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Problems and Opportunities Arising from the Migration of OPMET Data to BUFR

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OPAG PROMET REPORTS

PROBLEMS AND OPPORTUNITIES ARISING FROM THE MIGRATION OF OPMET DATA TO BUFR

PROGRESS/ACTIVITY REPORT

SUMMARY

Reference: CAeM-XIII/Doc. 4.2(7)

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PROGRESS/ACTIVITY REPORT

1. INTRODUCTION

1.1 The BUFR transition for OPMET data stemmed from a recommendation by the conjoint WMO CAeM-XII/ICAO MET Divisional Meeting (2002) and from the plan of WMO, endorsed by its Fourteenth Congress in May 2003, for the transition from the traditional alphanumeric codes (TAC) to Table Driven Code Forms (TDCF) for all types of meteorological information including the OPMET data. OPMET data refers to meteorological information currently exchanged via the Aeronautical Fixed Telecommunication Network (AFTN) i.e., METAR, SPECI, TAF, SIGMET, volcanic ash (VA) and tropical cyclone (TC) advisories etc.

1.2 The document entitled “Plan for migration to Table Driven Code Forms” developed by CBS indicates the schedule for migrating the OPMET data from the alphanumeric code forms to TDCF. In particular, exchange of OPMET data in BUFR code could start as early as the end of 2007 through bilateral arrangements between Members, and distribution of the current alphanumeric codes will be terminated by 2015. Amendment 74 to ICAO Annex 3/WMO Technical Regulations (Chapter C.3.1) to be applicable on 7 November 2007 introduces enabling clauses to use BUFR for the dissemination of METAR/SPECI and TAF on a bilateral basis.

1.3 Over the past few years, some concerns on the BUFR migration have been expressed among the aeronautical meteorological community, including:

(a) The expected cost of the transition for the meteorological services;

(b) The lack of obvious benefits from the transition; and

(c) Uncertainties regarding the end-user products/messages.

1.4 At the same time, some of the civil aviation authorities have already started their planning of the transition to the Aeronautical Message Handling System (AMHS) which could handle exchange of digital data. A number of these authorities are already in procurement stage and any future changes in the planning for the BUFR transition would result in significant cost to them.

1.5 It is therefore imperative for the benefits, problems and opportunities of the BUFR transition to be fully considered by the Commission for taking a decision on the best way forward.

2. THE PERCEIVED BENEFITS AND PROBLEMS

2.1 The main perceived benefits by CBS of the migration to BUFR, as summarized in the “Plan for migration to Table Driven Code Forms” and supported by the Fourteenth Congress, are:

(a) Self description, flexibility, and expandability (e.g. the ability to add new parameters without the need for definition of new codes); and

(b) Reliability of binary data transmission (e.g. by using communications protocols that includes sophisticated error detection).

2.2 Apparently, since the BUFR coding requires highly standardized meteorological input, all currently observed discrepancies and deficiencies in the implementation of the ICAO and WMO prescribed formats should be resolved. However, concern has also been expressed that the currently observed discrepancies and deficiencies are not expected to change in the foreseeable

future and that the use of a more sophisticated code such as BUFR might aggravate the problem and jeopardize the availability of reliable OPMET data.

2.3 Unlike many other meteorological data exchanged over the WMO data system (GTS/WIS), most of the OPMET data are presented to aeronautical users in text format. In recent meetings in RA VI (Europe) and RA II (Asia), some Members have raised concerns that the real benefits of the migration to BUFR were not easily seen by both aviation meteorological service providers and aviation users, if the migration was to be limited to translating the existing aeronautical meteorological codes to and from BUFR. At the same time, parts of the aviation industry are beginning to use industry standard such as XML in their internal data management and communications for the sake of internal harmonization of data formats and for ease of software maintenance. Indeed, CBS-XIII (2005) has agreed to consider the use of XML for the presentation of WWW data and products to users outside the WMO community.

3. THE OPPORTUNITIES

3.1 The improved technical capabilities of aviation meteorological services providers in the field of observations, forecasts and warnings, and aeronautical users in data assimilation enable the provision of additional meteorological information beyond that provided by the current OPMET data. Examples are given in the following paragraphs.

3.2 In a recent meeting in RA VI (Europe), the following limitations in the METAR and TAF code forms have been identified:

METAR:

(a) There is no possibility to derive accurately the maximum head/tail wind components or cross-wind components in case of gusts, leading to operational problems in particular where noise abatement procedures or other operational constraints require take-offs with tailwind;

(b) The current coding of temperature and dew point in whole degrees Celsius leads to a large uncertainty in resulting relative humidity. For example, for a report of air temperature 3 deg C and dew point 2 deg C, the relative humidity could vary between 87 and 99%; and

(c) The lowest, non-zero cloud base in METAR is 100 ft. CAT II and III equipped airports permit landings well below that limit, i.e. the METAR cannot be used as a decision making tool in these circumstances, leading to increased costs for the industry in cases when the *measured* ceiling height would be sufficient for an aircraft, but not the *reported* one.

TAF:

(a) The same deficiencies in terms of wind components apply as for METARs; and

(b) For optimized flight planning, a fully probabilistic forecast may have significant advantages as demonstrated by a Member. The current TAF is restricting the use of probabilities to values of 30 and 40%, whereas any optimization scheme would require the full range of probabilities depending on the cost/loss ratio of the decision-making problem. In order to address the typical thresholds determined by flight operation manuals, air traffic authorities and operations handbooks, the event probabilities of conditions for each of these categories would be required.

3.3 In the past few years, in support of air traffic management (ATM) and airport capacity management, a number of Members have found it necessary to introduce new weather forecasts, in the form of tabular and/or graphical formats, to provide information currently not readily available from the OPMET data. One common feature of these forecasts is the depiction of changes of weather elements in time series, and highlighting conditions below specified operating limits. Interpretation of these time series forecasts by the users should be straightforward and in most cases does not require special training.

3.4 The recent development and progressive implementation of automatic meteorological observing systems (AMOS) at airports worldwide also enable the meteorological service providers to supply weather observations at higher spatial and temporal resolution, beyond those currently given in weather reports in the METAR/SPECI codes.

3.5 The above scientific and technological advancement calls for the development of new data types and presentation formats for aeronautical weather information to better meet user requirements, especially in airport capacity management, flight planning and air traffic management.

4. POSSIBLE WAYS FORWARD

4.1 Since some of the civil aviation authorities have already started their planning of the transition to the AMHS which could handle exchange of digital data, the above-mentioned concerns on the transition of the existing OPMET data to BUFR should be addressed and a review of the transition plan, taking into account the discussions at CBS-Ext.(06) held during 9-16 November 2006, should be made as a matter of urgency. .

4.2 To identify the best approach to realize the benefits perceived by the Congress in the migration to TDCF and to justify the implementation cost, the WMO community should take the lead in reviewing the type and presentation format of the OPMET data in a strategic perspective. The review should study how flexible format like BUFR and XML may be used to deliver enhanced meteorological information to aviation users.

4.3 CAeM-XIII is invited to consider:

(a) Whether the transition of the existing OPMET data in TAC to BUFR should proceed as planned; and

(b) Tasking a CAeM expert team, in coordination with ICAO, CBS and users, to study the evolving aviation user requirements on meteorology, especially in support of airport capacity management, flight planning and air traffic management, and to recommend the most appropriate aeronautical meteorological code(s) for data exchange and delivering enhanced meteorological information to aviation users. The expert team should make its recommendations to the CAeM Management Group within 6 months after the first meeting to discuss the issue is held.

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