INTERNATIONAL CIVIL AVIATION ORGANIZATION

CAR/SAM REGIONAL PLANNING AND IMPLEMENTATION GROUP (GREPECAS)

FOURTH MEETING OF THE AERONAUTICAL METEOROLOGY SUBGROUP (AERMETSG/4)

(Mexico City, Mexico, 22 to 26 May 2000)

Agenda Item 8: MET in the CNS/ATM concept for the CAR/SAM Regions

METEOROLOGICAL SUPPORT TO THE NEW AIR TRAFFIC MANAGEMENT SYSTEM

(Presented by the Secretariat)

Summary

This paper describes the ways in which the provision of meteorological information supports air traffic management and the technological developments in meteorological systems which will be required to facilitate the evolutionary transition to new ATM systems in the CAR/SAM Regions. It also addresses the co-ordinated national, regional and global planning of meteorological systems needed to realise the potential benefits from improved meteorological information in the new CNS/ATM systems.

References :

- Annex 3: Meteorological Service for International Air Navigation
- Procedures for Air Navigation Services – Rules of the Air and Air Traffic Services (PANS-RAC, *Doc 4444*)
- Manual of Aeronautical Meteorological Practice, (*Doc 8896)*

1 Introduction

1.1 Development of new communications, navigation and surveillance (CNS) technologies to be applied to both the ATS system and aircraft will allow to improve and extend substantially the air traffic services currently provided to aircraft operators. This process will, no doubt, affect meteorological support to air traffic services and the co-ordination between the air traffic services authorities and the meteorological authorities and their respective operational units.

2 **Meteorological Support to International Air Navigation Development Trends**

2.1 Traditionally the meteorological information provided to air traffic services units and through these units to aircraft, has been strictly related to a flight information region (FIR) and particular aerodromes required as destinations and alternates in that FIR and in immediately adjacent FIRs. Communication of this information beyond the FIRs concerned was tightly controlled so as not to overload the AFTN unnecessarily. The meteorological information was provided to pilots, *inter alia*, in face-to-face briefing in an airport meteorological office, in controller/pilot voice communications and through the ATIS and HF/VHF VOLMET broadcasts.

2.2 However, the fundamental changes in international air navigation in the 1980s, which essentially prompted the creation of CNS/ATM systems, would also drive a parallel need for changes in the provision of meteorological services for international air navigation.

2.3 These changes to the provision of meteorological services which began in the early 1980s comprised two main elements. The first was the development of the ICAO world area forecast system (WAFS) which, initially and for the case of the CAR/SAM Regions, centralized the production of global upper wind and temperature forecasts in the Washington world area forecast centre (WAFC), and the production of significant weather (SIGWX) forecasts in the Brasilia, Buenos Aires and Washington regional area forecast centres (RAFCs). The second element concerned the change in the content, format and distribution of the operational meteorological information provided to pilots and a relaxation of the rules governing the exchange of OPMET messages to permit a wider distribution.

2.4 In parallel with these developments, the introduction of data links has permitted for the first time the automated up-link of meteorological information direct to the cockpit, either at the initiation of the ATM system or in response to the pilots' request, and the automated down-link of data from the aircraft including wind and temperature, turbulence and humidity.

2.5 The following examples hereunder show the new elements or already implemented concerning the support to the air traffic services regarding the pre-flight planning and flight operations, either en route or in the terminal area:

- *Pre- flight planning and en route operations:*

a. provision of medium level SIGWX forecasts and en-route diversion aerodrome reports and forecasts for one-engine inoperative drift-down procedures for extended range operations;

b. the daily selection of the organized tracks over the North Atlantic based upon upper wind fields produced by the WAFCs;

c. provision of the latest SIGMETs and upper wind/temperature data from meteorological watch offices (MWO) and WAFCs respectively, direct to ATC computers for updating flight plans for dynamic aircraft routing over the Pacific Ocean; and

d. use of real-time information on hazardous en-route and destination weather and updated upper wind fields for air traffic flow control.

- *Terminal area:*

e. uplink of reports from automatic weather observing stations;

f. uplink of wind shear/microburst warnings from automated terminal doppler weather radars (TDWR); and

g. automatic downlink of wind/temperature data from aircraft on approach.

3 Meteorological Systems to Support the Transition to New Global ATM System

3.1 In order to support and facilitate the transition to CNS/ATM systems, the meteorological systems described will have to be further developed and focused more towards global requirements, in addition to national and regional requirements. These developments must meet aeronautical requirements to improve safety and provide an identifiable cost benefit to users. The systems must converge, as far as possible, towards a seamless and transparent global meteorological system for the provision of meteorological service to international air navigation.

3.2 In many respects the WAFS and the ICAO direct satellite broadcasts have already made the transition to such a seamless and transparent system which, moreover, is also converging with systems for the exchange of OPMET messages. The global ATM system will require access to global meteorological information on a far shorter time scale than has been customary in the past. In many cases virtual "instant" access, including real-time data, will be required. Such stringent requirements will dictate that as many of the processes as possible, which the systems comprise, must be automated. The meteorologists' input will be increasingly transferred to the beginning of the processes, even to the extent of transferring knowledge and experience through artificial intelligence to dedicated expert systems.

3.3 Development of the meteorological systems to support a global ATM system will be required specifically in the following areas:

a. rapid progress to the final phase of the WAFS to obtain automated global upper winds/temperatures and SIGWX forecasts which may be input directly into ATC and airline computers;

b. continued extension of the three ICAO direct satellite broadcasts to exchange global OPMET messages and, as necessary, other non-MET aeronautical information;

c. availability at ATC centres and airline centralized operational control of background upper wind fields for display, both in the form of WAFS global upper wind forecasts and "real-time" wind fields derived from the wind information reported automatically from aircraft in ADS messages; and reports and forecasts of hazardous weather, particularly volcanic ash, thunderstorms, clear air-turbulence and icing, to assist in tactical decision-making for aircraft surveillance, air traffic flow management, and updating flight plans for flexible/dynamic aircraft routing;

d. automatic uplink of aerodrome weather observations to aircraft on approach or departure, including D-ATIS data link runway meteorological information and METAR/TAF/SIGMET data link to replace HF and VHF VOLMET; and dedicated systems to detect hazardous weather, such as automated TDWR;

e. automatic downlink of meteorological information derived from aircraft sensors (wind, temperature, turbulence and humidity) to ATC computers to provide background upper wind fields as described above, and real-time descent wind profiles to assist in the automatic sequencing of aircraft on approach to maximize runway capacity; and relay of this information to the Washington WAFC for assimilation in global numerical weather prediction models thereby improving the overall quality of subsequent global forecasts;

f. use of meteorological sensors including Doppler radar, possibly providing input to specialized systems which will provide automated runway wake vortex reports and forecasts to assist in optimizing aircraft separation, thereby maximizing runway capacity;

g. reduction in time delay for volcanic ash reports and advisories and associated SIGMETs to reach area control centres and aircraft in-flight from volcano observatories, Buenos Aires and Washington volcanic ash advisory centres (VAACs) and meteorological watch offices (MWOs) by employing more direct routing; and

h. harmonization of AIS and MET information to support combined automated AIS/MET pre-flight briefing facilities.

4 **Planning and Implementation of Meteorological Systems**

4.1 In developing these systems, a number of clarifications will be needed. One of them concerns the optimum balance between the required information being automatically transmitted to aircraft from the ground and being obtained from appropriated data bases (i.e. data banks and servers) on request by pilot. Associated with this, another clarification will be needed concerning the number, structure and location of databases as well as the necessary interaction among the databases. Procedures for authorized access to the databases by aeronautical users including in particular pilots and ATM personnel will also have to be studied and developed. **Appendix A** shows the Regional Meteorological System Implementation Plan.

5. Action by the AERMETSG

5.1 The Subgroup may wish to note that the Fortieth Meeting of the European Air Navigation planning Group (EANPG/40) noted the ongoing implementation of the ICAO concept for the CNS/ATM systems and its influence on the meteorological service for international air navigation (MET) and agreed that the engagement of the METG in the CNS/ATM planning and implementation in the EUR region is important.

5.2 The Subgroup may also wish to consider the information provided in this paper on the provision of meteorological service for international air navigation under the ICAO concept for the CNS/ATM systems for CAR/SAM Regions and agree that this subject should be included as a new task of the work programme of the Subgroup.

5.3 In the light of the foregoing the Subgroup may wish to consider the following Draft Decision to be submitted to GREPECAS:

DRAFT DECISION 4/.. AERONAUTICAL METEOROLOGY SUBGROUP OF THE GREPECAS (AERMETSG) ACTIVITIES IN THE CNS/ATM CONCEPT FOR THE CAR/SAM REGIONS

That:

a) the AERMETSG include monitoring of the activities in the CNS/ATM field and the development of relevant parts of the CAR/SAM Regional Air Navigation Plan (Doc 8733) in its work programme; and

b) this be included in the GREPECAS Procedural Handbook.

METEOROLOGICAL SYSTEM IMPLEMENTATION/

IMPLANTACION DEL SISTEMA METEOROLÓGICO