170201	02:03:34	ZJHK	ZJSA	
WVCI36	ZUUU	170205	02:11:04	ZUUU	ZPKM	
WVCI37	ZLXY	170205	02:07:44	ZLXY	ZLHW	
WVCI38	ZYTX	170205	02:01:50	ZYTX	ZYSH	
WVCI39	ZWWW	170202	02:02:40	ZWWW	ZWUQ	
WVCI45	ZHHH	170204	02:08:52	ZHHH	ZHWH	
WVFJ01	NFFN	170000	02:15:46	NFFN	NFFF	
WVIN31	VOMM	170201	02:09:57	VOMM	VOMF	
WVJP31	RJTD	170205	02:06:24	RJTD	RJJJ	
WVKP31	ZUUU	170206	02:12:23	ZUUU	VDPP	
WVLA31	VLVT	170200	02:01:03	VLVT	VLVT	
WVMS31	WMKK	170205	02:04:28	WMKK	WBFC	
WVPA01	PHFO	170201	02:02:09	PHFO	KZAK	
WVPH31	RPLL	170210	02:08:43	RPLL	RPHI	
WVPN01	KKCI	170200	02:00:11	KKCI	KZAK	
WVRA31	RUIR	YYGGgg	hh:mm:ss	UIII	UIII	
WVRA31	RUHB	170206	02:07:57	UHHH	UHHH	
WVRA31	RUKR	YYGGgg	hh:mm:ss	UNKL	UNKL	
WVRA31	RUMG	170205	02:08:59	UHMM	UHMM	
WVRA32	RUYK	170207	02:07:28	UELL	UELL	
WVRA33	RUYK	YYGGgg	hh:mm:ss	UERR	UERR	
WVRA31	RUYK	YYGGgg	hh:mm:ss	UEEE	UEEE	
WVRA31	RUPK	YYGGgg	hh:mm:ss	UHPP	UHPP	
WVSR20	WSSS	170205	02:05:38	WSSS	WSJC	
WVSS20	VHHH	170202	02:03:05	VHHH	VHKK	
WVTH31	VTBS	170211	02:13:53	VTBS	VTBB	
WVVS31	VVGL	170200	02:05:06	VVGL	VVHN	
WVVS31	VVGL	170208	02:14:38	VVGL	VVHM	

## 9. SIGMET TEST SUMMARY

### Bilateral or multilateral arrangements between States

9.1. Example of SIGMET test summary table used by RODBs: Where bilateral or multilateral arrangements exist between States for the provision of MWO services, the State responsible for providing air traffic services within the FIR concerned should ensure that arrangements are also in place for the issuance of SIGMET test messages in accordance with the procedures set out in this document.

### Coordination with other Regions

9.2. To facilitate additional monitoring of the SIGMET tests beyond the ICAO APAC Region, at each stage [of the SIGMET tests] the IROG Singapore will relay the meteorological bulletins containing the advisory/SIGMET test messages to the corresponding IROG in the ICAO European (EUR) Region.

### Detailed list of participating States, operational units and tasks

9.3. The following tables indicate the participating States, operational units and tasks required for the APAC regional SIGMET tests:

**Table 1: Participating MWOs**

MWOs (listed by ICAO Region and State) with indication of the required SIGMET test task/s including, where applicable, the associated TCAC/VAAC

MWO DETAILS				REQUIRED SIGMET TEST TASK ID (Refer Table 6 for further details)													W S I G M E T t e s t
				Associated TCAC WC SIGMET test						Associated VAAC WV SIGMET test							
ICA O R E G I O N *	STATE	MWO NAME	ICA O L o c a t i o n I n d i c a t o r	D a r w i n	N a d i	L a R é u n i o n	N e w D e l h i	T o k y o	H o n o l u l u	M i a m i	D a r w i n	T o u l o u s e	T o k y o	W e l l i n g t o n	A n c h o r a g e	W a s h i n g t o n	
A	AFGHANISTAN	KABUL	OAKB	-	-	-	-	-	-	-	-	WV 1.2	-	-	-	-	WS 1.0
A	AUSTRALIA	BRISBANE	YBRF	-	-	-	-	-	-	-	-	-	-	-	-	-	WS 1.0
		MELBOURNE (RFC)	YMRF	-	-	-	-	-	-	-	-	-	-	-	-	-	WS 1.0
		MELBOURNE (WMC)	YMMC	WC 1.1	WC 1.2	WC 2.1	-	-	-	-	WV 1.1	-	-	-	-	-	WS 1.0
A	BANGLADESH	DHAKA	VGHS	-	-	-	WC 1.3	-	-	-	-	WV 1.2	-	-	-	-	WS 1.0
A	CAMBODIA	PHNOM PENH	VDPP	-	-	-	-	WC 1.4	-	-	-	-	WV 1.3	-	-	-	WS 1.0
A	CHINA	BEIJING	ZBAA	-	-	-	-	WC 1.4	-	-	-	-	WV 1.3	-	-	-	WS 1.0
		CHENGDU	ZUUU	-	-	-	-	WC 1.4	-	-	-	-	WV 1.3	-	-	-	WS 1.0
		GUANGZHOU	ZGGG	-	-	-	-	WC 1.4	-	-	-	-	WV 1.3	-	-	-	WS 1.0
		HAIKOU	ZJHK	-	-	-	-	WC 1.4	-	-	-	-	WV 1.3	-	WV 1.5	-	WS 1.0
		HONG KONG	VHHH	-	-	-	-	WC 1.4	-	-	-	-	WV 1.3	-	-	-	WS 1.0
		SHANGHAI	ZSSS	-	-	-	-	WC 1.4	-	-	-	-	WV 1.3	-	-	-	WS 1.0
		SHENYANG	ZYTX	-	-	-	-	-	-	-	-	-	WV 1.3	-	-	-	WS 1.0
		TAIBEI	RCTP	-	-	-	-	WC 1.4	-	-	-	-	WV 1.3	-	-	-	WS 1.0

		URUMQI	ZWWW	-	-	-	-	-	-	-	-	WV 1.2	WV 1.3	-	-	-	WS 1.0
		WUHAN	ZHHH	-	-	-	-	-	-	-	-	WV 1.3	-	-	-	-	WS 1.0
		XI'AN	ZLXY	-	-	-	-	-	-	-	-	WV 1.3	-	-	-	-	WS 1.0
A	DPR KOREA	SUNAN	ZKPY	-	-	-	-	WC 1.4	-	-	-	WV 1.3	-	-	-	-	WS 1.0
A	FIJI	NADI	NFFN	-	WC 1.2	-	-	WC 1.4	-	-	-	-	-	WV 1.4	-	WV 1.6	WS 1.0
A	FRANCE French Polynesia	TAHITI	NTAA	-	WC 1.2	-	-	-	WC 1.5	WC 1.6	-	-	-	WV 1.4	-	-	WS 1.0
A	INDIA	CHENNAI	VOMM	-	-	-	WC 1.3	-	-	-	WV 1.1	WV 1.2	-	-	-	-	WS 1.0
		KOLKATA	VECC	-	-	-	-	-	-	-	-	WV 1.2	-	-	-	-	WS 1.0
		MUMBAI	VABB	-	-	WC 2.1	WC 1.3	-	-	-	-	WV 1.2	-	-	-	-	WS 1.0
		NEW DELHI	VIDP	-	-	-	-	-	-	-	-	WV 1.2	-	-	-	-	WS 1.0
A	INDONESIA	JAKARTA	WIII	WC 1.1	-	-	WC 1.3	WC 1.4	-	-	WV 1.1	-	-	-	-	-	WS 1.0
		MAKASSAR	WAAA	WC 1.1	-	-	-	WC 1.4	-	-	WV 1.1	-	-	-	-	-	WS 1.0
A	JAPAN	TOKYO	RJTD	-	-	-	-	WC 1.4	-	-	-	-	WV 1.3	-	-	-	WS 1.0
A	LAO PDR	VIENTIANE	VLVT	-	-	-	-	WC 1.4	-	-	-	-	WV 1.3	-	-	-	WS 1.0
A	MALAYSIA	KUALA LUMPUR	WMKK	-	-	-	WC 1.3	WC 1.4	-	-	WV 1.1	-	-	-	-	-	WS 1.0
A	MALDIVES	MALE	VRMM	-	-	WC 2.1	WC 1.3	-	-	-	-	WV 1.2	-	-	-	-	WS 1.0
A	MONGOLIA	ULAANBAATAR	ZMUB	-	-	-	-	-	-	-	-	-	WV 1.3	-	-	-	WS 1.0
A	MYANMAR	YANGON	VYYY	-	-	-	WC 1.3	-	-	-	WV 1.1	-	-	-	-	-	WS 1.0
A	NAURU	NAURU	ANYN	-	WC 1.2	-	-	-	-	-	-	-	WV 1.4	-	-	-	WS 1.0
A	NEPAL	KATHMANDU	VNKT	-	-	-	-	-	-	-	-	WV 1.2	-	-	-	-	WS 1.0
A	NEW ZEALAND	WELLINGTON	NZKL	-	WC 1.2	-	-	-	-	-	-	-	WV 1.4	-	-	-	WS 1.0
A	PAKISTAN	KARACHI	OPKC	-	-	-	WC 1.3	-	-	-	-	WV 1.2	-	-	-	-	WS 1.0
		LAHORE	OPLA	-	-	-	-	-	-	-	-	WV 1.2	-	-	-	-	-
A	PAPUA NEW GUINEA	PORT MORESBY	AYPY	WC 1.1	-	-	-	-	-	-	WV 1.1	-	-	-	-	-	WS 1.0
A	PHILIPPINES	MANILA	RPLL	-	-	-	-	WC 1.4	-	-	WV 1.1	-	WV 1.3	-	-	-	WS 1.0
A	REPUBLIC OF KOREA	INCHEON	RKSI	-	-	-	-	WC 1.4	-	-	-	-	WV 1.3	-	-	-	WS 1.0
A	SINGAPORE	SINGAPORE	WSSS	-	-	-	-	WC 1.4	-	-	WV 1.1	-	-	-	-	-	WS 1.0
A	SOLOMON ISLANDS	HONIARA	AGGH	WC 1.1	WC 1.2	-	-	-	-	-	WV 1.1	-	-	WV 1.4	-	-	WS 1.0
A	SRI LANKA	COLOMBO	VCBI	WC 1.1	-	-	WC 1.3	-	-	-	WV 1.1	-	-	-	-	-	WS 1.0
A	THAILAND	BANGKOK	VTBS	-	-	-	-	WC 1.4	-	-	WV 1.1	-	WV 1.3	-	-	-	WS 1.0
A	UNITED STATES	HONOLULU		-	WC 1.2	-	-	WC 1.4	WC 1.5	WC 1.6	-	-	-	WV 1.4	-	-	WS 1.0
A	VIET NAM	GIA LAM	VVGL	-	-	-	-	WC 1.4	-	-	WV 1.1	-	WV 1.3	-	-	-	WS 1.0
E	RUSSIAN FEDERATION	CHULMAN	UELL	-	-	-	-	-	-	-	-	-	WV 1.3	-	-	-	-
		IRKUTSK	UIII	-	-	-	-	-	-	-	-	-	WV 1.3	-	-	-	-
		KHABAROVSK	UHHH	-	-	-	-	-	-	-	-	-	WV 1.3	-	-	-	-
		KRASNOYARSK	UNKL	-	-	-	-	-	-	-	-	-	WV 1.3	-	-	-	-
		MAGADAN	UHMM	-	-	-	-	-	-	-	-	-	WV	-	-	-	-



\*Refer Table 6 for further details

**Table 4: Participating VAACs**

Participating VAACs listed by State and ICAO Region, with indication of the required SIGMET test tasks and the associated MWOs

STATE	ICAO REGION	VAAC NAME	ICAO Location Indicator	TASK (ID)*	Associated MWOs to which the advisory information on volcanic ash should be sent
AUSTRALIA	APAC	DARWIN	YMMC	WV 1.0	BANGKOK, CHENNAI, COLOMBO, GIA LAM, HONIARA, JAKARTA, KUALA LUMPUR, MAKASSAR, MANILA, MELBOURNE (WORLD MET CENTRE, BOM), PORT MORESBY, SINGAPORE, YANGON
FRANCE	EUR	TOULOUSE	LFPW	WV 1.0	CHENNAI, DHAKA, KABUL, KARACHI, KATHMANDU, KOLKATA, LAHORE, MALE, MUMBAI, NEW DELHI, URUMQI
JAPAN	APAC	TOKYO	RJTD	WV 1.0	<b>APAC:</b> BANGKOK, BEIJING, CHENGDU, GIA LAM, GUANGZHOU, HAIKOU, HONG KONG, INCHEON, MANILA, PHNOM PENH, SHANGHAI, SHENYANG, SUNAN, TAIBEI, TOKYO, ULAANBAATAR, URUMQI, VIENTIANE, WUHAN, XI'AN <b>EUR:</b> CHULMAN, IRKUTSK, KHABAROVSK, KRASNOYARSK, MAGADAN, MIRNY, YELIZOVO/PETROPALOVSK-KAMCHATSKY, YAKUTSK
NEW ZEALAND	APAC	WELLINGTON	NZKL	WV 1.0	HONIARA, HONOLULU, MELBOURNE (WORLD MET CENTRE, BOM), NADI, NAURU, TAHITI, WELLINGTON
UNITED STATES	NAM	ANCHORAGE	PAWU	WV 1.0	HAIKOU
	NAM	WASHINGTON	KNES	WV 1.0	NADI

\*Refer Table 6 for further details

**Table 5: Participating WAFCs**

WAFCs listed by State and ICAO Region, with indication of the required SIGMET test tasks

STATE	ICAO REGION	W AFC NAME	ICAO Location Indicator	AFTN ADDRESS	TASK (ID)*
UNITED KINGDOM	EUR	LONDON	EGZZ	EGZZMASI	WC 4.0, WV 2.0, WS 2.0
UNITED STATES	NAM	WASHINGTON	KWBC	KWBCYMYX	WC 4.0, WV 2.0, WS 2.0

\*Refer Table 6 for further details

**Table 6: SIGMET test tasks**

Chronology and detailed description of tasks, listed by task ID

<b>TASK ID.</b>	<b>WHO?</b> Responsible unit/s	<b>WHAT?</b> Detailed description of the task	<b>WHEN?</b> Date/Time indicated in the following format: YYYYMMDD/HHMM UTC
<b>SIGMET test for tropical cyclone (WC SIGMET test) – 20191113/0200, 20191113/0500 and 20191113/0800</b>			
<b>WC 1.0</b>	TCACs listed in Table 3 except TCAC La Réunion	<b>Send the TC advisory test message</b> (see para. 7.1) to: i. MWOs as indicated in Table 3 ( <b>Note:</b> at this time, TCAC New Delhi should <u>only</u> send the TC advisory test message to MWOs in the <u>APAC Region</u> ); ii. RODBs listed in Table 2 ( <b>Note:</b> this only applies to TCACs Darwin, Nadi, New Delhi and Tokyo); and iii. WAFCs listed in Table 5	20191113/0200
<b>WC 1.1</b>	MWOs associated with TCAC Darwin, as indicated in Table 1 and Table 3	<b>Send the WC SIGMET test message</b> based on the TC advisory test message from TCAC Darwin (see para. 7.3) to: i. RODBs listed in Table 2; and ii. WAFCs listed in Table 5	<b>Either:</b> a. <b>On receipt of the TC advisory test message</b> from TCAC Darwin between 20191113/0200 and 20191113/0230; <b>or</b> b. <b>At</b> or as soon as practicable after <b>20191113/0230</b> , only when the MWO does not receive the TC advisory test message from TCAC Darwin
<b>WC 1.2</b>	MWOs associated with TCAC Nadi, as indicated in Table 1 and Table 3	<b>Send the WC SIGMET test message</b> based on the TC advisory test message from TCAC Nadi (see para. 7.3) to: i. RODBs listed in Table 2; and ii. WAFCs listed in Table 5	<b>Either:</b> a. <b>On receipt of the TC advisory test message</b> from TCAC Nadi between 20191113/0200 and 20191113/0230; <b>or</b> b. <b>At</b> or as soon as practicable after <b>20191113/0230</b> , only when the MWO does not receive the TC advisory test message from TCAC Nadi
<b>WC 1.3</b>	MWOs associated with TCAC New Delhi, as indicated in Table 1 and Table 3	<b>Send the WC SIGMET test message</b> based on the TC advisory test message from TCAC New Delhi (see para. 7.3) to: i. RODBs listed in Table 2; and ii. WAFCs listed in Table 5	<b>Either:</b> a. <b>On receipt of the TC advisory test message</b> from TCAC New Delhi between 20191113/0200 and 20191113/0230; <b>or</b> b. <b>At</b> or as soon as practicable after <b>20191113/0230</b> , only when the MWO does not receive the TC advisory test message from TCAC New Delhi
<b>WC 1.4</b>	MWOs associated with TCAC Tokyo, as indicated in Table 1 and Table 3	<b>Send the WC SIGMET test message</b> based on the TC advisory test message from TCAC Tokyo (see para. 7.3) to: a. RODBs listed in Table 2 ( <b>Note:</b> this only applies to MWOs in the APAC Region); and b. WAFCs listed in Table 5	<b>Either:</b> a. <b>On receipt of the TC advisory test message</b> from TCAC Tokyo between 20191113/0200 and 20191113/0230; <b>or</b> b. <b>At</b> or as soon as practicable after <b>20191113/0230</b> , only when the MWO does not receive the TC advisory test message from TCAC Tokyo
<b>WC 1.5</b>	MWOs associated with TCAC Honolulu, as	<b>Send the WC SIGMET test message</b> based on the TC advisory test message from TCAC Honolulu (see para. 7.3) to:	<b>Either:</b> a. <b>On receipt of the TC advisory test message</b> from TCAC Honolulu

	indicated in Table 1 and Table 3	<ul style="list-style-type: none"> <li>i. RODBs listed in Table 2 (<b>Note:</b> this only applies to MWOs in the APAC Region); and</li> <li>ii. WAFCs listed in Table 5</li> </ul>	<ul style="list-style-type: none"> <li>b. <b>At</b> or as soon as practicable after <b>20191113/0230</b>, only when the MWO does not receive the TC advisory test message from TCAC Honolulu</li> </ul>
WC 1.6	MWOs associated with TCAC Miami, as indicated in Table 1 and Table 3	<p><b>Send the WC SIGMET test message</b> based on the TC advisory test message from TCAC Miami (see para. 7.3) to:</p> <ul style="list-style-type: none"> <li>i. RODBs listed in Table 2 (<b>Note:</b> this only applies to MWOs in the APAC Region); and</li> <li>ii. WAFCs listed in Table 5</li> </ul>	<p><b>Either:</b></p> <ul style="list-style-type: none"> <li>1. <b>On receipt of the TC advisory test message</b> from TCAC Miami between 20191113/0200 and 20191113/0230; <b>or</b></li> <li>2. <b>At</b> or as soon as practicable after <b>20191113/0230</b>, only when the MWO does not receive the TC advisory test message from TCAC Miami</li> </ul>
WC 2.0	TCAC La Réunion	<p><b>Send the TC advisory test message</b> (see para. 7.1) to:</p> <ul style="list-style-type: none"> <li>i. MWOs as indicated in Table 3;</li> <li>ii. RODBs listed in Table 2; and</li> <li>iii. WAFCs listed in Table 5</li> </ul>	20191113/0500
WC 2.1	MWOs associated with TCAC La Réunion, as indicated in Table 1 and Table 3	<p><b>Send the WC SIGMET test message</b> based on the TC advisory test message from TCAC La Réunion (see para. 7.3) to:</p> <ul style="list-style-type: none"> <li>i. RODBs listed in Table 2; and</li> <li>ii. WAFCs listed in Table 5</li> </ul>	<p><b>Either:</b></p> <ul style="list-style-type: none"> <li>1. <b>On receipt of the TC advisory test message</b> from TCAC La Réunion between 20191113/0500 and 20191113/0530; <b>or</b></li> <li>2. <b>At</b> or as soon as practicable after <b>20191113/0530</b>, only when the MWO does not receive the TC advisory test message from TCAC La Réunion</li> </ul>
WC 3.0	TCAC New Delhi	<p><b>Send the TC advisory test message</b> (see para. 7.1) to:</p> <ul style="list-style-type: none"> <li>i. MWOs as indicated in Table 3 (<b>Note:</b> at this time, TCAC New Delhi should <u>only</u> send the test TCA to MWOs in the <u>MID Region</u>);</li> <li>ii. RODBs listed in Table 2; and</li> <li>iii. WAFCs listed in Table 5</li> </ul>	20191113/0800
WC 3.1	MWOs in the MID Region associated with TCAC New Delhi, as indicated in Table 1 and Table 3	<p><b>Send the WC SIGMET test message</b> based on the TC advisory test message from TCAC New Delhi (see para. 7.3) to:</p> <ul style="list-style-type: none"> <li>1. WAFCs listed in Table 5</li> </ul>	<p><b>Either:</b></p> <ul style="list-style-type: none"> <li>1. <b>On receipt of the TC advisory test message</b> from TCAC New Delhi between 20191113/0800 and 20191113/0830; <b>or</b></li> <li>2. <b>At</b> or as soon as practicable after <b>20191113/0830</b>, only when the MWO does not receive the TC advisory test message from TCAC New Delhi</li> </ul>
WC 4.0	RODBs listed in Table 2 and WAFCs listed in Table 5	<ul style="list-style-type: none"> <li>. <b>File all incoming TC advisory and WC SIGMET test messages;</b> and</li> <li>. <b>Prepare and send the SIGMET test summary table</b> (see para. 8.1) to: <ul style="list-style-type: none"> <li>i. APAC SIGMET test focal points (see para. 6.4); and</li> <li>ii. Copy to the ICAO APAC Office</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>1. <b>Between 20191113/0200 and 20191113/0830;</b> and</li> <li>2. <b>After 20191113/0830</b></li> </ul>
<b>SIGMET test for volcanic ash (WV SIGMET test) - 20191120/0200</b>			

WV 1.0	VAACs listed in Table 4	Send the VA advisory test message (see para. 7.2) to: i. MWOs as indicated in Table 4; ii. RODBs listed in Table 2 (Note: this only applies to VAACs Darwin, Tokyo and Wellington); and iii. WAFCs listed in Table 5	20191120/0200
WV 1.1	MWOs associated with VAAC Darwin, as indicated in Table 1 and Table 4	Send the WV SIGMET test message based on the VA advisory test message from VAAC Darwin (see para. 7.4) to: i. RODBs listed in Table 2; and ii. WAFCs listed in Table 5	Either: 1. On receipt of the VA advisory test message from VAAC Darwin between 20191120/0200 and 20191120/0230; or 2. At or as soon as practicable after 20191120/0230, only when the MWO does not receive the VA advisory test message from VAAC Darwin
WV 1.2	MWOs associated with VAAC Toulouse, as indicated in Table 1 and Table 4	Send the WV SIGMET test message based on the VA advisory test message from VAAC Toulouse (see para. 7.4) to: i. RODBs listed in Table 2; and ii. WAFCs listed in Table 5	Either: 1. On receipt of the VA advisory test message from VAAC Toulouse between 20191120/0200 and 20191120/0230; or 2. At or as soon as practicable after 20191120/0230, only when the MWO does not receive the VA advisory test message from VAAC Toulouse
WV 1.3	MWOs associated with VAAC Tokyo, as indicated in Table 1 and Table 4	Send the WV SIGMET test message based on the VA advisory test message from VAAC Tokyo (see para. 7.4) to: i. RODBs listed in Table 2 (Note: this only applies to MWOs in the APAC Region); and ii. WAFCs listed in Table 5	Either: 1. On receipt of the VA advisory test message from VAAC Tokyo between 20191120/0200 and 20191120/0230; or 2. At or as soon as practicable after 20191120/0230, only when the MWO does not receive the VA advisory test message from VAAC Tokyo
WV 1.4	MWOs associated with VAAC Wellington, as indicated in Table 1 and Table 4	Send the WV SIGMET test message based on the VA advisory test message from VAAC Wellington (see para. 7.4) to: a. RODBs listed in Table 2; and b. WAFCs listed in Table 5	Either: 1. On receipt of the VA advisory test message from VAAC Wellington between 20191120/0200 and 20191120/0230; or 2. At or as soon as practicable after 20191120/0230, only when the MWO does not receive the VA advisory test message from VAAC Wellington
WV 1.5	MWOs associated with VAAC Anchorage, as indicated in Table 1 and Table 4	Send the WV SIGMET test message based on the VA advisory test message from VAAC Anchorage (see para. 7.4) to: a. RODBs listed in Table 2; and b. WAFCs listed in Table 5	Either: 1. On receipt of the VA advisory test message from VAAC Anchorage between 20191120/0200 and 20191120/0230; or 2. At or as soon as practicable after 20191120/0230, only when the MWO does not receive the VA advisory test message from VAAC Anchorage

<b>WV 1.6</b>	<b>MWOs associated with VAAC Washington, as indicated in Table 1 and Table 4</b>	<b>Send the WV SIGMET test message</b> based on the VA advisory test message from VAAC Washington (see para. 7.4) to: a. RODBs listed in Table 2; and b. WAFCs listed in Table 5	<b>Either:</b> 1. <b>On receipt of the VA advisory test message</b> from VAAC Washington between 20191120/0200 and 20191120/0230; <b>or</b> 2. <b>At</b> or as soon as practicable after 20191120/0230, only when the MWO does not receive the VA advisory test message from VAAC Washington
<b>WV 2.0</b>	<b>RODBs listed in Table 2 and WAFCs listed in Table 5</b>	1. <b>File all incoming VA advisory and WV SIGMET test messages;</b> and 2. <b>Prepare and send the SIGMET test summary table</b> (see para. 8.1) to: a. APAC SIGMET test focal points (see para. 6.4); and b. Copy to the ICAO APAC Office	1. <b>Between 20191120/0200 and 20191120/0230;</b> and 2. <b>After 20191120/0230</b>
<b>SIGMET test for weather and other phenomena apart from tropical cyclone and volcanic ash (WS SIGMET test) - 20191127/0200</b>			
<b>WS 1.0</b>	<b>MWOs in the APAC Region listed in Table 1</b>	<b>Send the WS SIGMET test message</b> (see para. 7.5) to: i. RODBs listed in Table 2; and ii. WAFCs listed in Table 5	<b>20191127/0200</b>
<b>WS 2.0</b>	<b>RODBs listed in Table 2 and WAFCs listed in Table 5</b>	1. <b>File all incoming WS SIGMET test messages;</b> and 2. <b>Prepare and send the SIGMET test summary table</b> (see para. 8.1) to: a. APAC SIGMET test focal points (see para. 6.4); and b. Copy to the ICAO APAC Office	1. <b>Between 20191127/0200 and 20191127/0230;</b> and 2. <b>After 20191127/0230</b>
<b>Final</b>	<b>APAC SIGMET test focal points listed in para. 6.4</b>	<b>Prepare the final report of the SIGMET tests</b>	<b>Sequential to Tasks WC 4.0 b., WV 2.0 b. and WS 2.0 b</b>

## APPENDIX D

### WMO HEADINGS (WMO AHL) FOR SIGMET BULLETINS

Used by Asia/Pacific Meteorological Watch Offices

MWO location	ICAO location indicator	WMO SIGMET Headings						FIR/ACC served	Remarks
		WS/LS		WC/LY		WV/LV		ICAO location indicator	
1	2	3		4		5		6	7
<b>AFGHANISTAN</b>									
KABUL AD	OAKB	WSAH31	LSAH31			WVAH31	LVAH31	OAKX	AFTN not available Headings not confirmed
<b>AUSTRALIA</b>									
BRISBANE/Brisbane	YBRF	WSAU21	LSAU21					YBBB YMMM	
MELBOURNE/Melbourne	YMRF	WSAU21	LSAU21					YBBB YMMM	
MELBOURNE (WORLD MET CENTRE, BUREAU OF METEOROLOGY)	YMMC	WSAU21	LSAU21	WCAU01	LYAU01	WVAU01	LVAU01	YBBB YMMM	
<b>BANGLADESH</b>									
DHAKA/Hazrat Shahjalal International Airport	VGHS	WSBW20	LSBW20	WCBW20	LYBW20	WVBW20	LVBW20	VGFR	
<b>CAMBODIA</b>									
PHNOM-PENH/Phnom Penh Intl	VDPP	WSKP31	LSKP31	WCKP31	LYKP31	WVKP31	LVKP31	VDPP	
<b>CHINA</b>									
BEIJING/Capital	ZBAA	WSCI33	LSCI33	WCCI33	LYCI33	WVCI33	LVCI33	ZBPE	
GUANGZHOU/Baiyun	ZGGG	WSCI35	LSCI35	WCCI35	LYCI35	WVCI35	LVCI35	ZGZU	
HAIKOU/Meilan	ZJHK	WSCI35	LSCI35	WCCI35	LYCI35	WVCI35	LVCI35	ZJSA	
CHENGDU/Shuangliu	ZUUU	WSCI36	LSCI36			WVCI36	LVCI36	ZPKM	
XI'AN/Xianyang	ZLXY	WSCI37	LSCI37			WVCI37	LVCI37	ZLHW	
SHANGHAI/Hongqiao	ZSSS	WSCI34	LSCI34	WCCI34	LYCI34	WVCI34	LVCI34	ZSHA	
SHENYANG/Taoxian	ZYTX	WSCI38	LSCI38			WVCI38	LVCI38	ZYSH	
TAIBEI/Taibei Intl	RCTP	WSCI31	LSCI31	WCCI31	LYCI31	WVCI31	LVCI31	RCAA	
URUMQI/Diwopu	ZWWW	WSCI39	LSCI39			WVCI39	LVCI39	ZWUQ	
WUHAN/Tianhe	ZHHH	WSCI45	LSCI45			WVCI45	LVCI45	ZHWH	
HONG KONG/Hong Kong Intl	VHHH	WSSS20	LSSS20	WCSS20	LYSS20	WVSS20	LVSS20	VHHK	
<b>DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA</b>									
SUNAN	ZKPY	WSKR31	LSKR31	WCKR31	LYKR31	WVKR31	LVKR31	ZKKP	
<b>FIJI</b>									
NADI/Nadi Intl	NFFN	WSFJ01, 02,...	LSFJ01,0 2,...	WCFJ01, 02,...	LYFJ01,0 2,...	WVFJ01, 02,...	LVFJ01,0 2,...	NFFF	
<b>FRENCH POLYNESIA</b>									
TAHITI/Faaa	NTAA	WSPF21, 22	LSPF21,2 2	WCPF21	LYPF21	WVPF21	LVPF21	NTTT	

MWO location	ICAO location indicator	WMO SIGMET Headings						FIR/ACC served	Remarks
		WS/LS		WC/LY		WV/LV		ICAO location indicator	
<b>INDIA</b> KOLKATA CHENNAI/Chennai DELHI/Indira Ghandi Intl MUMBAI/Chhatrapati Shivaji Intl.	VECC VOMM VIDP VABB	WSIN31 WSIN31 WSIN31 WSIN31	LSIN31 LSIN31 LSIN31 LSIN31	WCIN31 WCIN31 WCIN31 WCIN31	LYIN31 LYIN31 LYIN31 LYIN31	WVIN31 WVIN31 WVIN31 WVIN31	LVIN31 LVIN31 LVIN31 LVIN31	VECF VOMF VIDF VABF	
<b>INDONESIA</b> JAKARTA/Soekarno-Hatta (Comm Center) UJUNG PANDANG/Hasanuddin (Comm Center)	WIII WAAA	WSID20 WSID21	LSID20 LSID21	WCID20 WCID21	LYID20 LYID21	WVID20 WVID21	LVID20 LVID21	WIIZ WAAZ	
<b>JAPAN</b> TOKYO (CITY)	RJTD	WSJP31	LSJP31	WCJP31	LYJP31	WVJP31	LVJP31	RJJJ	
<b>LAO PEOPLE'S DEMOCRATIC REPUBLIC</b> VIENTIANE/Wattay	VLVT	WSLA31	LSLA31	WCLA31	LYLA31	WVLA31	LVLA31	VLVT	
<b>MALAYSIA</b> SEPANG/KL International Airport	WMKK	WSMS31	LSMS31	WCMS31	LYMS31	WVMS31	LVMS31	WBFC WMFC	
<b>MALDIVES</b> MALE/Intl	VRMM	WSMV31	LSMV31	WCMV31	LYMV31	WVMV31	LVMV31	VRMF	
<b>MONGOLIA</b> ULAAN BAATAR	ZMUB	WSMO31	LSMO31			WVMO31	LVMO31	ZMUB	
<b>MYANMAR</b> YANGON/Yangon International	VYYY	WSBM31	LSBM31	WCBM31	LYBM31	WVBM31	LVBM31	VYYY	
<b>NAURU</b> NAURU	ANYN	WSNW20	LSNW20	WCNW20	LYNW20	WVNW20	LVNW20	ANAU	MWO not established however
<b>NEPAL</b> KATHMANDU	VNKT	WSNP31	LSNP31			WVNP31	LVNP31	VNSM	SIGMET currently not issued
<b>NEW ZEALAND</b> WELLINGTON (Meteorological Office)	NZKL	WSNZ21 WSPS21	LSNZ21 LSPS21	WCNZ21 WCPS21	LYNZ21 LYPS21	WVNZ21 WVPS21	LVNZ21 LVPS21	NZZC NZZO	
<b>PAKISTAN</b> KARACHI/Jinnah Intl LAHORE/Allama Iqbal Intl	OPKC OPLA	WSPK31 WSPK31	LSPK31 LSPK31	WCPK31	LYPK31	WVPK31 WVPK31	LVPK31 LVPK31	OPKR OPLR	
<b>PAPUA NEW GUINEA</b> PORT MORESBY/Intl	AYPY	WSNG20	LSNG20	WCNG20	LYNG20	WVNG20	LVNG20	AYPY	
<b>PHILIPPINES</b> MANILA/Ninoy Aquino Intl, Pasay City, Metro Manila	RPLL	WSPH31	LSPH31	WCPH31	LYPH31	WVPH31	LVPH31	RPHI	

MWO location	ICAO location indicator	WMO SIGMET Headings						FIR/ACC served	Remarks
		WS/LS		WC/LY		WV/LV		ICAO location indicator	
<b>REPUBLIC OF KOREA</b> INCHEON	RKSI	WSKO31	LSKO31	WCKO31	LYKO31	WVKO31	LVKO31	RKRR	
<b>SINGAPORE</b> SINGAPORE/Changi	WSSS	WSSR20	LSSR20	WCSR20	LYSR20	WVSR20	LVS20	WSJC	
<b>SOLOMON ISLANDS</b> HONIARA/Henderson	AGGH	WSSO20	LSSO20	WCSO20	LYSO20	WVSO20	LVSO20	AGGG	
<b>SRI LANKA</b> COLOMBO/Bandaranaike International Airport Colombo	VCBI	WSSB31	LSSB31	WCSB31	LYSB31	WVSB31	LVSB31	VCBI	
<b>THAILAND</b> BANGKOK/Suvarnabhumi Intl Airport	VTBS	WSTH31	LSTH31	WCTH31	LYTH31	WVTH31	LVTH31	VTBB	
<b>UNITED STATES</b> ANCHORAGE/Anchorage Intl HONOLULU/Honolulu Intl  KANSAS CITY  KANSAS CITY	PAWU PHFO  KKCI  KKCI	WSAK01-09 PAWU WSPA01-13 PHFO  WSNT01-13 KKCI  WSPN01-13 KKCI	LSAK01-09 PAWU LSPA01-13 PHFO  LSNT01-13 KKCI  LSPN01-13 KKCI	WCAK01-09 PAWU WCPA01-13 PHFO  WCNT01-13 KKCI  WCPN01-13 KKCI	LYAK01-09 PAWU LYPA01-13 PHFO  LYNT01-13 KKCI  LYPN01-13 KKCI	WVAK01-09 PAWU WVPA 01-13 PHFO  WVNT01-13 KKCI  WVPN01-13 KKCI	LVAK01-09 PAWU LVPA 01-13 PHFO  LVNT01-13 KKCI  LVPN01-13 KKCI	PAZA KZAK  KZNY KZMA KZHU TJZU KZAK	
<b>VIET NAM</b> Gia Lam	VVGL	WSVS31	LSVS31	WCVS31	LYVS31	WVVS31	LVVS31	VVHN VVHM	

## APPENDIX E

### TROPICAL CYCLONE ADVISORY CENTRES

#### Explanation of Table

- Col. 1: Name of the tropical cyclone advisory centre (TCAC).
- Col 2: ICAO location indicator used by the TCAC.
- Col 3: WMO heading (TTAAii CCCC) of the FK bulletin.
- Col 4: Area of responsibility for the preparation of advisory information on tropical cyclones by the TCAC in column 1.
- Col 5: Period of operation of the TCAC.
- Col 6: MWOs to which the advisory information on tropical cyclones should be sent.
- Col 7: ICAO location indicator of the MWOs in Column 6.
- Col 8: Remarks (e.g., Any other bulletin-specific information).

*Note. -MWOs in italics are situated outside the Asia/Pacific Region.*

TCAC (State)	WMO Heading TTAAii CCCC	Area of Responsibility	Period of operation <sup>1)</sup>	MWO to which advisory information is to be sent	Remarks
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	ICAO location indicator				Name	ICAO location indicator	
1	2	3	4	5	6	7	8
<b>TC Advisories (FK)</b>							
<b>Miami</b> (United States)	KNHC	FKNT21-25 KNHC FKPZ21-25 KNHC	Atlantic  Northeast Pacific N: 60°N S: 0°N W: 140°W E: Coastline	May – November	Honolulu <i>Kansas City</i> Tahiti	PHFO <i>KKCI</i> NTAA	ii = 21 – 25; up to 5 different bulletins possible at a time according to the number of TCs in the TCAC's area of responsibility.
<b>Honolulu</b> (United States)	PHFO	FKPA21-25 PHFO	Central Pacific N: 60°N S: 0°N W: 180°W E: 140°W	May – November	<i>Anchorage</i> Honolulu <i>Kansas City</i> Tahiti	<i>PAWU</i> PHFO <i>KKCI</i> NTAA	ii = 21 – 25; up to 5 different bulletins possible at a time according to the number of TCs in the TCAC's area of responsibility.
<b>New Delhi</b> (India)	VIDP	FKIN20 VIDP FKIN21 VIDP	1) Bay of Bengal  2) Arabian Sea N: Coastline S: 5°N W: Coastline E: 100°E	April –June October – December	<i>Bahrain</i> Chennai Colombo Dhaka <i>Emirates</i> Jakarta <i>Jeddah</i> Karachi Kuala Lumpur <i>Kuwait</i> Male Mumbai <i>Muscat</i>	<i>OBBI</i> VOMM VCBI VGHS <i>OMAE</i> WIII <i>OEJN</i> OPKC WMKK <i>OKBK</i> <i>VRMM</i> VABB <i>OOMS</i>	

					Tehran Sana'a Yangon	OIII OYSN VYYY	
<b>Darwin</b> (Australia)	ADRM	FKAU01 - 06 ADRM	Area bounded by 0°S 90°E, 40°S 90°E, 40°S 160°E, 0°S 160°E, 0°S 90°E.	November – April	Brisbane <sup>2)</sup> Colombo Honiara Jakarta Melbourne <sup>2)</sup> Port Moresby Ujung Pandang Melbourne(World Met Centre, BoM) <sup>2)</sup>	YBRF VOMM AGGH WIII YMRF AYPY WAAA YMMC	
<b>Nadi</b> (Fiji)	NFFN	FKPS01 NFFN	Southern Pacific N: 0°S S: 40°S W: 160°E E: 120°W	November – April	Brisbane <sup>2)</sup> Honiara Honolulu Melbourne <sup>2)</sup> Melbourne (World Met Centre, BoM) <sup>2)</sup> Nadi Nauru <sup>3)</sup> Tahiti Wellington (Aviation Weather Centre)	YBRF AGGH PHFO YMRF YMMC NFFN ANYN NTAA NZKL	

<b>Tokyo</b> (Japan)	RJTD	FKPQ30-35 RJTD	Western Pacific (incl. South China Sea) N: 60°N S: 0°N W: 100°E E: 180°E	Throughout the year	Bangkok Beijing Chengdu Gia Lam Guangzhou Haikou Hong Kong Honolulu Incheon Jakarta <i>Kansas City</i> Kota Kinabaru Kuala Lumpur Manila Nadi Phnom-Penh Shanghai Singapore Sunan Taibei Tokyo Ujung Pandang Vientiane	VTBS ZBAA ZUUU VVGL ZGGG ZJHK VHHH PHFO RKSI WIII <i>KMKC</i> WBKK WMKK RPLL NFFN VDPP ZSSS WSSS ZKPY RCTP RJTD WAAA VLVT	
<b>Réunion</b> (France)	FMEE	FKIO20 FMEE	Southwest Indian Ocean N: 0°S S: 40°S W: African Coastline E: 90°E	Throughout the year	<i>Antananarivo</i> <i>Bloemfontein</i> Brisbane <sup>2)</sup>	<i>FMMI</i> <i>FABL</i> YBRF	

					<i>Dar-es-Salaam</i> <i>Durban</i> <i>Gaborone</i> <i>Harare</i> <i>Johannesburg</i> <i>Lilongwe</i> <i>Mahé</i> Male <i>Maputo</i> <i>Mauritius</i> Melbourne <sup>2)</sup> Melbourne (World Met Centre, BoM) <sup>2)</sup> Mumbai <i>Nairob</i>	HTDA FADN FBSK FVHA FAJS FWLI FSIA VRMM FQMA FIMP YMRF YMMC VABB HKJK	
--	--	--	--	--	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------	--

*NOTES:*

- 1) *Indicates approximately the main seasons for tropical cyclones.*
- 2) *Tropical cyclone SIGMET for the Australian FIRs is issued by MWOs: Brisbane, Melbourne and Melbourne (World Met Centre, BoM).*
- 3) *MWO not implemented.*

CURRENT STATUS OF ICAO TROPICAL CYCLONE ADVISORY CENTRES (TCACs) - AREAS OF RESPONSIBILITY  
 SITUATION ACTUELLE DES CENTRES D'AVIS DE CYCLONES TROPICAUX (TCAC) OACI - ZONES DE RESPONSABILITÉ  
 SITUACIÓN ACTUAL DE LOS CENTROS DE AVISOS DE CICLONES TROPICALES, OACI (TCAC) - ZONAS DE RESPONSABILIDAD

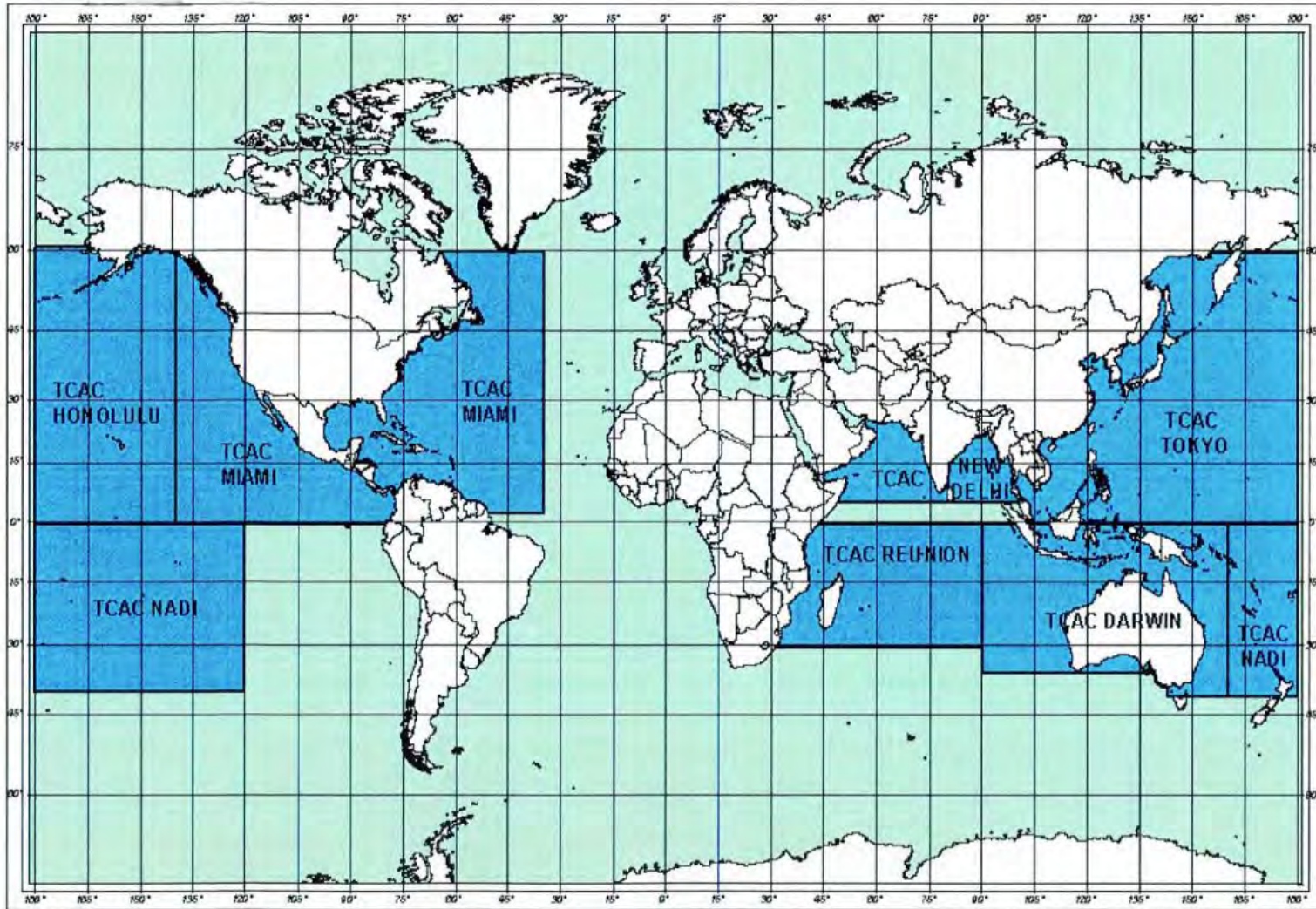


Figure: Areas of responsibility of the TCACs

## **APPENDIX F**

### **VOLCANIC ASH ADVISORY CENTRES**

#### **Explanation of Table**

- Col. 1: Name of the volcanic ash advisory centre (VAAC).
- Col 2: ICAO location indicator of VAAC (for use in the WMO heading of advisory bulletin).
- Col 3: WMO heading (TTAAii CCCC) of the FV bulletin.
- Col 4: Area of responsibility for the preparation of advisory information on volcanic ash by the VAAC in column 1.
- Col 5: MWOs to which the information on volcanic ash should be sent.
- Col 6: ICAO location indicator of the MWOs in column 7.
- Col 7: ACCs/FICs to which the information on volcanic ash should be sent.
- Col 8: ICAO location indicator of the ACCs/FICs in column 9.
- Col 9: Remarks (e.g., Any other bulletin-specific information).

VAAC		WMO Heading TTAAii CCCC	Area of Responsibility	MWO to which advisory information is to be sent		ACC/FIC to which advisory information is to be sent		Remarks
Name (State)	ICAO location indicator			Name	ICAO location indicator	Name	ICAO location indicator	
1	2	3	4	5	6	7	8	9
<b>Anchorage</b> (United States)	PAWU	FVAK21-25 PAWU	Please refer to the ICAO Doc. 9766 "HANDBOOK ON THE INTERNATIONAL AIRWAYS VOLCANO WATCH (IAVW)". <a href="https://www.icao.int/airnavigation/METP/MOGVA%20Reference%20Documents/Handbook%20on%20the%20IAVW,%20Doc%209766.pdf">https://www.icao.int/airnavigation/METP/MOGVA%20Reference%20Documents/Handbook%20on%20the%20IAVW,%20Doc%209766.pdf</a>					ii = 21 – 25; up to 5 different bulletins possible at a time according to the number of VA clouds in the VAAC's area of responsibility.
<b>Darwin</b> (Australia)	ADRM	FVAU01-10 ADRM						
<b>Tokyo</b> (Japan)	RJTD	FVFE01 RJTD						
<b>Toulouse</b> (France)	LFPW	FVXX01-04 LFPW						
<b>Washington</b> (United States)	KNES	FVXX20-27 KNES						ii = 20 – 27; up to 8 different bulletins possible at a time according to the number of VA clouds in the VAAC's area of responsibility.
<b>Wellington</b> (New Zealand)	NZKL	FVPS01-05 NZKL						

CURRENT STATUS OF ICAO VOLCANIC ASH ADVISORY CENTRES (VAAC) - AREAS OF RESPONSIBILITY  
 SITUATION ACTUELLE DES CENTRES OACI D'AVIS DE CENDRES VOLCANIQUES (VAAC) - ZONES DE RESPONSABILITE  
 ESTADO ACTUAL DE LOS CENTROS DE AVISOS DE CENIZAS VOLCANICAS (VAAC) DE LA OACI - AREAS DE RESPONSABILIDAD  
 СУЩЕСТВУЮЩЕЕ РАСПРЕДЕЛЕНИЕ КОНСУЛЬТАТИВНЫХ ЦЕНТРОВ ИКАО ПО ВУЛКАНИЧЕСКОМУ ПЕЛУ (VAAC) - РАЙОНЫ ОТВЕТСТВЕННОСТИ

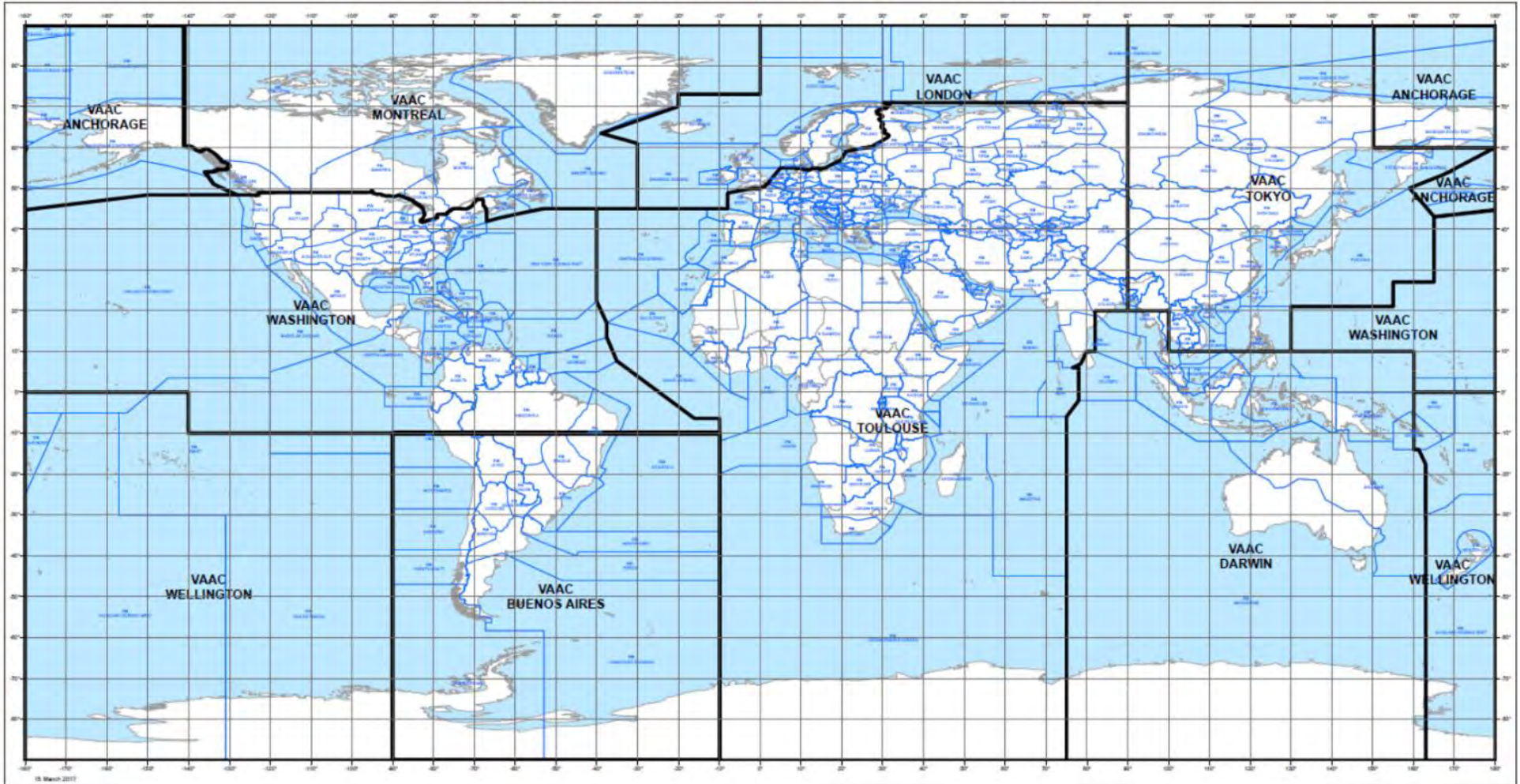


Figure: Areas of responsibility of the VAACs

## APPENDIX G

### ASIA/PACIFIC VAAC BACK-UP PROCEDURES

#### 1. Situations in which Back-up Procedures should be considered

1.1 Situations that may require VAAC responsibilities to be handed over to the back-up partner include:

- Insufficient VAAC staff resources are available to adequately perform VAAC duties;
- VAAC forecasters are unable to access the information required to adequately monitor any volcanic activity;
- The VAAC is unable to generate VAAs;
- The VAAC is unable to disseminate VAAs;
- The VAAC is under threat from an event that may limit its ability to properly perform its functions in the near future; and
- During any other situation where the VAAC Shift Supervisor considers the VAAC is unable to properly perform its functions.

#### 2. Actions to be taken by Routine VAAC to initiate handover to Back-up VAAC

2.1 The VAAC Shift Supervisor will request back-up from Back-up VAAC using the VAAC contact details contained within IAVW Handbook (ICAO Doc. 9766) Table 4-2. Requests are to be made using the following media in this order:

- a. Fax;
- b. Telephone; and
- c. Email.

2.2 Using the appropriate communications forms, provide detailed information regarding the following:

- a. Expected duration and nature of outage;
- b. Current Volcanic Ash Advisories including:
  - Volcano names
  - Next routine issue times
  - Sequence number
  - What has been observed on satellite imagery
  - What other reports have been received e.g. Volcanological Agency Reports, AIREPs, ASHTAMs, SIGMETs, phone calls or emails
  - Forecast strategy and expected developments; and
- c. Other volcanoes of interest including:
  - Any volcanoes for which an imminent eruption has been forecast
  - Any volcanoes exhibiting elevated levels of activity
  - Any recent volcanic activity reports received.

2.3 If possible, provide via email or fax, any information other than listed above that is not currently available to the Back-up VAAC.

2.4 Maintain a written logbook of actions taken for the duration of the back-up service.

#### 3. Actions to be taken by the Back-up VAAC upon receipt of a back-up request

3.1 Commence satellite monitoring for the Routine VAAC.

3.2 Send a confirmation message using the appropriate communications forms indicating whether operational back-up for the Routine VAAC is able to be commenced.

3.3 Continue routine satellite monitoring and issue VAA as required to the relevant AFTN addresses.

3.4 Send VAA to external users advising of the outage and advising Back-up VAAC contact details as per appropriate VAA proforma.

3.5 Advise volcanological agencies that new information should be sent directly to the Back-up VAAC.

3.6 Maintain a written logbook of actions taken for the duration of the back-up service.

#### **4. Actions to be taken by Routine VAAC to resume normal operations**

4.1 Commence satellite monitoring for the Routine VAAC.

4.2 Send a notification of intent to resume normal operations to the Back-up VAAC, using the appropriate communications forms.

4.3 Upon receipt of confirmation from the Back-up VAAC, continue routine satellite monitoring and issue VAA as required to the appropriate AFTN addresses.

4.4 Issue VAA to external users advising of the resumption of normal operations by the Routine VAAC as per appropriate VAA pro forma.

4.5 Advise volcanological agencies that information should now be sent directly to the Routine VAAC.

4.6 Prepare an event report summarizing the significant actions and any other relevant information contained within the logbooks of the Back-up VAAC and Routine VAAC.

#### **5. Actions to be taken by Back-up VAAC upon receipt of intent to resume normal operations notification from the Routine VAAC**

5.1 Send a confirmation receipt for the intent to resume normal operations notification, using the appropriate communications forms.

5.2 Using the appropriate communications forms, provide detailed information regarding:

- a. Details of current Volcanic Ash Advisories including:
  - Volcano names
  - Next routine issue times
  - Sequence number
  - What has been observed on satellite imagery
  - What other reports have been received e.g. Volcanological Agency Reports, AIREPs, ASHTAMs, SIGMETs, phone calls or emails
  - Current forecast strategy and expected developments; and
- b. Other volcanoes of interest including:
  - Any volcanoes for which an imminent eruption has been forecast
  - Any volcanoes exhibiting elevated levels of activity
  - Any recent volcanic activity reports received.

5.3 Provide the Routine VAAC with copies of logbooks created by the Back-up VAAC during the back-up event.

5.4 Cease routine satellite monitoring for the Routine VAAC.

---

## APPENDIX H

### TOKYO/DARWIN VAAC BACK-UP TEST PROCEDURES

#### 1. Introduction

- 1.1 The *Handbook on the International Airways Volcano Watch (IAVW) — Operational Procedures and Contact List* (Doc 9766) recommends that Volcanic Ash Advisory Centres (VAACs) should conduct back-up tests at least annually.
- 1.2 The Tokyo and Darwin VAACs have developed a mutual back-up arrangement that includes procedures for undertaking a back-up test as described in Doc 9766.

#### 2. Purpose and Scope of VAAC Back-up tests

- 2.1 The purpose of the VAAC back-up test is to ensure that internal procedures for the handover of responsibility and the issue of products for the other VAAC's area of responsibility are robust and functional.
- 2.2 The scope of the test also includes checking the dissemination pathways of the volcanic ash advisory (VAA) messages. However it is not designed to check the issuance of volcanic ash SIGMET and so there is **no requirement** to issue test SIGMETs.

#### 3. Back-up test of VAAC Darwin by VAAC Tokyo

- 3.1 On the specified date for the test, at 0100UTC on VAAC Darwin will request back-up services from VAAC Tokyo according to internal procedures and using the operational VAAC contact details contained within the IAVW Handbook (Doc 9766) Table 4-2. VAAC Tokyo will issue a VAA for commencement of back-up test to participating operational units as per the VAA example in Attachment 1A (i) and the AFTN addresses in Attachment 2A.
- 3.2 VAAC Tokyo will issue a VAA for VAAC back-up test to participating operational units as per the VAA example in Attachment 1A (ii) and the AFTN addresses in Attachment 2A. All recipients (ACCs/FICs, MWOs, WAFCs and RODBs) of this VAA are requested to **respond to VAAC Darwin** using the email address [darwin.vaac@bom.gov.au](mailto:darwin.vaac@bom.gov.au) and the subject 'VAA TEST' with an affirmative or negative response regarding the receipt of the test VAA.
- 3.3 At 0130UTC VAAC Darwin will notify of intent to resume normal operations to VAAC Tokyo, and at 0145UTC VAAC Darwin will issue a VAA for cessation of back-up test to participating operational units as per the VAA example in Attachment 1A (iii) and the AFTN addresses in Attachment 2A.
- 3.4 MWOs should NOT issue a test SIGMET at any stage of the test.

#### 4. Back-up test of VAAC Tokyo by VAAC Darwin

- 4.1 At 0200UTC, the VAAC Tokyo will request back-up services from VAAC Darwin according to internal procedures and using the operational VAAC contact details contained within the IAVW Handbook (Doc 9766) Table 4-2. VAAC Darwin will issue a VAA for commencement of back-up test to participating operational units as per the VAA example in Attachment 1B (i) and the AFTN addresses in Attachment 2B.

- 4.2 VAAC Darwin will issue a VAA for VAAC back-up test to participating operational units as per the VAA example in Attachment 1B (ii) and the AFTN addresses in Attachment 2B. All recipients (ACCs/FICs, MWOs, WAFCs and RODBs) of this VAA are requested to **respond to VAAC Tokyo** using the email address [vaac.tokyo@volash.kishou.go.jp](mailto:vaac.tokyo@volash.kishou.go.jp) and the subject 'VAA TEST' with an affirmative or negative response regarding the receipt of the test VAA.
  - 4.3 At 0230UTC VAAC Tokyo will notify of intent to resume normal operations to VAAC Darwin, and at 0245UTC VAAC Tokyo will issue a VAA for cessation of back-up test to participating operational units as per the VAA example in Attachment 1B (iii) and the AFTN addresses in Attachment 2B.
  - 4.4 MWOs should NOT issue a test SIGMET at any stage of the test.
- 5. Back-up test termination and reporting**
- 5.1 At 0300UTC the test will be terminated.
  - 5.2 In case of significant eruption, the test should be ceased.
  - 5.3 During the test each VAAC will maintain a logbook of events and will provide the other VAAC with a copy.
  - 5.4 Email responses to the VAA for VAAC back-up test will be analyzed by the VAACs. Both VAACs will analyze the responses to the test VAAs and will present the results to the conjoint meeting of the Asia/Pacific Meteorological Information Exchange Working Group or an appropriate expert group (or groups) that may be required to progress International Airways Volcano Watch (IAVW) related work..

## ATTACHMENT 1A – SAMPLE VAA MESSAGES

### (i) VAA for commencement of back-up test; AFTN message from VAAC Tokyo to operational units in VAAC Darwin area of responsibility:

FF \*\*\*\*\*  
DDHHMM RJTDYMYX  
FVAU01 ADRM DDHHMM  
VA ADVISORY  
STATUS: TEST  
DTG: YYYYMMDD/HHMMZ  
VAAC: DARWIN  
VOLCANO: NOTICE 999999  
PSN: S8959 E9959  
AREA: UNKNOWN  
SUMMIT ELEV: 9999M  
ADVISORY NR: YYYY/N  
INFO SOURCE: NIL  
AVIATION COLOUR CODE: NIL  
ERUPTION DETAILS: NIL  
OBS VA DTG: NIL  
OBS VA CLD: NIL  
FCST VA CLD +6HR: NO VA EXP  
FCST VA CLD +12HR: NO VA EXP  
FCST VA CLD +18HR: NO VA EXP  
RMK: VAAC DARWIN AND VAAC TOKYO ARE CONDUCTING A BACK UP TEST NOW.  
THIS IS A TEST NOTICE ISSUED BY VAAC TOKYO FOR THE VAAC DARWIN AREA  
OF RESPONSIBILITY ANNOUNCING THE START OF BACK UP TEST FOR VAAC  
DARWIN BY VAAC TOKYO.  
NXT ADVISORY: NO FURTHER ADVISORIES.

### (ii) VAA for VAAC back-up test; AFTN message from VAAC Tokyo to operational units in VAAC Darwin area of responsibility:

FF \*\*\*\*\*  
DDHHMM RJTDYMYX  
FVAU01 ADRM DDHHMM  
VA ADVISORY  
STATUS: TEST  
DTG: YYYYMMDD/HHMMZ  
VAAC: DARWIN  
VOLCANO: TEST 999999  
PSN: S8959 E9959  
AREA: UNKNOWN  
SUMMIT ELEV: 9999M  
ADVISORY NR: YYYY/N  
INFO SOURCE: NIL  
AVIATION COLOUR CODE: NIL  
ERUPTION DETAILS: NIL  
OBS VA DTG: NIL  
OBS VA CLD: NIL  
FCST VA CLD +6HR: NO VA EXP  
FCST VA CLD +12HR: NO VA EXP  
FCST VA CLD +18HR: NO VA EXP  
RMK: THIS IS A TEST ADVISORY ISSUED BY VAAC TOKYO  
FOR THE VAAC DARWIN AREA OF RESPONSIBILITY NORTH OF LATITUDE 20S. PLEASE  
ACKNOWLEDGE RECEIPT OF THIS ADVISORY BY SENDING AN EMAIL TO  
DARWIN.VAAC AT BOM.GOV.AU

NXT ADVISORY: NO FURTHER ADVISORIES.

**(iii) VAA for cessation of back-up test; AFTN message from VAAC Darwin to operational units in VAAC Darwin area of responsibility:**

FF \*\*\*\*\*  
DDHHMM YPDMYMYX  
FVAU01 ADRM DDHHMM  
VA ADVISORY  
STATUS: TEST  
DTG: YYYYMMDD/HHMMZ  
VAAC: DARWIN  
VOLCANO: NOTICE 999999  
PSN: S8959 E9959  
AREA: UNKNOWN  
SUMMIT ELEV: 9999M  
ADVISORY NR: YYYY/N  
INFO SOURCE: NIL  
AVIATION COLOUR CODE: NIL  
ERUPTION DETAILS: NIL  
OBS VA DTG: NIL  
OBS VA CLD: NIL  
FCST VA CLD +6HR: NO VA EXP  
FCST VA CLD +12HR: NO VA EXP  
FCST VA CLD +18HR: NO VA EXP  
RMK: VAAC DARWIN AND VAAC TOKYO ARE CONDUCTING A BACK UP TEST NOW.  
THIS IS A TEST NOTICE ISSUED BY VAAC DARWIN FOR THE VAAC DARWIN AREA  
OF RESPONSIBILITY ANNOUNCING THE END OF BACK UP TEST FOR VAAC DARWIN  
BY VAAC TOKYO.  
NXT ADVISORY: NO FURTHER ADVISORIES.

(\*\*\*\*\* Indicates appropriate AFTN addresses as per Attachment 2A)

## ATTACHMENT 1B – SAMPLE VAA MESSAGES

### (i) VAA for commencement of back-up test; AFTN message from VAAC Darwin to operational units in VAAC Tokyo area of responsibility:

FF \*\*\*\*\*  
DDHHMM YPDMYMYX  
FVFE01 RJTD DDHHMM  
VA ADVISORY  
STATUS: TEST  
DTG: YYYYMMDD/HHMMZ  
VAAC: TOKYO  
VOLCANO: NOTICE 999999  
PSN: S8959 E9959  
AREA: UNKNOWN  
SUMMIT ELEV: 9999M  
ADVISORY NR: YYYY/N  
INFO SOURCE: NIL  
AVIATION COLOUR CODE: NIL  
ERUPTION DETAILS: NIL  
OBS VA DTG: NIL  
OBS VA CLD: NIL  
FCST VA CLD +6HR: NO VA EXP  
FCST VA CLD +12HR: NO VA EXP  
FCST VA CLD +18HR: NO VA EXP  
RMK: VAAC DARWIN AND VAAC TOKYO ARE CONDUCTING A BACK UP TEST NOW.  
THIS IS A TEST NOTICE ISSUED BY VAAC DARWIN FOR THE VAAC TOKYO AREA  
OF RESPONSIBILITY ANNOUNCING THE START OF BACK UP TEST FOR VAAC  
TOKYO BY VAAC DARWIN.  
NXT ADVISORY: NO FURTHER ADVISORIES.

### (ii) VAA for VAAC back-up test; AFTN message from VAAC Darwin to operational units in VAAC Tokyo area of responsibility:

FF \*\*\*\*\*  
DDHHMM YPDMYMYX  
FVFE01 RJTD DDHHMM  
VA ADVISORY  
STATUS: TEST  
DTG: YYYYMMDD/HHMMZ  
VAAC: TOKYO  
VOLCANO: TEST 999999  
PSN: S89.59 E99.59  
AREA: UNKNOWN  
SUMMIT ELEV: 9999M  
ADVISORY NR: YYYY/N  
INFO SOURCE: NIL  
AVIATION COLOUR CODE: NIL  
ERUPTION DETAILS: NIL  
OBS VA DTG: NIL  
OBS VA CLD: NIL  
FCST VA CLD +6HR: NO VA EXP  
FCST VA CLD +12HR: NO VA EXP  
FCST VA CLD +18HR: NO VA EXP  
RMK: THIS IS A TEST ADVISORY ISSUED BY DARWIN  
VAAC FOR THE VAAC TOKYO AREA OF RESPONSIBILITY. PLEASE  
ACKNOWLEDGE RECEIPT OF THIS ADVISORY BY SENDING AN EMAIL TO  
VAAC.TOKYO AT VOLASH.KISHOU.GO.JP

NXT ADVISORY: NO FURTHER ADVISORIES.

**(iii) VAA for cessation of back-up test; AFTN message from VAAC Tokyo to operational units in VAAC Tokyo area of responsibility:**

FF \*\*\*\*\*

DDHHMM RJTDYMYX

FVFE01 RJTD DDHHMM

VA ADVISORY

STATUS: TEST

DTG: YYYYMMDD/HHMMZ

VAAC: TOKYO

VOLCANO: NOTICE 999999

PSN: S89.59 E99.59

AREA: UNKNOWN

SUMMIT ELEV: 9999M

ADVISORY NR: YYYY/N

INFO SOURCE: NIL

AVIATION COLOUR CODE: NIL

ERUPTION DETAILS: NIL

OBS VA DTG: NIL

OBS VA CLD: NIL

FCST VA CLD +6HR: NO VA EXP

FCST VA CLD +12HR: NO VA EXP

FCST VA CLD +18HR: NO VA EXP

RMK: VAAC DARWIN AND VAAC TOKYO ARE CONDUCTING A BACK UP TEST NOW.

THIS IS A TEST NOTICE ISSUED BY VAAC TOKYO FOR THE VAAC TOKYO AREA

OF RESPONSIBILITY ANNOUNCING THE END OF TEST FOR VAAC TOKYO BY VAAC

DARWIN.

NXT ADVISORY: NO FURTHER ADVISORIES.

(\*\*\*\*\* Indicates appropriate AFTN addresses as per Attachment 2B)

## ATTACHMENT 2A

AFTN addresses for exchange of VAAC back-up test VAA messages in the VAAC Darwin area of responsibility

YBZZPUXX (VAAC Darwin)					
AGGGZQZX	NZKLYMYX	VTBSYMYX	WBFCZQZX	YAMBZGZA	YPDNZAZX
AGGHYMYX	RJAAJALO	VVGLYMYX	WBKKYMYX	YAMBZTZX	YPDNZGZA
AYPMZQZX	RJAANCAO	VVNBZQZX	WBKKZQZQ	YBBBVOZM	YPDNZTZX
AYPYANGM	RJTDYMYX	VVTSZQZX	WIIFZQZX	YBBBZRZA	YPRFYMYX
AYPYANGO	RKSIYPYX	VVTSZRZX	WIIYMYX	YBBBZRZB	YPRMYMYX
AYPYMYX	RPHIZQZX	VYYFZQZX	WMFCZQZX	YBBBZRZG	YPTNZAZX
EGLLSITV	RPLLYMYX	VYYVYMYX	WMKKMASD	YBBBZRZX	YPTNZGZA
EGZZMASI	VHHHCPAO	VYYYYMYX	WMKKYMYX	YBRFYMYX	YPTNZTZX
EGZZMPAC	VHHHYMYX	VYYYZQZX	WMKKZQZX	YMHFYMYX	YSRFYMYX
EGZZVANW	VOMFZQZX	WAAAYMYX	WRRRYNYX	YMMLJSTX	YSSYQFAM
KLGBPACO	VOMMYMYX	WAAAZQZX	WSJCZQZX	YMMZRZA	YSSYWZAX
KWBCYMYX	VOMMZQZQ	WAAFZQZX	WSSSSIAO	YMMZRZB	
LSZHWRW	VTBBYPYX	WADDYMYF	WSSSYMYX	YMMZRZG	
NFFNYPYX	VTBBZQZX	WADDYMYX	WSSSYZYK	YMMZRZX	
NZAAANZO	VTBDYMYX	WADDYOYX	YAMBZAZX	YMRFYMYX	

## ATTACHMENT 2B

AFTN addresses for exchange of VAAC back-up test VAA messages in the VAAC Tokyo area of responsibility

RJTDYMYX (VAAC Tokyo)					
CWAOYMYU	EGKKVIRW	EGLLSITV	EGRRYMYX	EGZZMASI	EGZZVANW
EHAMKLM	EHAMKLMK	EHAMKLMW	KWBCYMYX	NFFNYPYX	NZAAANZO
NZKLYMYX	PANCYMYX	RCTPYMYX	RCAAZQZX	RKRRZQZX	RKSIYMYX
RPHIZRZX	RPLLYMYV	RPLLYMYX	SAZZMAMX	UEEEYMYX	UEEEZRZX
UELLYMYX	UELLZRZX	UERRYMYX	UERRZRZX	UHBBYMYX	UHBIYMYX
UHHHYMYX	UHHHZRZX	UHMMYMYX	UHMMZRZX	UHNNYMYX	UHOOYMYX
UHPPYMYX	UHPPZRZX	UHSHYMYX	UHSSYMYX	UHWWYMYX	UIAAYMYX
UIAAZRZX	UIBBYMYX	UIIIYMYX	UIIIZRZX	UIKKYMYX	ULMMYMYX
ULMMZRZX	UNKLYMYX	UNKLZRZX	UUUYNYX	UUWZDZX	VDPYFYX
VDPYMYX	VDPZRZX	VDPZTZ	VHHHYMYX	VLVTYMYX	VTBBYPYX
VTBDYMYX	VTBSYMYX	VVGLYMYX	VVNBZRZX	VVTSZRZX	VYYYYMYX
VYYYZQZX	WSJCZRZX	WSSSYMYX	WSSSYZYX	YBBYPYX	YBZZSQJX
YMMLJSTX	YPDYMYX	ZBAAYMYX	ZBBYPYX	ZGGGYMYX	ZHHHYMYX
ZJHKYMYX	ZKPYMYX	ZLXYMYX	ZMUBYMYX	ZSSSYMYX	ZUUYMYX
ZWWWYMYX	ZYTXMYX				

### ATTACHMENT 3

List of States, participating units and tasks required\* for VAAC back-up test

STATE	UNIT TYPE	LOCATION NAME	LOC. ID.	TASK/S REQUIRED*	AFTN ADDRESS
AUSTRALIA	ACC/FIC	BRISBANE/BRISBANE INTL	YBBN	D	YBBBZRZA YBBBZRZB YBBBZRZG YBBBZRZX
AUSTRALIA	ACC/FIC	MELBOURNE ACC/FIC	YMMM	D	YMMMZRZA YMMMZRZB YMMMZRZG YMMMZRZX
AUSTRALIA	RODB	BRISBANE (FIR/FIC/ACC/COM/MET/NOF)	YBBB	D J	YBBBYPYX
AUSTRALIA	VAAC	MELBOURNE (WORLD MET CENTRE, BOM)	YMMC	A E F H I M	YPDMYMYX
CAMBODIA	ACC/FIC	PHNOM PENH	VDPP	J	VDPPZRZX
CAMBODIA	MWO	PHNOM PENH	VDPP	J	VDPPYMYX
CHINA	ACC/FIC	TAIBEI CITY/TAIBEI INTL AP	RCAA	J	RCAAZQZX
CHINA	ACC/FIC	HONG KONG FIR	VHHK	J	VHHKZQZX
CHINA	ACC/FIC	HUHHOT/BAITA	ZBHH	J	ZBHHZQZX
CHINA	ACC/FIC	HULUNBEIER/HAILAR	ZBLA	J	ZBLAZQZX
CHINA	ACC/FIC	BEIJING FIR	ZBPE	J	ZBPEZQZX
CHINA	ACC/FIC	TAIYUAN/WUSU	ZBYN	J	ZBYNZQZX
CHINA	ACC/FIC	CHANGSHA CITY	ZGCS	J	ZGCSZQZX
CHINA	ACC/FIC	GUILIN/LIANGJIANG	ZGKL	J	ZGKLZQZX
CHINA	ACC/FIC	NANNING/WUXU	ZGNN	J	ZGNNZQZX
CHINA	ACC/FIC	GUANGZHOU FIR	ZGZU	J	ZGZUZQZX
CHINA	ACC/FIC	WUHAN FIR	ZHWH	J	ZHWHZQZX
CHINA	ACC/FIC	SANYA FIR/ACC	ZJSA	J	ZJSAZQZX
CHINA	ACC/FIC	LANZHOU CITY	ZLAN	J	ZLANZQZX
CHINA	ACC/FIC	LANZHOU FIR	ZLHW	J	ZLHWZQZX
CHINA	ACC/FIC	XI'AN CITY	ZLSN	J	ZLSNZQZX
CHINA	ACC/FIC	KUNMING FIR	ZPKM	J	ZPKMZQZX
CHINA	ACC/FIC	XIAMEN/GAOQI	ZSAM	J	ZSAMZQZX
CHINA	ACC/FIC	NANCHANG/CHANGBEI	ZSCN	J	ZSCNZQZX
CHINA	ACC/FIC	SHANGHAI FIR	ZSHA	J	ZSHAZQZX
CHINA	ACC/FIC	NANJING/LUKOU	ZSNJ	J	ZSNJZQZX
CHINA	ACC/FIC	HEFEI/XINQIAO	ZSOF	J	ZSOFZQZX
CHINA	ACC/FIC	QINGDAO/LIUTING	ZSQD	J	ZSQDZQZX
CHINA	ACC/FIC	JINAN CITY	ZSTN	J	ZSTNZQZX
CHINA	ACC/FIC	CHONGQING/JIANGBEI	ZUCK	J	ZUCKZQZX
CHINA	ACC/FIC	CHENGDU CITY	ZUDS	J	ZUDSZQZX
CHINA	ACC/FIC	URUMQI FIR	ZWUQ	J	ZWUQZQZX
CHINA	ACC/FIC	URUMQI/DIWOPU	ZWWW	J	ZWWWZQZX
CHINA	ACC/FIC	HARBIN/TAIPING	ZYHB	J	ZYHBZQZX
CHINA	ACC/FIC	SHENYANG FIR	ZYSH	J	ZYSHZQZX
CHINA	ACC/FIC	DALIAN/ZHOUSHUIZI	ZYTL	J	ZYTLZQZX
CHINA	MWO	TAIBEI CITY/TAIBEI INTL AP	RCTP	J	RCTPYMYX
CHINA	MWO	HONG KONG/INTERNATIONAL	VHHH	J	VHHHYMYX
CHINA	MWO	BEIJING/CAPITAL	ZBAA	J	ZBAAYMYX
CHINA	MWO	GUANGZHOU/BAIYUN	ZGGG	J	ZGGGYMYX
CHINA	MWO	WUHAN/TIANHE	ZHHH	J	ZHHHYMYX
CHINA	MWO	HAIKOU/MEILAN	ZJHK	J	ZJHKYMYX

CHINA	MWO	XI 'AN/XIANYANG	ZLXY	J	ZLXYMYX
CHINA	MWO	SHANGHAI/HONGQIAO	ZSSS	J	ZSSSYMYX
CHINA	MWO	CHENGDU/SHUANGLIU	ZUUU	J	ZUUUYMYX
CHINA	MWO	URUMQI/DIWOPU	ZWWW	J	ZWWWYMYX
CHINA	MWO	SHENYANG/TAOXIAN	ZYTX	J	ZYTXMYX
DPR KOREA	ACC/FIC	PYONGYANG (FIR)	ZKKP	J	ZKPYYMYX
DPR KOREA	MWO	SUNAN	ZKPY	J	ZKPYYMYX
FIJI	RODB	NADI/INTL	NFFN	D J	NFFNYPYX
INDIA	ACC/FIC	CHENNAI (FIC)	VOMF	D	VOMFZQZX
INDIA	MWO	CHENNAI	VOMM	D	VOMMYMYX
INDONESIA	ACC/FIC	MAKASSAR/SULTAN HASANUDDIN	WAAA	D	WAAAZQZX
INDONESIA	ACC/FIC	JAKARTA INTL/SOEKARNO- HATTA	WIII	D	WIIIZQZX
INDONESIA	MWO	MAKASSAR/SULTAN HASANUDDIN	WAAA	D	WAAAYMYX
INDONESIA	MWO	JAKARTA INTL/SOEKARNO- HATTA	WIII	D	WIIIIYMYX
JAPAN	ACC/FIC	SAPPORO ACC	RJCG	J	RJCGZQZX
JAPAN	ACC/FIC	FUKUOKA ACC	RJDG	J	RJDGZQZX
JAPAN	ACC/FIC	TOKYO ACC	RJTG	J	RJTGZQZX
JAPAN	ACC/FIC	NAHA ACC	RORG	J	RORGZQZX
JAPAN	MWO	TOKYO (CITY)	RJTD	J	RJTDYMYX
JAPAN	RODB	TOKYO (CITY)	RJTD	D J	RJAAZMYX
JAPAN	VAAC	TOKYO (CITY)	RJTD	B C G K L M	RJTDYMYX
LAO PDR	ACC/FIC	VIENTIANE (WATTAY)	VLVT	J	VLVTZQZX
LAO PDR	MWO	VIENTIANE (WATTAY)	VLVT	J	VLVTYMYX
MALAYSIA	ACC/FIC	KOTA KINABALU ACC/FIC	WBFC	D	WBFCZQZX
MALAYSIA	ACC/FIC	KUALA LUMPUR ACC/FIC	WMFC	D	WMFCZQZX
MALAYSIA	MWO	SEPANG/KL INTERNATIONAL AIRPORT	WMKK	D	WMKKYMYX
MONGOLIA	ACC/FIC	ULAANBAATAR/CHINGGIS KHAAN	ZMUB	J	ZMUBZQZX
MONGOLIA	MWO	ULAANBAATAR/CHINGGIS KHAAN	ZMUB	J	ZMUBYMYX
MYANMAR	ACC/FIC	YANGON INTERNATIONAL	VYYY	D	VYYYZQZX
MYANMAR	MWO	YANGON INTERNATIONAL	VYYY	D	VYYYMYX
PAPUA NEW GUINEA	ACC/FIC	PORT MORESBY ACC/FIC/COM	AYPM	D	AYPMZGZX
PAPUA NEW GUINEA	MWO	PORT MORESBY ACC/FIC/COM	AYPM	D	AYPMYMYX
PHILIPPINES	ACC/FIC	MANILA (ACC/FIC/COM)	RPHI	D J	RPHIZRZX
PHILIPPINES	MWO	NINOY AQUINO INTERNATIONAL AIRPORT, MANILA	RPLL	D J	RPLLYMYX
REPUBLIC OF KOREA	ACC/FIC	INCHEON ACC	RKRR	J	RKRRZQZX
REPUBLIC OF KOREA	MWO	INCHEON INTL	RKSI	J	RKSIYMYX
RUSSIAN FEDERATION	ACC/FIC	CHULMAN	UELL	J	UELLZRZX
RUSSIAN FEDERATION	ACC/FIC	KHABAROVSK/NOVY	UHHH	J	UHHHZRZX
RUSSIAN FEDERATION	ACC/FIC	MAGADAN/SOKOL	UHMM	J	UHMMZRZX
RUSSIAN FEDERATION	ACC/FIC	PETROPAVLOVSK- KAMCHATSKY/YELIZOVO	UHPP	J	UHPPZRZX

RUSSIAN FEDERATION	ACC/FIC	IRKUTSK	UIII	J	UIIIZRZX
RUSSIAN FEDERATION	MWO	CHULMAN	UELL	J	UELLMYX
RUSSIAN FEDERATION	MWO	KHABAROVSK/NOVY	UHHH	J	UHHHYMYX
RUSSIAN FEDERATION	MWO	MAGADAN/SOKOL	UHMM	J	UHMMYMYX
RUSSIAN FEDERATION	MWO	PETROPAVLOVSK-KAMCHATSKY/YELIZOVO	UHPP	J	UHPPYMYX
RUSSIAN FEDERATION	MWO	IRKUTSK	UIII	J	UIIIYMYX
SINGAPORE	ACC/FIC	SINGAPORE ACC/FIC	WSJC	D	WSJCZRZX
SINGAPORE	MWO	SINGAPORE/CHANGI	WSSS	D	WSSSYMYX
SINGAPORE	RODB	SINGAPORE/CHANGI	WSSS	D J	WSSSYZYX
SOLOMON ISLANDS	ACC/FIC	HONIARA (HENDERSON)	AGGH	D	AGGHYMYX
SOLOMON ISLANDS	MWO	HONIARA (HENDERSON)	AGGH	D	AGGHYMYX
SRI LANKA	ACC/FIC	KATUNAYAKE/BANDARANAIKE INTERNATIONAL AIRPORT COLOMBO	VCBI	D	VCBIZQZX
SRI LANKA	MWO	KATUNAYAKE/BANDARANAIKE INTERNATIONAL AIRPORT COLOMBO	VCBI	D	VCBIYMYX
THAILAND	ACC/FIC	BANGKOK (ACC/FIC/COM CENTRE)	VTBB	D J	VTBBYPYX
THAILAND	MWO	BANGKOK/SUVARNABHUMI INTL AIRPORT	VTBS	D J	VTBSYMYX
THAILAND	RODB	BANGKOK (ACC/FIC/COM CENTRE)	VTBB	D J	VTBBYPYX
UNITED KINGDOM	W AFC	UK PDAI (GEN)	EGZZ	D J	EGZZMASI
UNITED STATES	W AFC	WASHINGTON (NWS NATIONAL MET CENTER), DC.	KWBC	D J	KWBCYMYX
VIET NAM	ACC/FIC	HA NOI/NOI BAI INTERNATIONAL	VVNB	D J	VVNBZRZX
VIET NAM	ACC/FIC	HO CHI MINH/TAN SON NHAT INTERNATIONAL	VVTS	D J	VVTSZRZX
VIET NAM	MWO	GIA LAM	VVGL	D J	VVGLYMYX

\*Tasks required for VAAC back-up test

TASK ID.	TIME UTC	TASK DESCRIPTION
<b>A</b>	<b>0100</b>	VAAC Darwin will request VAAC Tokyo to commence back-up services
<b>B</b>	Sequential	VAAC Tokyo will issue a VAA (commencement of test) for VAAC Darwin area of responsibility
<b>C</b>	Sequential	VAAC Tokyo will issue a VAA (test) for VAAC Darwin area of responsibility
<b>D</b>	Sequential	MWOs/ACCs/FICs in VAAC Darwin area of responsibility and RODBs/WAFCS will respond to VAAC Darwin (using email) to confirm receipt or non-receipt of test VAA issued by Tokyo VAAC for the VAAC Darwin area of responsibility
<b>E</b>	<b>0130</b>	VAAC Darwin will notify VAAC Tokyo of intent to resume normal operations

<b>F</b>	<b>0145</b>	VAAC Darwin will issue a VAA (cessation of test) for VAAC Darwin area of responsibility
<b>G</b>	<b>0200</b>	VAAC Tokyo will request VAAC Darwin to commence back-up services
<b>H</b>	Sequential	VAAC Darwin will issue a VAA (commencement of test) for VAAC Tokyo area of responsibility
<b>I</b>	Sequential	VAAC Darwin will issue a VAA (test) for VAAC Tokyo area of responsibility
<b>J</b>	Sequential	MWOs/ACCs/FICs in VAAC Tokyo area of responsibility and RODBs/WAFCs will respond to VAAC Tokyo (using email) to confirm receipt or non-receipt of test VAA issued by VAAC Darwin for the VAAC Tokyo area of responsibility
<b>K</b>	<b>0230</b>	VAAC Tokyo will notify VAAC Darwin of intent to resume normal operations
<b>L</b>	<b>0245</b>	VAAC Tokyo will issue a VAA (cessation of test) for VAAC Tokyo area of responsibility
<b>M</b>	0100 - 0245	VAAC Tokyo and VAAC Darwin will maintain a log of events

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## APPENDIX I

### WELLINGTON/DARWIN VAAC BACKUP TEST PROCEDURES

#### 1. Introduction

1.1. The International Airways Volcano Watch Operations Group (IAVWOPSG) recognized the need for the regular testing of VAAC backup procedures that would ensure the continuing availability of Volcanic Ash Advises and identify deficiencies in the dissemination procedures of backup products. Therefore, the second meeting of IAVWOPSG held in Bangkok, 15 to 19 March 2004, adopted Conclusion 2/19, as follows:

***Conclusion 2/19 – Inclusion of VAAC backup procedures in Doc 9766***  
*That the Secretariat include in Doc 9766, Handbook on the International Airways Volcano Watch (IAVW) – Operational Procedures and Contact List, the VAAC backup procedures agreed by the group.*

1.2. Appendix D, paragraph f) of ICAO Doc.9766 - Handbook on International Airways Volcano Watch (IAVW) states that:

*The backup arrangements should be tested at least annually.*

1.3. The Wellington and Darwin VAACs have developed a mutual backup arrangement that includes procedures for undertaking a backup test as described in this document.

#### 2. Purpose and Scope of VAAC Backup tests

2.1. The purpose of the VAAC backup test is to ensure that internal procedures for the handover of responsibility and the issue of products for the other VAAC's area of responsibility are robust and functional.

2.2. The scope of the test also includes checking the dissemination pathways of the Volcanic Ash Advisory (VAA) messages.

2.3. The test is not designed to check the issuance of Volcanic Ash SIGMET and so there is **no requirement** to issue test SIGMETs.

#### 3. Backup test Procedures

##### 3.1. Procedures for Wellington – Darwin VAAC Backup tests

3.1.1. Internal procedures related to handover of responsibility and issuance of VAAs for the other VAAC's area of responsibility will be tested and the results included in a final report.

##### 3.2. Procedures for testing the dissemination of backup VAAs

3.2.1. On the specified date at 0100 UTC VAAC Darwin will request backup services from VAAC Wellington. VAAC Wellington will issue a test Volcanic Ash Advisory (VAA) for the Darwin VAAC area of responsibility south of latitude 20S. The message will indicate that it is a TEST and will follow the format given in **Section 4** of these procedures.

3.2.2. Recipients of the message **should send a confirmation email** to the email address given in the RMK section of the VAA, including the message text and the time received. If no VAA is received by 0130 UTC on the specified date, test participants are requested to **send an email advising of negative receipt** of the test VAA.

**3.2.3. MWOs should NOT issue a test SIGMET.**

3.2.4. At 0130 UTC on the specified date, VAAC Darwin will notify VAAC Wellington of intent to resume normal operations.

3.2.5. On the specified date at 0145 UTC VAAC Wellington will request backup services from VAAC Darwin. VAAC Darwin will issue a test Volcanic Ash Advisory (VAA) for the Wellington VAAC area of responsibility. The message will indicate that it is a TEST and will follow the format given in **Section 4** of these procedures.

3.2.6. Recipients of the message **should send a confirmation email** to the email address given in the RMK section of the VAA, including the message text and the time received. If no VAA is received by 0215 UTC on the specified date, test participants are requested to **send an email advising of negative receipt** of the test VAA.

**3.2.7. MWOs should NOT issue a test SIGMET.**

3.2.8. In the event of a major eruption in either area the test may be cancelled.

3.3. Processing of the test results

3.3.1. The participating Asia/Pacific VAACs, in conjunction with the Asia/Pacific Regional OPMET Databanks (RODBs), will analyse the received responses to the test messages and present the results to the APANPIRG Meteorology Sub Group (MET SG) or an appropriate expert group (or groups) that may be required to progress international airways volcano watch (IAVW) related work.

#### **4. Format of test VAA for Backup Test**

4.1. From VAAC Wellington for VAAC Darwin

```
FVAUii ADRM DDHHMM  
VA ADVISORY  
STATUS: TEST  
DTG: YYYYMMDD/HHMMZ  
VAAC: DARWIN  
VOLCANO: TEST 999999  
PSN: N1000 E10000  
AREA: UNKNOWN
```

SUMMIT ELEV: 9999M  
ADVISORY NR: YYYY/N  
INFO SOURCE: TEST TEST TEST  
AVIATION COLOUR CODE: NIL  
ERUPTION DETAILS: TEST TEST TEST  
OBS VA DTG: DD/HHMMZ  
OBS VA CLD: WIND FL099/099 VRB/99KT  
FCST VA CLD +6 HR: DD/HHMMZ NO VA EXP  
FCST VA CLD +12 HR: DD/HHMMZ NO VA EXP  
FCST VA CLD +18 HR: DD/HHMMZ NO VA EXP  
RMK: THIS IS A TEST ADVISORY ISSUED BY WELLINGTON VAAC FOR THE DARWIN  
VAAC AREA OF RESPONSIBILITY SOUTH OF LATITUDE 20S. PLEASE ACKNOWLEDGE  
RECEIPT OF THIS ADVISORY BY SENDING AN EMAIL TO DARWIN.VAAC (AT)  
BOM.GOV.AU.  
NXT ADVISORY: NO FURTHER ADVISORIES=

4.2

From VAAC Darwin for VAAC Wellington

FVPSii NZKL DDHHMM  
VA ADVISORY  
STATUS: TEST  
DTG: YYYYMMDD/HHMMZ  
VAAC: WELLINGTON  
VOLCANO: TEST 999999  
PSN: N1000 E10000  
AREA: UNKNOWN  
SUMMIT ELEV: 9999M  
ADVISORY NR: YYYY/N  
INFO SOURCE: TEST TEST TEST  
AVIATION COLOUR CODE: NIL  
ERUPTION DETAILS: TEST TEST TEST  
OBS VA DTG: DD/HHMMZ  
OBS VA CLD: WIND FL099/099 VRB/99KT  
FCST VA CLD +6 HR: DD/HHMMZ NO VA EXP  
FCST VA CLD +12 HR: DD/HHMMZ NO VA EXP  
FCST VA CLD +18 HR: DD/HHMMZ NO VA EXP  
RMK: THIS IS A TEST ADVISORY ISSUED BY DARWIN VAAC FOR THE WELLINGTON  
VAAC AREA OF RESPONSIBILITY. PLEASE ACKNOWLEDGE RECEIPT OF THIS  
ADVISORY BY SENDING AN EMAIL TO VAAC (AT) METSERVICE.COM  
NXT ADVISORY: NO FURTHER ADVISORIES=

## APPENDIX J

### ADDITIONAL CRITERIA FOR ISSUANCE OF SIGMET FOR THUNDERSTORM

#### 1. Introduction

1.1 As defined in ICAO Annex 3 Appendix 6, SIGMET are required to be issued for thunderstorms when they are:

- (i) obscured with or without hail (OBSC TS /TSGR);
- (ii) embedded with or without hail (EMBD TS/TSGR);
- (iii) frequent with or without hail (FRQ TS/TSGR); and
- (iv) squall line with or without hail (SQL TS/TSGR).

1.2 ICAO Annex 3, Appendix 6 further defines that an area of thunderstorms and cumulonimbus clouds should be considered:

- (i) **Obscured (OBSC)** if it is obscured by haze or smoke or cannot be readily seen due to darkness;
- (ii) **Embedded (EMBD)** if it is embedded within cloud layers and cannot be readily recognized;
- (iii) **Frequent (FRQ)** if within that area there is little or no separation between adjacent thunderstorms with a maximum spatial coverage greater than 75 per cent of the area affected, or forecast to be affected, by the phenomenon (at a fixed time or during the period of validity); and
- (iv) **Squall line (SQL)** should indicate a thunderstorm along a line with little or no space between individual clouds.

1.3 Some States have developed additional criteria, such as minimum area of coverage of thunderstorms and minimum length of squall line, for the issuance of SIGMET for thunderstorms. Examples of additional criteria developed by the Bureau of Meteorology, Australia (The Bureau) and the Japan Meteorological Agency (JMA) are provided in Section 2 and Section 3 below. Individual States may consider developing additional criteria in consultation with users.

#### 2. Additional Criteria for Issuance of SIGMET for Thunderstorms Developed by the Bureau of Meteorology, Australia.

##### 2.1 Minimum area affected:

2.1.1 A minimum area was introduced for the area affected by embedded (EMBD TS) and frequent (FRQ TS) thunderstorm SIGMETs as follows:

- (i) For areas where low-level area forecasts are valid, EMBD and FRQ TS should be affecting an area of 3000 NM<sup>2</sup> (approximately 1 degree

squared) or more. This covers areas of high-level air traffic movements and low-level flights; and

- (ii) For areas outside of where low-level area forecasts are valid, EMBD and FRQ TS should be affecting an area of 7200 NM<sup>2</sup> (approximately 2 degree by 1 degree) or more. This covers areas where there are lower air traffic movements and generally high-level flights with airborne radar to tactically fly around thunderstorms.

## 2.2 Definition of “little or no separation”:

2.2.1 When determining if thunderstorms have “little or no separation”, as required for FRQ and SQL TS SIGMET, the following criterion is used:

- (i) The distance between adjacent thunderstorm cells to be applied for frequent (FRQ TS) and squall line (SQL TS) SIGMETs shall be approximately 40 NM between identifiable thunderstorm cells.

2.2.2 This criterion is based on the Australian Civil Aviation Safety Authority and the Federal Aviation Administration recommendations for thunderstorm avoidance which recommends pilots avoid any thunderstorm identified as severe, or giving an intense radar echo, by at least 20NM.

## 2.3 Length of squall line:

2.3.1 When determining if a line of thunderstorms requires a squall line SIGMET, the following criteria is applied:

- (i) A squall line (SQL TS) SIGMET is issued for thunderstorms along a line of approximately 100 NM or more in length, with little or no separation between the clouds

## 3. **Additional Criteria for Issuance of SIGMET for Thunderstorms Developed by the Japan Meteorological Agency.**

### 3.1 FRQ TS

3.1.1 FRQ TS SIGMETs are issued for CB clouds associated with lightning covering greater than or equal to 50% of the area concerned (CB coverage is greater than or equal to OCNL). If there are developing CB clouds with their coverage of OCNL, it is considered they will become FRQ CB. The criteria for minimum size required for SIGMET issuance are as below;

- (1) Approach control areas around congested airports : 10,000 sq. km (100km x 100km)
- (2) Around main air routes in Japan : 22,500 sq.km (150km x 150km)
- (3) Other area (oceanic region) : 40,000 sq.km (200km x 200km)

## 3.2 EMBD TS

- 3.2.1 The criteria of CB coverage and minimum size for EMBD TS SIGMET are same as those of FRQ TS. If CB areas are embedded within cloud layers and cannot be readily recognized, EMBD TS SIGMETs are issued.

## 3.3 SQL TS

- 3.3.1 SQL TS SIGMETs are issued for line-shaped CB clouds with length of more than 500km and width of more than 100km.
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## APPENDIX K

### SPACE WEATHER ADVISORIES (SWXA)

#### 1. Introduction

1.1 ICAO Annex 3 Amendment 78 (effective November 2018) introduced the provision of Space Weather Advisories (SWXA) issued by designated Space Weather Centres.

1.2 **SIGMETs are not issued for Space Weather.** The purpose of this appendix is to provide a brief description on the SWXA products.

#### 2. Example Space Weather Advisories

##### Space weather advisory message (GNSS effects)

SWX ADVISORY  
DTG: 20161108/0100Z  
SWXC: DONLON\*  
ADVISORY NR: 2016/2  
NR RPLC: 2016/1  
SWX EFFECT: GNSS MOD  
OBS SWX: 08/0100Z HNH HSH E18000 – W18000  
FCST SWX +6 HR: 08/0700Z HNH HSH E18000 – W18000  
FCST SWX +12 HR: 08/1300Z HNH HSH E18000 – W18000  
FCST SWX +18 HR: 08/1900Z HNH HSH E18000 – W18000  
FCST SWX +24 HR: 09/0100Z NO SWX EXP  
RMK: LOW LVL GEOMAGNETIC STORMING CAUSING INCREASED AURORAL ACT AND SUBSEQUENT MOD DEGRADATION OF GNSS AVBL IN THE AURORAL ZONE. THIS STORMING EXP TO SUBSIDE IN THE FCST PERIOD. SEE WWW.SPACEWEATHERPROVIDER.WEB  
NXT ADVISORY: NO FURTHER ADVISORIES

##### Space weather advisory message (RADIATION effects)

SWX ADVISORY  
DTG: 20161108/0000Z  
SWXC: DONLON\*  
ADVISORY NR: 2016/2  
NR RPLC: 2016/1  
SWX EFFECT: RADIATION MOD  
FCST SWX: 08/0100Z HNH HSH E18000 – W18000 ABV FL 350  
FCST SWX +6 HR: 08/0700Z HNH HSH E18000 – W18000 ABV FL 350  
FCST SWX +12 HR: 08/1300Z HNH HSH E18000 – W18000 ABV FL 350  
FCST SWX +18 HR: 08/1900Z HNH HSH E18000 – W18000 ABV FL 350  
FCST SWX +24 HR: 09/0100Z NO SWX EXP  
RMK: RADIATION LVL EXCEEDED 100 PCT OF BACKGROUND LVL AT FL350 AND ABV. THE CURRENT EVENT HAS PEAKED AND LVL SLW RTN TO BACKGROUND LVL. SEE WWW.SPACEWEATHERPROVIDER.WEB  
NXT ADVISORY: NO FURTHER ADVISORIES

**Space weather advisory message (HF COM effects)**

SWX ADVISORY

DTG: 20161108/0100Z

SWXC: DONLON\*

ADVISORY NR: 2016/1

SWX EFFECT: HF COM SEV

OBS SWX: 08/0100Z DAYLIGHT SIDE

FCST SWX +6 HR: 08/0700Z DAYLIGHT SIDE

FCST SWX +12 HR: 08/1300Z DAYLIGHT SIDE

FCST SWX +18 HR: 08/1900Z DAYLIGHT SIDE

FCST SWX +24 HR: 09/0100Z NO SWX EXP

RMK: PERIODIC HF COM ABSORPTION AND LIKELY TO CONT IN THE NEAR  
TERM. CMPL AND PERIODIC LOSS OF HF ON THE SUNLIT SIDE OF THE EARTH

EXP. CONT HF COM DEGRADATION LIKELY OVER THE NXT 7 DAYS. SEE

[WWW.SPACEWEATHERPROVIDER.WEB](http://WWW.SPACEWEATHERPROVIDER.WEB)

NXT ADVISORY: 20161108/0700Z

\*DONLON is a fictitious Space Weather Centre

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## APPENDIX L

### GUIDELINES FOR OPERATIONAL SIGMET COORDINATION

1. Inconsistencies in SIGMET information issued by different Meteorological Watch Offices (MWOs) across Flight Information Region (FIR) boundaries pose safety concerns to airspace users. Improved cross-FIR-boundary coordination and sharing of meteorological (MET) information between MWOs concerned is necessary to ensure seamlessness in SIGMET information across FIR boundaries.

2. A concerted effort within the MET community to improve operational coordination across FIR boundaries to provide harmonized MET information for hazardous weather phenomena is of great benefit to airspace users. To this end, the Asia/Pacific Air Navigation Planning and Implementation Group (APANPIRG) adopted the following conclusions in 2015 and 2017:

- **Conclusion APANPIRG/26/62** – Cross-border MET Collaboration and Coordination

*Recognising the presence of SIGMET weather phenomena that straddles across boundaries, States/Administrations are encouraged to promote cross-border collaboration and coordination to harmonise the MET products of such phenomena between Meteorological Authorities to enhance MET support for ATM in the Asia/Pacific Region.*

- **Conclusion APANPIRG/28/30** – SIGMET coordination in the APAC Region

*That, States and Administrations are encouraged to:*

- a) Participate in cross-FIR-boundary SIGMET coordination on a bilateral or multilateral basis for seamless hazardous weather information for the benefit of aviation users, as well as advancing the capabilities of participating MWOs in the issuance of SIGMETs for cross-border hazardous weather phenomena; and*
- b) Continue to share outcomes from SIGMET coordination activities and consider a step-by-step integration of SIGMET coordination activities in the region when operationally ready.*

3. In Amendment 78 to ICAO Annex 3 "Meteorological Services for International Air Navigation", a reference to ICAO Doc. 8896 "Manual of Aeronautical Meteorological Practices" was incorporated, which provides guidance on coordination between MWOs on a bilateral or multilateral basis to encourage MWOs to adopt a coordinated approach in SIGMET issuance.

4. This document was developed to provide MWOs with guidelines on SIGMET coordination, including planning and implementing operationally.

#### **b. Objectives and Guiding Principles**

5. Prior to implementing SIGMET coordination with neighboring MWOs it is important for the participating MWOs to agree to the following objectives and guiding principles:

- To share information and enhance coordination between MWOs to ensure seamless

- MET information across borders improved quality of SIGMET information;
- To undertake effective and efficient coordination between MWOs to avoid any delays. Coordination should not be conducted at the expense of the quality and timeliness of the issuance of SIGMET;
  - To put in place a consultative coordination process to facilitate consensus between participating MWOs. However, each MWO remains responsible for the SIGMET(s) issued within their respective area of responsibility (AoR) and in the event that consensus cannot be reached, each MWO retains the right to adjust parameters and assess SIGMETs in their AoR;
  - To ensure subsequent issuance of SIGMETs are in line with the guidance provided in the "*ICAO Asia/Pacific Regional SIGMET Guide*" and ICAO Doc 8896 "*Manual of Aeronautical Meteorological Practice*", and complies with relevant provisions on SIGMET content and issuance in accordance with ICAO Annex 3 on "*Meteorological Service for International Air Navigation*".

### **c. Preliminary Requirements**

6. Prior to operationalising SIGMET coordination, the following requirements should be considered.

#### **6.1. Bilateral or multilateral coordination**

- 6.1.1. MWOs should determine whether coordination is required on a bilateral or multilateral basis.
- 6.1.2. Bilateral coordination is considered straightforward since consensus is only required between two MWOs. Interaction with only one MWO may assist with timely issuance of SIGMETs.
- 6.1.3. Multilateral coordination is necessary for the issuance of harmonized SIGMETs for multiple FIRs. However, there may be added complexities arising from diversity of views in multilateral discussions that may cause issues in reaching consensus.

#### **6.2. Formalizing coordination arrangements**

- 6.2.1. MWOs should formalize operational arrangements for SIGMET coordination to establish a common understanding on what SIGMET coordination entails. The different modalities include a Letter of Agreement, the Exchange of Letters or a Memorandum of Understanding. Such arrangements can be made on a bilateral or multilateral basis, depending on how coordination is conducted.

#### **6.3. Coordination procedures**

- 6.3.1. MWOs should jointly develop and endorse a set of clear procedures for SIGMET coordination, which then should be adopted when facilitating SIGMET coordination process.
- 6.3.2. While there are special circumstances for each region (or sub-region) and different challenges (e.g. availability of communications link, language differences, in-house processes), procedures that are developed based on commonalities shared amongst the participating MWOs (e.g. weather pattern and climatology) are the most helpful

tools in overcoming differences and challenges.

- 6.3.3. Procedures may include methodology of coordination (including common situational awareness tools), a communications protocol, criterion for issuances, and methodology for review and evaluation. Each of these is discussed in greater detail in subsequent sections.

#### **d. Operational Coordination**

7. The aim of SIGMET coordination is to consult with the participating MWOs, exchange content and reach an agreement.
8. Content to be discussed includes:
  - vertical extent;
  - boundaries;
  - direction and speed of movement of the SIGMET phenomenon observed, and/or expected to affect, two or more areas of responsibility.
9. Initiation of SIGMET coordination
  - 9.1. Coordination can be initiated by any of the participating MWOs. However, the following protocols are recommended:
    - When hazardous weather phenomenon warranting a SIGMET is observed or forecast in an AoR and is expected to move in a direction such that an adjacent FIR(s) may be affected, the MWO that issued the initial SIGMET should initiate consultation with the neighboring MWO(s).
    - When hazardous weather phenomenon warranting a SIGMET is observed or forecast across FIR boundaries, the MWO with the largest proportion of the hazardous weather phenomenon in its FIR should initiate consultation with the neighboring MWO(s).
10. Common interface
  - 10.1. It is helpful to have access to a common interface (such as a web application) where observational and/or Numerical Weather Prediction (NWP) data can be shared to enable common situational awareness amongst the operational meteorologists. The interface allows operational meteorologists on duty at each MWO to have a shared view of the weather situation and prognosis, before coming to a consensus on the area and parameters to be included in the SIGMET. Hence, graphical presentation of observations, NWP data, and SIGMETs issued on the common interface would be particularly helpful.
  - 10.2. If a web application is available, the application should be interactive to enable technical discussions between MWOs. Therefore, any such tools developed should incorporate functionalities that would support technical discussions, in graphical, textual and/or verbal form. Due to this requirement, it is recommended that such tools be the primary mode of communication between the participating MWOs.
11. Communications protocol

11.1. To ensure effective communication that helps to facilitate discussion whilst arriving at a consensus in a timely manner it may be necessary to develop a communications protocol that includes preset syntax, particularly for the most commonly encountered weather phenomena. Preset syntax can overcome difficulties in communications due to language differences.

12. Alternative communication modes

12.1. Alternative means of communication for operational coordination can serve as redundancy in the event of non-availability of the primary mode of communication. Participating MWOs can use various communication modes, such as telephone and mobile applications (e.g. WhatsApp), as their common contingency or complementary measure.

12.2. Other channels of communication such as video-conferencing and emails can facilitate more in-depth discussion on issues outside of operational coordination or for long-lived and prolonged weather phenomena (e.g. tropical cyclones, sand storms).

13. Establishing what constitutes consensus

13.1. It may be necessary to identify indicators of consensus. These should form part of the preliminary requirements as agreed by the participating MWOs. This establishes a common understanding of what constitutes consensus and can help focus consultation efforts to ensure consensus can be arrived at more often than not.

14. Timeliness in issuance of coordinated SIGMETs

14.1. Certain weather phenomena, such as thunderstorms, can undergo rapid development and therefore, efficient coordination is critical to ensure coordinated SIGMETs are issued in a timely manner. Participating MWOs may set time limits for consultation so that technical discussions do not become so protracted that SIGMET issuance is delayed. In most cases, discussions should not take longer than 15 minutes to complete.

15. Record of consultation cases

15.1. It is a good practice to log all cases of consultation. Items to log include the date and time of consultations, whether consensus was reached and the SIGMETs that were issued. For cases where consensus was not reached reasons should be logged. In case there is not enough time to log all elements in real time, participating MWOs can log remaining elements post event or log only specific cases, such as instances when consensus was not reached.

15.2. Records should be compiled and reviewed regularly to identify difficult cases, common issues that affect coordination and achieve consensus, etc. This will contribute to continuous improvement of the coordination procedures and cooperation between MWOs. The records may also help to highlight important technical issues which may have contributed to difficulties in SIGMET coordination. This will be discussed in a later section.

**e. Common Technical Difficulties Encountered in SIGMET Coordination**

16. Criteria for issuance

16.1. Subjectivity is inherent in weather forecasting and each MWO will have its own analysis tools and suite of NWP data to be used for analysis, assessment and forecasting. Each operational meteorologist's assessment will be informed by his or her own experience and skills. For a given set of weather conditions and NWP data, the permutation of forecasts that can be issued may have considerable spread.

16.2. The element of subjectivity is known to affect harmonization of SIGMET information. Therefore, setting objective criteria for SIGMET issuance can enable consistency in SIGMET information. The *ICAO Asia/Pacific Regional SIGMET Guide* provides general guidance, however, it should be noted that there is no one-size-fits-all guidance. Issuance criteria generally vary from region to region given that each region has its own unique weather, climate characteristics and challenges.

16.3. SIGMET coordination initiatives have brought MWOs together to discuss such technical issues but the problems are often linked to fundamental meteorological science, which require more focused efforts by the scientific community to resolve. Where appropriate, these issues could be discussed at relevant ICAO and WMO meetings so that a global perspective can be developed which in turn can provide useful guidance and standardised procedures for issuance of coordinated SIGMET. In addition, conducting a stock take of the practices and assessment methodology amongst the MWOs would help to form the basis for the development of a common set of criteria for issuance.

17. Harmonization of SIGMET across regions with different weather characteristics

17.1. As the network of MWOs participating in SIGMET coordination expands, the likelihood of coordination with an MWO with different meteorological characteristics increases. MWOs will have to factor in the different climatology of the different AoRs when drawing up coordination procedures. This information should be included in the preliminary requirements.

**f. Post Event Assessment**

18. Regular reviews

18.1. Post event, offline reviews should be conducted regularly to ensure continuous improvement is incorporated in the process. For example, regular post event review meetings at the senior meteorologists / chief meteorologists' level with input from operational meteorologists can work on resolving persistent coordination issues and refining procedures, so that the process becomes more efficient. It also promotes harmonization of SIGMET information when coordination amongst MWOs becomes more effective. Technical issues hampering consensus can also be raised for discussions at such fora.

18.2. The MWOs may consider developing case studies based on the findings from the post review events and use these for further improvements.

19. Evaluation of performance

19.1. Similar to other aviation MET products issued, there is a need to verify the forecast and evaluate the quality of the product. Participating MWOs are encouraged to conduct objective verification and evaluation of coordinated SIGMETs issued to measure the performance of the coordination effort.

20. User / stakeholder feedback

20.1. User feedback is critical in improving the SIGMET product. MWOs participating in SIGMET coordination should regularly engage users and stakeholders to solicit feedback on the utility of their SIGMETs, so as to identify areas for improvement. Verification and evaluation of SIGMET and collection of user feedback should be conducted within the States' quality management system.

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