



International Civil Aviation Organization

**Eight Meeting of the Communications/Navigation/Surveillance and
Meteorology Sub-Group (CNS/MET/SG/8) of APANPIRG**

Bangkok, Thailand, 12 – 16 July 2004

Agenda Item 3: Aeronautical Fixed Service

Agenda Item 9: Exchange of OPMET Information

**MIGRATION TO BUFR-CODED AERONAUTICAL METEOROLOGICAL
MESSAGES (METAR/SPECI AND TAF)**

(Presented by Secretariat)

SUMMARY

This paper introduces the plans for migration from the traditional aeronautical meteorological messages to BUFR-coded messages. An overview of the BUFR code and its benefits is presented. The paper presents proposal for addressing the migration issue by APANPIRG and its contributory bodies.

1. INTRODUCTION

1.1. The Fourteenth World Meteorological Organization (WMO) Congress held in Geneva, Switzerland, from 5 to 23 May 2003 endorsed a plan for migration from the traditional alphanumeric codes (TACs) to the so-called table-driven code formats (TDCFs), i.e. BUFR and CREX code forms. The migration plan would allow the use of table-driven codes in parallel with alphanumeric codes as of the year 2007, and would require the exclusive use of table-driven codes around the year 2015.

1.2. It should be recalled that, in accordance with *Working Arrangements between the International Civil Aviation Organization and the World Meteorological Organization* (Doc 7475), WMO is the organization responsible for the aeronautical meteorological codes. It now has firm plans to migrate from all alphanumeric codes to the table-driven codes. Under these circumstances, with regard to aeronautical meteorological codes, there is no other option than to undertake the migration towards table-driven codes.

1.3. The purpose of this paper is to draw the attention of the CNS/MET SG to this issue in view of the need for an orderly migration to the TDCFs, which would require development of a detailed regional implementation plan involving MET and CNS experts. When establishing such a migration plan, account should be taken both to the intra- and inter-regional exchanges of OPMET data. The inter-regional exchanges will have to be coordinated with the other regions concerned.

1.4. It is expected that the transition to the TDCFs for aeronautical meteorological messages will be a major undertaking and potentially expensive. Therefore, the PIRGs are urged to initiate work on this important issue as soon as possible.

2. DISCUSSION

Overview of Table Driven Code Formats

2.1 Table driven codes are self-describing. This means that in each message there is an element that defines the format in which the data is held. This descriptive element refers to a number of standard data definitions defined by the WMO. TDCFs come in two variants, BUFR (Binary Universal Form for the Representation of meteorological data) and CREX (Character form for the Representation and Exchange of data). CREX, although it provides human readability, is not suited to the provision of aviation briefing data as it is considerably more difficult to interpret than the existing TAC formats. Only BUFR is to be considered for use in the aviation domain.

2.2 The adoption of TDCFs provides a number of benefits to the WMO, for instance:

- **Codes are flexible.** If a new data field is required for use it can be added simply by adjusting the descriptive element of the code. This would not require any modification to the universal coder/decoders and so the cost of change would be reduced.
- Flexibility allows the WMO to easily include the **systematic passing of meta-data including geographical co-ordinates** (latitude, longitude, and height) in every report solving the perennial problem of maintaining information on observing stations.
- It is envisaged that TDCFs will be encoded and decoded by a **universal coder/decoder**. This can be applied to all of the many codes used by the WMO and should reduce the overhead of software maintenance and development.
- BUFR code provides **significant compression** of data providing more efficient use of bandwidth.

2.3 The WMO Transition Plan states that in the aviation domain the affected data types shall be METAR, SPECI, TAF, CODAR, AMDAR, WINTEN, ARFOR and ROFOR. Experimental exchange should commence in 2006; operational exchange in 2008 and the migration should be complete by 2015. The most significant of these codes are METAR, SPECI and TAF that are used to promulgate observations and forecasts for individual aerodromes. It should be noted however that a number of meteorological related messages do not appear to be included in the transition programme. These include SIGMET, AIRMET, GAMET, Volcanic Ash Advisories and Tropical Cyclone Advisories.

2.4 More information about the TDCFs could be downloaded from the WMO web site on: <http://www.wmo.ch/web/www/DPS/Migration/TDC21st-Universal-English.pdf>

Communication Problems

2.5 The WMO Transition plan is based on the World Weather Watch (WWW) in which it is assumed that products are disseminated over the Global Telecommunications System (GTS), the WMO global network. In the aviation domain this data is promulgated via the AFS. With the introduction of AMHS it would be expected that this traffic, currently, promulgated on AFTN, would be transferred to the AMHS, as AFTN cannot support binary data. It should be noted that according to the implementation plan most ASIA/PAC States would be ready for bit oriented data exchange for the identified transition period. However, in order to handle BUFR-coded OPPMET data detailed information should be provided regarding the message headers, the detailed format of the messages and bulletins, etc.

2.6 In addition to ATN and ATN-compatible networks, which would be able to carry the new message formats, some alternative ways could be considered, such as:

- the use of the satellite distribution systems, SADIS and ISCS, which currently promulgate binary data and are part of the AFS;
- the use of the Internet; this subject is being discussed by the Aviation Use of the Public Internet Study Group (AUPISG);
- the non-use of AMHS for meteorological messages; it may be possible for these messages to be promulgated using the existing GTS protocols on a TCP/IP network. If the Ground/Ground ATN network were to be based on a TCP/IP protocol stack this could be a cost-effective means of promulgation.

Action by CNS/MET SG and APANPIRG

2.7 It may be recalled that changes to aeronautical meteorological codes in the past, e.g., the major change of METAR/SPECI and TAF code in 1993, and the modification to these codes in 1996, created a lot of stress on national and international level. These were expensive undertakings requiring hardware and software changes, training of MET, COM, ATS and airline personnel, regional and inter-regional coordination etc. The meeting should be aware that the transition to BUFR-coded aeronautical meteorological messages is a change of a larger scale than the previous changes. Therefore, the regional planning and implementation groups are requested to address the migration to the TDCFs as a matter of urgency despite the fact that the final target date is more than 10 years from now.

2.8 In response to this, the European Air Navigation Planning and Implementation Group (EANPG) at its 45th meeting held in Paris, December 2003, formulated Decision 45/13 - PLANNING FOR MIGRATION TO BUFR CODED OPMET MESSAGES and established a BUFR Transition Assessment Task Force to look at the impact of the transition on the whole chain of supplying OPMET data to the aeronautical users.

2.9 After reviewing the current structure of the APANPIRG contributory bodies, the Secretariat is of the view that at this stage, instead of establishing a new group to address the migration to TDCFs, the task could be assigned to the existing ATN Transition Task Force, which reports directly to APANPIRG, and to the OPMET Management Task Force, which reports to CNS/MET SG. Both groups should review the matter based on their specific expertise and coordinate a draft migration plan. In order to foster the coordination between the groups, it is envisaged that the regular annual meetings of the ATN Transition TF and the OPMET/M TF should be held conjointly in 2005.

2.10 In view of the above discussion, the meeting is invited to consider the following draft decision:

Draft Decision 8/xx – Planning for migration to BUFR-coded aeronautical meteorological messages

That,

- a) an item be added in the Subject/Tasks List of the ATN Transition Task Force and OPMET Management Task Force to conduct a study for the migration to BUFR-coded aeronautical messages;
- b) the two Task Forces develop in coordination a regional plan for migration to BUFR-coded aeronautical meteorological information by the end of 2005.

Note: A conjoint meeting of the two Task Forces would be desirable to address the issues after completing studies in their respective areas.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) Note the information provided in this paper;
- b) Agree on the Draft Decision in para. 2.10.

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