

METWSG/5 Action Agreed 5/2

**SUBJECT TO ENDORSEMENT BY THE
METEOROLOGICAL WARNINGS STUDY GROUP (METWSG)**

**Concept of Operations
(ConOps)
for
Advisory Services for Hazardous
Meteorological Conditions
in
Support of International Air Navigation**

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Preface

The 4th meeting of ICAO's Meteorological Warning Study Group (METWSG) in May 2012 formulated action agreed 4/1 on the establishment of an ad hoc group tasked with the development of a proposal for the establishment of Regional Hazardous Weather Advisory Centres (RHWACs). As part of this agreed action, the ad hoc group was tasked to develop a concept of operations (ConOps) for a multi-regional advisory system for hazardous meteorological conditions and criteria for the selection of RHWACs by the respective Planning and Implementation Regional Groups (PIRGs) of ICAO. The 5th meeting of the METWSG in June 2013 proposed to mature the ConOps document. The objective for establishing RHWACs is to address a long-standing deficiency in SIGMET provision in some ICAO Regions and to move towards a regional-based en-route significant weather notification system.

The ConOps should guide the practical steps and measures to be taken for the establishment of RHWACs, which will have to be based on identified functional and performance requirements. It is intended to guide the implementation of RHWAC by providing a description of how RHWAC should operate in conjunction with the Meteorological Watch Offices (MWOs) while at the same time provide end users with information on hazardous meteorological conditions in support of international air navigation. It also describes the necessary infrastructure and performance framework (including competency of the personnel) for such a centre. The ConOps is to be the basis to support any future amendments to the Standards and Recommended Practices (SARPs) contained in ICAO Annex 3 – *Meteorological Service for International Air Navigation* on the provision of such information.

This document is intended as a living document and will evolve as technology and operational requirements evolve. Therefore, the focus of this document is on short-term changes to provide a baseline to define or constitute advisory services for hazardous meteorological conditions that is considered relevant to the safety of flight while recognizing that further changes to these services will be part of the continual improvement process.

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| 0.3 | Feb 2013 | Revised draft. |
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| 0.7 | 28 September 2013 | Editorial improvement to draft prior to consultation with METWSG members via correspondence. |
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Subject to METWSG endorsement

1.0 Introduction/Scope

This Concept of Operations (ConOps) is intended to outline the services that will help minimize or eliminate current deficiencies identified in some ICAO Regions in the provision of SIGMET and to move towards regional-based notification system of en-route significant weather information. This ConOps only addresses those aspects of en-route weather phenomena which may affect the safety of aircraft operations and require the issuance of SIGMET where advisory information is currently not available. This concept is similar to the current practices for advisory information on volcanic ash and tropical cyclones as currently provided by volcanic ash advisory centres (VAAC) and tropical cyclone advisory centers (TCAC) designated by regional air navigation agreement within the framework of the international airways volcano watch and tropical cyclone watch respectively. A regional hazardous weather advisory centre (RHWAC) would provide services relating to hazardous meteorological conditions including, as a minimum, thunderstorms, icing, turbulence and mountain waves, but exclusive of volcanic ash and tropical cyclones. Historical review of the status quo, gap analysis and identification of issues are given in Appendix 2.

1.1 Purpose

This ConOps describes the provision and use of SIGMET advisory in support of international air navigation and considers the functional and performance requirements to support the development of future amendments to Annex 3 for such advisories to satisfy the near-term operational needs of aviation decision-makers (including pilots, air traffic managers and airline dispatchers) while pointing to the future development of the advisory services.

1.2 Establishment of regional centers

ICAO has established precedent in the provision of advisory information with the designation of VAACs and TCACs whose original purpose was to support the issuance of SIGMET for volcanic ash and tropical cyclone respectively by meteorological watch offices (MWOs). The RHWACs are expected to be organized and to produce forecasts similar to those of the VAACs and TCACs.

1.3 Regional Hazardous Weather Advisory Centres (RHWAC) Concept Overview

RHWACs are to be designated by regional air navigation agreement, to maintain watch for the hazardous meteorological conditions (with the exception of volcanic ash and tropical cyclones) that may affect flight operations within their respective area(s) of responsibility. The RHWACs will issue advisory information, in both textual and graphical format, concerning the occurrence and/or expected occurrence of these hazardous meteorological conditions to MWOs in their area(s) of responsibility. In the short-term (2014-2017), the RHWACs would provide advisories to assist MWOs to issue SIGMETs. The advisories would alert the MWOs about the evolving hazards in their area of responsibility. Based on the information received, MWOs may then issue corresponding SIGMET information based on the advisory having considered other sources of information, such as special air-reports, and local forecast based on local experience. The advisories would also reach the users (airlines) through established ICAO communications networks and systems, e.g. AFTN, SADIS, WIFS, etc. The involvement of users is important because the users have to learn how to handle this new information message and also to enable users to monitor the implementation of the various phases.

For the longer term (2016-2020), the RHWACs would provide advisories directly to the users as regional-based notification system of significant weather. The roles of the MWOs would be to provide local meteorological data and expertise to the RHWACs for the provision of advisories, and to provide information concerning hazardous meteorological conditions for near-term and immediate service needs. Moreover, the evolving ICAO Meteorological Information Exchange Model (IWXXM) will be expanded to cover such advisory information so that the information will be exchanged in a digital code form (using XML/GML) to facilitate global exchange and possibly flight planning systems and flight management systems interoperability. Reference is made to the document titled *Strategy for the Future Provision of Information on Hazardous Meteorological Conditions* as developed by the METWSG in 2013.

2.0 Current Operations and Capabilities

Currently, MWOs established by the States with air traffic service responsibilities provide SIGMETs for en-route hazardous meteorological conditions for their area(s) of responsibility, in accordance with Annex 3. The SIGMETs are disseminated via established ICAO communication networks and systems and then used by Airline Operations Centres (AOCs) and pilots for flight planning and tactical decisions in order to avoid impacts from the expected or occurring hazardous meteorological conditions. The SIGMETs are distributed globally on AFTN via regional OPMET data banks and are provided to the world area forecast centers (WAFCs) for distribution to users via the satellite distribution system for information relating to air navigation (SADIS), the Secure SADIS FTP service and the WAFS Internet File Service (WIFS).

However, deficiencies in provision of SIGMET still exist in some regions of ICAO where some MWOs do not comply, for a variety of reasons, with the (Annex 3) requirement for the issuance of SIGMET. Over the course of many years ICAO, through its Regional Offices in the ICAO Regions, has coordinated and conducted SIGMET tests to help determine where deficiencies in services exist and what is required to eliminate those deficiencies. The results of SIGMET tests, particularly in the AFI and the ASIA-PAC Regions, has shown a very low level of SIGMET issuance by some MWOs. Of particular concern are those situations where there is complete non-issuance of a SIGMET. The lack of information has a direct impact on the safety of international air navigation since SIGMETs are intended to advise users of hazardous meteorological conditions en-route.

Unlike the VAACs and TCAC, there is currently no regional centre(s) established to support the MWOs by providing them with advisory information on other hazardous meteorological conditions.

2.1 Description of Current Operations

The functions of MWOs are described in Annex 3, Chapter 3, 3.4. MWOs issue SIGMETs for their flight information region (FIR) area(s) of responsibility in accordance with the required format identified in ICAO Annex 3, Appendix 6. Upon receipt, the SIGMET should be displayed at the relevant air traffic service (ATS) units and AOC, and transmitted to aircraft-in-flight if it is valid for the portion of the route up to two hours flying time ahead of the aircraft.

Example of SIGMET:

```
WSSR20 WSSS 091131
WSJC SIGMET 3 VALID 091140/091540 WSSS-
WSJC SINGAPORE FIR EMBD TS OBS AT 1130Z N OF N01 E OF E106 W OF E114
STNR NC=

WSFR31 LFPW 250900
LFFF SIGMET 2 VALID 251000/251400 LFPW-
LFFF PARIS FIR/UIR SEV ICE FCST WI N5000 W00015 - N5115 E00200 - N4930
E00600 - N4900 E00445 - N4845 E00500 - N4845 E00445 FL020/060 MOV SW
10KT NC=
```

2.2 Current Supporting Infrastructure

States with MWOs responsibility are expected to adequately equip the facility to be able to identify, analyze and forecast those phenomena for which SIGMET is required. Appropriate

telecommunication means should be made available at the MWO to ensure timely dissemination of SIGMETs. This dissemination includes local ATS users, AOCs, aerodrome meteorological offices where SIGMET is required for briefing and/or flight documentation, other MWOs, and regional OPMET bulletin exchange (ROBEX) centres and regional OPMET data banks. Close coordination should also be established between the MWO, and the corresponding ATS unit for transmission without delay by the ATS unit of special air-reports received.

If, for some reason, a State is not able to meet its obligations for establishing or supporting MWOs and for provision of SIGMET, arrangements should be made between the meteorological authorities concerned, that another MWO takes over these responsibilities for a certain period of time.

At present, SIGMETs (for thunderstorms, icing, turbulence and mountain waves) are prepared by MWOs, and there is no regional centre, similar to the VAACs and the TCACs, to support the MWOs in the provision of SIGMET.

3.0 Description of Changes

There have been many MWOs facing many challenges in providing SIGMETs to comply with ICAO requirements as described in Annex 3. The proposed establishment of the RHWAC is intended to provide much needed assistance to MWOs by making available advisory information concerning hazardous meteorological conditions to assist in the preparation of SIGMETs. The SIGMET advisory information and SIGMET would be made available to MWOs through different platforms such as a SIGMET monitoring webpage, SADIS and WIFS. The SIGMET advisory information would be issued in both textual and graphical format. In the short term, the graphical advisory would be issued in PNG format. In the long term, such advisory information would also be issued in a digital code form (using XML/GML) to facilitate the integration of the information into automated flight planning systems and air traffic flow management systems.¹

¹ Moreover, in the long term, the advisories issued by the RHWACs would be provided directly to the users as regional-based notification system of hazardous meteorological conditions. The regionally harmonized advisories would not be bound to the FIR boundaries, but would be expected to cover the area covered by the phenomenon or phenomena under consideration.

4.0 Proposed Concept for the establishment of Regional Centres for Hazardous Meteorological Conditions

RHWACs are proposed to be established at a regional level (designated by regional air navigation agreement) to provide advisory messages to MWOs on those weather phenomena that have identified deficiencies in SIGMET issuance at the present, including thunderstorms, turbulence, icing and mountain waves. Initially, only those areas with identified SIGMET deficiencies, such as parts of the ASIA-PAC Region and AFI Region, would require RHWACs. RHWACs could be set up in other ICAO Regions as the need may become apparent.

The function of an RHWAC would be to provide information and guidance to MWOs in its area of responsibility regarding the severity, occurrence, extent and forecast movement of hazardous meteorological conditions meeting criteria defined in Annex 3. The number of RHWACs required to support the Region and their area of responsibility would be determined through/designated by regional air navigation agreement.

The regional hazardous weather advisories (RHWA) in textual format would be disseminated in the same manner as SIGMETs. In the short-term, upon receipt of an RHWA, an MWO in the area of responsibility of the RHWAC would be expected to issue the corresponding SIGMET information having also consulted other sources of information, such as weather radar, special air-reports, and local observations and forecasts based on local experience. It is expected that the RHWA would also reach the users informally in the short term, with direct addressing that would develop over time.

4.1 Assumptions and Constraints

The success in RHWAC in improving the issuance of SIGMET is based on the following preconditions:

- Provider State with sufficient competent staff to operate the centre, real-time access to state-of-the-art numerical models to support forecasts, real-time access to satellite and other remote sensing equipment data, including meta-data; and
- The MWOs have the required telecommunication facilities to receive the RHWAs and the necessary expertise and facilities to disseminate the corresponding SIGMET information according to established practice.

4.2 Operational Environment

Support of the issuance of an RHWA requires access to the following information as a minimum:

- Real-time satellite data including “advanced” products as derived from the satellite data;
- High-resolution numerical weather prediction model products for the entire area of responsibility;
- METAR/SPECI;
- Special air-reports
- AMDAR data including EDR turbulence data (if available);
- Surface observations (SYNOP) and upper-air observations including radiosonde, wind profiler, satellite winds, etc. (if available); and
- WAFS forecasts

In addition to the above, a RHWAC provider needs to be able to support:

- Real-time visualization of the above-mentioned meteorological observations and forecasts and to produce both textual and graphical SIGMET advisories;
- Dissemination of the products via ICAO aeronautical fixed services;
- Establish an operational web-based site that allows access to all authorized users and is in compliance with ICAO *Guidelines on the Use of the Public Internet in Aeronautical Applications* (Doc 9855).
- Quality Management System based on ISO 9001:2008 and aeronautical forecasters that are properly trained and competent in identifying weather hazards relevant for the issuance of RHWA;
- Well-established links with the MWOs that are identified to have SIGMET deficiencies, so that the RHWAC has data available from the MWOs to support and maintain the climatological records of MWOs concerned; and
- Maintain currency in aeronautical meteorology in accordance with WMO Technical Regulations.

4.3 Operations

There are currently 9 VAACs (across 8 States) and 7 TCACs (across 6 States) in the world providing regionally-oriented advisory information on volcanic ash and tropical cyclone respectively. Considering the spatially rather small scale and high frequency of hazardous meteorological conditions such as intense convection, the size of the area of responsibility of a RHWAC may be smaller relative to that provided by a VAAC or a TCAC. Considering the issue of SIGMET deficiency is more serious in certain ICAO Regions than in others, in the short-term the size and number of RHWACs and areas of responsibility should be determined by regional air navigation agreement, taking into account the advice of WMO. In the long term, if the globe is to be covered fully by RHWACs, it is proposed that no more than 12 RHWACs would be needed considering regional climatology. Each RHWAC would be staffed with a sufficient number of aeronautical meteorological forecasters to continually monitor weather conditions and issue RHWAs based upon observed or expected conditions.

The advisories would be issued in both text and graphical format. The RHWAs would outline areas of hazardous meteorological conditions regardless of FIR boundaries (i.e. they would be phenomenon based). Multiple or sub-FIR areas (e.g. locally observed MTW activity) would be possible.

The RHWAs should target early detection and prediction of hazardous meteorological conditions, alerting the MWOs to developments which might indicate the hazard, e.g. intensification of a jet streak in presence of supercooled large droplets as well as the detection of the actual occurrence of the weather hazard itself.

Upon receipt of a RHWAs, the MWO would be expected to issue a corresponding SIGMET having consulted with nationally and locally available data sources (where available).

4.4 Operational Requirements for the advisories

The RHWAs would be displayed graphically (e.g. on the homepage of RHWAC) for the reference of the MWOs. Text advisory messages would be disseminated through the AFS. In the longer term, for States with the capability of doing so, the RHWAs may be disseminated in digital code form (using XML/GML) based on IWXXM for a data-centric, network-enabled provision for meteorological information. The success of the implementation of the RHWACs may depend to some extent on the development of XML/GML form for SIGMET, eliminating the apparently

highly error-prone, complex and inflexible abbreviated plain language structure of the existing SIGMET and its distribution mechanism and addressing system.

4.5 Supporting Infrastructure

The necessary changes to Annex 3 and associated guidance material (including the *Manual of Aeronautical Meteorological Practice* (Doc 8896) and regional SIGMET guides) would be made in order to cater for the establishment and functioning of RHWACs. The RHWACs should have the necessary data sources (e.g. satellite, radar, etc.) and the necessary computing capabilities, as well as the required competence and expertise of the personnel engaged in the provision of meteorological service. It would be necessary that AFS would be used to disseminate RHWAs and the users could receive them.

4.6 Benefits to Be Realized

- Timely availability of SIGMET to users to advise them about hazardous meteorological conditions en-route.
- The safety of international air navigation in areas identified as containing hazardous meteorological conditions will be enhanced.
- Better coordination of SIGMET (in terms of time and location) across FIR boundaries.

The RHWA may help the timely issuance of SIGMETs by the MWOs, especially in regions with SIGMET deficiencies. As a key performance target, the probability of detection of hazardous meteorological conditions that would be notified through the issuance of SIGMET should increase from the current 20 to 65 per cent to around 90 per cent based on a regional SIGMET advisory trial conducted in 2011 by the METWSG. Cooperation between RHWACs and MWOs, if extended to the use of common templates and basic software, should aim at a key performance target at least 75 to 90 per cent correctly formatted SIGMET. This would largely meet the desirable operational requirements of the operators and assure the safe operation of the aircraft

5.0 Requirements

5.1 Functional Requirements

The following are an initial set of functions for the provision of RHWAC information, where the RHWAC provider shall:

- Continually monitor weather conditions, identify, analyze and forecast if weather phenomena are meeting or are expected to meet the criteria established in Annex 3 for SIGMET issuance
- Receive prompt notification of hazardous meteorological conditions that would require issuance of an advisory
- Determine the current intensity, location and extent of the hazard
- Forecast the future intensity, location and extent of the hazard
- Determine airspace impacted by the hazard
- Receive notification or detect when the hazard no longer exists

5.2 Performance Requirements

As the proposed establishment of RHWAC is to provide advice to MWOs in the issuance of SIGMET, apart from the performance requirements of RHWAs, the end-to-end performance of SIGMET are also included here for completeness.

5.2.1 Existing Performance Requirements for SIGMET

The existing performance of SIGMET could be found in the Doc 8896. The relevant paragraphs are extracted below:

4.2.6 The period of validity of a SIGMET is normally up to 4 hours and should not, in any case, exceed 6 hours. In the special case of a SIGMET for volcanic ash cloud and tropical cyclones, an outlook should be included giving information for up to 6 hours beyond the normal period of validity, which includes the expected trajectory of the volcanic ash cloud and positions of the centre of the tropical cyclone.

4.2.7 SIGMET relating to the expected occurrence of weather phenomena, with the exception of volcanic ash cloud and tropical cyclones, should be issued not more than 6 hours, and preferably not more than 4 hours, before the expected time of occurrence of such phenomena. In order to provide advance warning of the existence of volcanic ash clouds and tropical cyclones, SIGMET should be issued up to 12 hours before the commencement of the period of validity or as soon as practicable if such advance warning of the existence of these phenomena is not available. These SIGMET need to be updated at least every 6 hours. SIGMET are cancelled by the issuing office

when the phenomena are no longer occurring or are no longer expected to occur in the area.

5.2.2 New Performance Requirements

There is no change to the performance requirements of SIGMET. The performance requirements of RHWAs are tabulated below.

| Performance requirement | Expected performance of RHWAs |
|-------------------------------|---|
| Validity period | For a period of up to 6 hours and an outlook out to 12 hours |
| Issuance | Every 3 hours |
| Advisory information | As soon as practicable before the expected time of occurrence of the phenomenon, or immediately upon its occurrence if the phenomenon has not been earlier forecast |
| Timeliness of SIGMET issuance | Within 30 minutes to one hour after receipt of the RHWAs depending on the nature of the hazard |

Table 1 Performance requirements, and the expected performance in the presence of RHWAs

6.0 Operational Scenarios

In the short-term (2014 to 2017), RHWACs would be established to assist MWOs in the issuance of SIGMETs. This may take the form of a semi-operational trial of the concept of RHWACs in selected regions, particularly those regions with SIGMET deficiencies. The RHWACs would monitor the meteorological conditions and forecast the occurrence of thunderstorms, icing, turbulence and mountain waves, and prepare and issue RHWAs to the MWOs to assist the issuance of SIGMETs. An amendment of relevant SIGMET guidance material would be provided. In the RHWACs, personnel competency for staff would also be established. The feedback from the MWOs could also be monitored and the RHWAs would be verified. The RHWAs would reach the users through the approved ICAO channels.²

² In the second phase, RHWACs would prepare and issue RHWAs to the users directly as replacement of the SIGMETs. The advisories would be regional based and would not be bound by the FIR boundaries. MWOs would

Here is a possible example on how the short-term measure is going to work semi-operationally. It is about the issuance of a RHWA for an area of thunderstorms (TS).

1. RHWAC notices an area that has the potential for TS development that will be over FIR A and FIR B.
2. RHWAC contacts MWOs A and B to discuss situation. MWO A has been contacted, but it is unable to contact MWO B.
3. RHWAC issues RHWA for area of TS covering portions of FIRs A and B..
4. MWO A receives RHWA and issues TS SIGMET for FIR A.
5. AOCs and ATS receive SIGMET for FIR A, but also receive RHWA which provides TS information into FIR B.

6.1 Verification and validation

The RHWA products need to be verified and validated on a regular basis per the established QMS for the RHWAC in the form of open-access reports, on various seasons, scenarios and meteorological phenomena as given in the advisories, in accordance with the agreed KPIs. To this end, advisories are compared to ground-based, remote sensing and in-situ observational data, such as surface observations and profile data (radiosondes, AMDAR, Lidar, profiler), available radar and satellite products, in order to establish their quality. SIGMET, if not already issued by an MWO, would be based on the RHWA, and also monitored and compared to the underpinning RHWA as far as possible to measure the added value of such SIGMET. The evaluation may be carried out by the RHWAC or other designated meteorological service provider(s) with the capability to do so.

For the evaluation, arrangements may have to be made for the exchange of non-real-time meteorological data for specific cases. The evaluation results would be published and available for open access on the RHWAC web sites as part of the Quality Management System.

provide information on hazardous meteorological conditions based on their national networks to the RHWACs. Reference is made to the document titled *Strategy for the Future Provision of Information on Hazardous Meteorological Conditions*.

7.0 Assessment of Impacts

The establishment of RHWACs is expected to be a means to improve the timeliness and availability of SIGMETs issued by MWOs in the short term. The feedback of MWOs and other aviation users on the use of the advisory messages would be gauged.

References

METWSG/3 SN9; METWSG/4 SN8, METWSG/5 SN16

Subject to METWSG endorsement

Appendices

Appendix 1 Acronyms used in the ConOps:

AOC – Airline Operator Centre

ATS – Air Traffic Service

FIR – Flight Information Region

IAVW – International Airways Volcano Watch

IWXXM – ICAO Meteorological Information Exchange Model

KPI – Key Performance Index

METWSG – Meteorological Warnings Study Group

MWO – Meteorological Watch Office

PIRG - Planning and Implementation Regional Group

RHWA – Regional Hazardous Weather Advisory

RHWAC – Regional Hazardous Weather Advisory Centre

SARPs - Standards and Recommended Practices

SIGMET – Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of aircraft operations.

TCAC - Tropical Cyclone Advisory Centre

VAAC - Volcanic Ash Advisory Centre

WAFC – World Area Forecast Centre

WAFS – World Area Forecast System

Appendix 2: Historical review of the status quo, gap analysis and identification of issues

1. Background information and Gap Analysis of the Status quo.

Current ICAO provisions concerning the issuance and dissemination of SIGMET information are contained in:

- Annex 3 - *Meteorological Service for International Air Navigation*, Part I, Chapter 3, 3.4 – 3.7, Chapter 7, 7.1, and Part II, Appendix 6;
- ICAO Regional Air Navigation Plans, Part VI, Basic ANP and FASID Tables MET 1B, MET 3A and MET 3B;
- Annex 11 - *Air Traffic Services*, Chapter 4, 4.2.1 and Chapter 7, 7.1;
- PANS – *Air Traffic Management*, Doc 4444, Chapter 9, 9.1.3.2;
- Regional Supplementary Procedures, Doc 7030, Part 1, 11.2.

Additional guidance on the SIGMET procedures is contained in the *Manual of Aeronautical Meteorological Practice* (Doc 8896), and the *Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services* (Doc 9377) and regional SIGMET guides.

MWOs are established by the States that have accepted the responsibility for providing ATS within a FIR or a control area. MWOs are required to maintain continuous watch over meteorological conditions affecting flight operations and the provision of SIGMET within their area of responsibility. The area of responsibility is normally the FIR concerned, but could be neighbouring FIRs as well. If, for some reason, a State is not able to meet its obligations for establishing MWOs and for provision of SIGMET, arrangements should be made between the meteorological authorities concerned, that another MWO takes over these responsibilities for a certain period of time.

While the requirements and guidance on preparation and dissemination of SIGMET are available, long-standing deficiencies in the issuance of SIGMET are observed in some parts of the world. The International Air Transport Association (IATA) has expressed concern over the safety of operations in areas where SIGMETs are rarely, if ever, issued for hazardous weather. States are requested to develop remedial action plans to meet the standards in Annex 3. Meanwhile ICAO and the World Meteorological Organization (WMO) have convened educational training seminars and developed a SIGMET poster and handbook for use by MWOs to address this issue.

Despite these various efforts, the problem of missing SIGMET, or SIGMET not being issued correctly, has continued. Consequentially, the Air Navigation Commission has deemed it essential that a Study Group be established to provide a rationalization of how to address this issue. At the second meeting of the International Civil Aviation Organization (ICAO) Meteorological Warnings Study Group (METWSG/2), it was agreed that a feasibility study be conducted to establish the viability of providing assistance to States through the introduction of SIGMET advisory information issued by selected regional centres similar to that produced by the VAACs and TCACs.

The SIGMET advisory trial was conducted in the summer of 2011: 4 May to 31 July 2011 for Asia, 4 April to 30 June 2011 for the northern part of Africa, and 4 April to 31 July 2011 for the southern part of Africa. In Asia, 18 MWOs participated in the trial, and the VCP course of WMO was arranged in China beforehand. In the northern and southern parts of Africa, there were 19 and 12 MWOs participating in the trial, respectively. MWOs, Rwanda, Burundi, Swaziland and Lesotho did not take part in the trial as they fall within the FIRs covered by other MWOs, i.e. Dar es Salaam and South Africa.

The trial showed that SIGMET advisories improved the issuance of SIGMETs by MWOs. They encourage some MWOs identified with SIGMET deficiencies in the past to issue SIGMETs. For those MWOs that have already issued SIGMETs in the past, the advisories appear to help improve the timeliness and accuracy of the SIGMETs. From the feedback of the users, it is generally supported to establish regional SIGMET advisory centres. Moreover, bilateral agreements between MWOs and the availability of more training opportunities are considered to be some other possible ways to address the SIGMET deficiencies. At the METWSG/4 meeting, the group formulated the agreed action 4/1 which called for the establishment of an ad hoc working group to develop a proposal on SIGMET implementation for endorsement by the MET Divisional Meeting to address the issue of SIGMET deficiency in some ICAO Regions.

2. Problem Analysis

SIGMET is by nature information of a warning character, hence it is of highest priority among other types of meteorological information provided to the aviation users. The lack of issuance or incorrect formulation of SIGMET to advise aircraft on hazardous meteorological conditions constitutes a safety risk to international air navigation.

In particular the following underlying problems have been identified as

- A lack of resources to the MWOs in terms of infrastructure and competent personnel to support the issuance of SIGMET;

- A lack of coordination between neighbouring FIRs leading to inconsistent timing, location and intensity information of hazardous weather warnings across FIR boundaries exacerbated by differences in available infrastructure, training and working practices between MWOs;
- significant deficiencies in SIGMET format compliance and incorrect routing of SIGMET with particular reference to the first line of the SIGMET which translates into the inability of end users receiving these time critical messages because of incorrect format that leads to the rejection of messages in automated systems.

3 Examples of currently existing formatting and addressing problems

Another problem is significant deficiencies in SIGMET format compliance and incorrect routing of SIGMET with particular reference to the first line of the SIGMET which translates into the inability of end users receiving these time critical messages because of incorrect format that leads to the rejection of messages in automated systems.

Some sample SIGMETs with formatting problems are given below:

```
1597445 FBSK SIGMET E02 VALID 151600/152000 FBGR GABORONE FIR EMBD TS
OBS WI E02504 S2322-E02630-S2429 E02611-S2459 E02552 S2534 E02528
S2529 E02416 S2500 E02329 S2506 E02254 S2557 E02242 TOP FL450= FBSK
FBGR
```

```
1697454 SIGMET B2 CANCELLED AT 250930 CWUL- TS HAVE BECM ISOLD.
END/1/GFA34/CMAC-E/CHANTAL MATHIEU0000018801 WSSC20 FSIA 250900 FSSS
SIGMET 01 VALID 250930/251300 FSIA- FSSS SEYCHELLES FIR EMBD TS OBS WI
N0332 E06002- N0417 E05703 - N0621 E05446 - N1020 E05947. CB TOPS
FL450 STNR INTSE= FSIA FSIA
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Last but not the least is inconsistent cessation or change of information on hazardous meteorological conditions at FIR boundaries due to differences in methods and working practices between MWOs. While the safety risk involved might not be as high as having no SIGMET, nonetheless pilots found this disturbing as they have difficulty reconciling the differences.

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