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**Agenda Item 4:           Activities for the development of the air navigation systems/services**  
**4.3       Aeronautical Meteorology (MET)**

**CURRENT STATUS OF CNS/ATM SYSTEMS METEOROLOGICAL COMPONENTS**

(Presented by the Secretariat)

**SUMMARY**

This Working Paper presents updated information on the current status of CNS/ATM systems meteorological components in the CAR/SAM Regions.

**References:**

- Report of the Thirteen Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/13), (Santiago, Chile, 14 - 18 November 2005);
- Report of the Twelfth Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/12), (Havana, Cuba, 7 - 11 June 2004); and
- Report of the Seventh Meeting of the GREPECAS Aeronautical Meteorology Subgroup (AERMETSG/7), (Mexico City, Mexico, 23 to 27 May 2005).

**1.           Introduction**

1.1           The development of new CNS technologies to be applied to both the ATS system and aircraft will facilitate a substantial improvement to and extension of the ATS currently provided to aircraft operators. This process will no doubt require additional meteorological support to ATS and will affect the coordination between the ATS and meteorological authorities and their respective operational units. In this context, it is important to take into account that meteorological components supporting CNS/ATM systems are closely related with the world area forecast system (WAFS), the international airways volcano watch (IAVW) and the exchange of operational meteorological information (OPMET).

## 2. Discussion

### 2.1 Implementation status of the world area forecast system (WAFS) in the CAR/SAM Regions

2.1.1 The world area forecast system (WAFS) had been created in response to fundamental changes in the operational requirements that arose in the mid to late 1970s, related to standardized, high quality, global forecasts in both numerical and graphical formats to be available in all States/Territories for flight documentation and flight planning for practically any prospective route, which lead, after the appropriate assessment of these emerging requirements by the Air Navigation Commission (ANC), through Panels and subsequent meetings, to recommend the establishment of a new global area forecast system in two phases (initial and final) in 1982 and to amend Annex 3 – *Meteorological Service for International Air Navigation*.

2.1.2 The WAFS initial phase comprised two World Area Forecast Centres (WAFC) in London and Washington producing standardized, high-quality global forecasts of upper winds and temperatures in numerical format and transmitting them to fifteen (15) Regional Area Forecast Centres (RAFC). The RAFC, based on this numerical output, produces graphical upper wind and temperature charts and significant weather (SIGWX) forecasts for selected areas of coverage for all the major international air routes and transmits them by HF facsimile broadcasts to the States/Territories under their area of responsibility. The final phase of the WAFS required the world area forecast centres of London and Washington to produce and transmit directly to the States/Territories, both the upper winds and temperatures, and significant weather (SIGWX) forecasts, which was achieved in 2002.

2.1.3 The information produced by the WAFS is transmitted by satellite broadcasts, as part of the ICAO aeronautical fixed service (AFS), in accordance with Annex 10 – *Aeronautical Telecommunications*, providing global coverage. These broadcasts comprise the International Satellite Communication System (ISCS) provided by the United States, which operates two uplinks, one of them [ISCS(1)] serving, among others, the North and South American Regions. The third uplink provided by the United Kingdom comprises the Satellite Distribution System for Aeronautical Information Relating to Air Navigation (SADIS), serving the other ICAO Regions to complete the global coverage. Amendment 73 to Annex 3 (July 2004) included back-up procedures to be used in the event of the interruption of operation of a world area forecast centre.

2.1.4 The global current stage of the WAFS envisages that as of 1<sup>st</sup> July 2005 every State/Territory would receive global forecasts for grid points only in digital form of winds, temperatures and humidity, tropopause heights and temperatures and maximum wind speed, direction and height in GRIB code form for all required levels in the air navigation plans and as a follow up to Conclusion 2/12 of the Second Meeting of the WAFS Operations Group (WAFSOPSG/2), Bangkok, Thailand, March 2005. Global forecasts on significant weather phenomena for levels FL 250 – 630 (SWH) and for levels FL 100 – 250 (SMH) for limited geographic areas, will be prepared by the WAFC of London and Washington in T4 facsimile charts until 30 November 2006, transmitted in TCP/IP protocol starting from 1<sup>st</sup> August 2005. To this end the States should have the appropriate software for the reception of WAFS products and personnel duly trained to operate it.

2.1.5 Even though most States of the CAR/SAM Regions currently have the required WAFS antenna and work station, it is important that they operate regularly in optimum conditions; therefore, GREPECAS/10 formulated Conclusion 10/35 – Maintenance of WAFS Equipment and systems. However, some States/Territories have faced financial constraints to implement this Conclusion, for this reason GREPECAS/13 formulated Conclusion 13/16, included in the Appendix to IP/04, which requires

special attention by this meeting, as well as Conclusion 13/17 – Survey on ISCS efficacy, in order to obtain the participation of all E/CAR States/Territories.

## **2.2 Implementation status of the international airways volcano watch (IAVW) in the CAR/SAM Regions**

2.2.1 Provision of timely and accurate warnings for hazardous en-route weather phenomena in the form of SIGMET messages, is one of the highest priority tasks of the State's meteorological authorities. As other ICAO Regions, the CAR Region has been affected by volcanic ash clouds. In order to support the issuance of SIGMETs by the State's meteorological watch offices (MWO) of the States/Territories, ICAO established a network of volcanic ash advisory centers (VAAC) that utilize state-of-the-art technologies to produce forecasts of the volcanic ash cloud trajectories.

2.2.2 Two of nine VAACs worldwide are part of the CAR/SAM Regions' ANP. It should be recalled that the first encounters of modern airliners with volcanic ash, which triggered the establishment by ICAO of the International Airways Volcano Watch (IAVW), happened in the airspace of Indonesia in 1982. Amongst them was the well known British Airways Flight 009, that lost its four engines and suffered severe damage on encountering ash from Mt Galunggung in Indonesia, in June 1982. It descended to 12 000 feet before being able to restart its engines and make an emergency landing in Jakarta.

2.2.3 The severe damage from volcanic ash on aircraft and dramatic effects on flight safety are now well known. In the past 20 years, more than 80 commercial aircraft have unexpectedly encountered volcanic ash clouds in flight. Commercial jetliners that have encountered volcanic ash plumes have had all engines fail, with several near-crashes. Abrasions to forward-facing surfaces, including cockpit windows, the leading edges of wings and control surfaces, engine cowlings, etc., threaten safety and require expensive repairs. Cockpit windows have been pitted badly enough to endanger landing. Damages to a single aircraft have reached \$80 million. In addition to these major repair costs from encountering a heavier plume of ash, aircraft flying through thinner plumes require instead maintenance of engines and external surfaces.

2.2.4 On average, about 15 explosive eruptions, powerful enough to inject ash into the stratosphere, occur per year. Ash clouds that reach above 25,000 ft. can travel hundreds of miles. Giant plumes from a major eruption, such as Mt. Pinatubo in 1991, can affect aircraft thousands of miles downwind. Therefore, the issuance of timely and accurate advisories and SIGMETs and their dissemination to airlines, ATS units and other users concerned should be pursued by all relevant organizations/agencies of the States/Territories in the regions exposed to volcanic activity.

2.2.5 It is a great achievement that the VAACs of Washington and Buenos Aires of the CAR/SAM Regions have been fully implemented and are now providing the required advisory services. However, these services would not be effective if the State's MWO, do not issue SIGMETs based on the advisories received from the VAAC, since the SIGMET is a crucial report to aircraft. Based on reports from the PIRGs, the Meteorology (MET) Divisional Meeting (2002) recognized that deficiencies existed in the issuance of SIGMETs, in particular SIGMET, for volcanic ash, and formulated specific recommendations in this regard.

2.2.6 Deficiencies related to SIGMET have been addressed by ICAO and assistance was provided to States by issuing a Regional SIGMET Guide. In the case of the CAR/SAM Regions, the SIGMET Guide is being updated based on amendment 73 to Annex 3 and in each Region a SIGMET Special Implementation Project (SIP) has been carried out with special emphasis given to volcanic ash SIGMETs. However, the main potential for improving SIGMET information is within the

States/Territories and could be realized by enhancing the coordination and cooperation between the MET offices, AIS and ATS units, volcanological agencies and operators, in order to ensure timely exchange of any available information that supports the SIGMET issuance. Therefore, the States/Territories' civil aviation administrations and the meteorological authorities are invited to address jointly all issued related to the issuance of SIGMET. The procedures in use should be reviewed and aligned with the relevant ICAO SARPs and guidance material.

2.2.7 An effective measure in enhancing the coordination at the national level would be the establishment of formal relationships by signing a Letter of Agreement between the organizations/agencies involved in the collection and dissemination of information relevant to SIGMETs.

2.2.8 Airlines should note that their important contribution to the collaborative effort of providing timely and accurate SIGMET information is in providing timely and accurate special air-reports by aircraft flying through or near meteorological phenomena that may affect the safety of flight.

2.2.9 The vision for a fully coherent and effective advisory service would be as follows: timely and accurate warnings (SIGMET) provided by the meteorological watch offices that ensure no surprises related to meteorological conditions in the air, timely and accurate advisories provided by the VAACs to meteorological watch offices in support of the SIGMET issuance and to airlines and air traffic services to effectively support their decision making on safe airspace usage. Cooperation at the national level is a crucial element in materializing this vision.

2.2.10 In order to assess the efficacy of procedures related to SIGMET issuance on volcanic ash by all the parties involved, GREPECAS formulated Conclusion 13/20 – Periodic tests on volcanic ash SIGMETs, volcanic ash advisories and volcanic ash ASHTAM or NOTAM. To this end, a test is being scheduled for 2006, anticipating the active participation of E/CAR States/Territories.

## 2.3 **OPMET information exchange in the CAR/SAM Regions**

2.3.1 The results obtained from OPMET information exchange controls carried out by CAR/SAM States participating in the control since 1996, have been analyzed by previous AERMET Subgroup and GREPECAS meetings, in compliance with the procedures established on this matter in previous implementation meetings and GREPECAS. Based on the results of these controls, it could be observed that even though there have been considerable improvements in OPMET exchange in most of the States participating in the control, there are still some problems in some of them, although in most cases the problems are due to temporary communication failures, errors in AFTN addresses and to the fact that some States/Territories are not considering the hours of operation of the aerodromes.

2.3.2 Additionally, it was noted that, except for two CAR States, the rest of the States/Territories do not participate in the control, and that the reception of OPMET data from CAR States/Territories in the controls of the States/Territories participating in the control is very poor, which can also be noted in the four annual controls carried out by the International OPMET Data Bank, based on that agreed in the SAM COM/MET Meeting 04/01 (2001).

2.3.3 The subject related to the plan for the migration from traditional alphanumeric codes (TACs) to binary universal formats to represent meteorological data (BUFR) of aeronautical meteorological messages, was also discussed during the GREPECAS/13 meeting. This will enable the use of the new codes in parallel with alphanumeric codes starting year in 2007 and finishing around 2015.

## 2.4 CAR/SAM Air Navigation Plan ANP Basic/FASID, Part VI – MET

2.4.1 The meeting will note that GREPECAS/13 reviewed and updated the regional meteorological procedures of Part VI – Meteorology of the CAR/SAM ANP Basic/FASID (Doc 8733), in compliance with the provisions of Annex 3 and to line them up with the structure of the current practices of the requirements of the CAR/SAM Regions. The amendment to regional procedures of the IAVW formulated in Conclusions 1/1 and 1/3 of the First Meeting of the IAVW Operations Group (Bangkok, Thailand, 15 –19 March 2004), was also considered and FASID Table MET 3C was included with volcano observatories of CAR/SAM selected States.

2.4.3 In addition and following Conclusion 1/12 a) of the IAVWOPSG/2, the Meeting was informed by the VAAC provider State of Washington of the extension of its area of responsibility at 10° South and 140° West to cover the west area of South America, requesting at the same time to amend Table MET 3B accordingly.

2.4.4 The regional procedures related to the WAFS agreed by the Second Meeting of the WAFS Operations Group, Conclusion 2/2 (Bangkok, Thailand, 8 – 11 March 2005), were also included.

2.4.5 The corresponding proposal for amendment is being prepared by the Secretariat and will be submitted to the Status/Territories for comments.

2.4.6 The meeting can note that meteorological procedures are experiencing important changes, which are reflected in the AERMET Subgroup work programme. However, since the reduced participation of Eastern Caribbean States in ICAO meetings, the following Draft Conclusion could be formulated:

### **DRAFT**

#### **CONCLUSION 30/XX**

#### **PARTICIPATION OF E/CAR MET PERSONNEL IN ICAO MEETINGS**

That, where applicable, civil aviation administrations make the necessary coordinations with national meteorological services to:

- a) enable the participation of meteorology experts in ICAO meetings;
- b) assign a MET expert to be directly contacted by the AERMET Subgroup Secretariat and by the task forces' rapporteurs to carry out the required actions in their respective work programmes; and
- c) send the contact information of the MET expert assigned to the ICAO NACC Office as soon as possible and, in any event, by **15 March 2007**.

## 3. Action suggested

3.1 The meeting is invited to review the contents of this working paper and consider the adoption of the Draft Conclusion included in paragraph 2.4.6.