



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 8(2): Review of the implementation of WAFS:
Transition to GRIB and BUFR coded WAFS products**

REGIONAL PROGRESS IN WAFS IMPLEMENTATION

(Presented by Chairman, WAFS Implementation Task Force)

SUMMARY

This paper reports on the progress of WAFS transition to GRIB and BUFR coded WAFS products and WAFS implementation in the Asia and Pacific Regions.

1. INTRODUCTION

1.1 The meeting may like to recall that, as discussed in the last (7th) meeting of the CNS/MET SG during 15-21 July 2003, with the establishment of the WAFS Operations Group (WAFSOPSG) it was likely that the role of the PIRGs in WAFS planning would become less important. However, in respect of WAFS implementation, the CNS/MET SG was expected to continue to address the ongoing issues, assisted by the WAFS Implementation Task Force (WAFS/ITF), including in particular, the States' progress in their capability to receive, decode, and process WAFS output products in the GRIB and BUFR code forms. Moreover, the results of the ASIA/PAC GRIB/BUFR regional survey in 2003 showed that urgent follow-up actions were required so that the ASIA/PAC Regions would be ready for the migration to GRIB and BUFR by 1 July 2005 when T4 facsimile products will be removed from the satellite broadcast.

1.2 Subsequent to CNS/MET SG7, the first meeting of the WAFSOPSG was held during 10-13 November 2003 to discuss the operation and development of WAFS. As members of the WAFSOPSG, Australia and China submitted one WP and three IPs to WAFSOPSG/1. These papers pertained to SIGWX lead time, icing forecasts for ETOPS operations, technical issues with BUFR migration, and more efficient operational WAFS. The executive summary and full report of WAFSOPSG/1 are available on the WAFSOPSG website at <http://www.icao.int/anb/WAFSOPSG/>. In particular, the meeting may like to note the following outcomes: -

1.2.1 Items related to GRIB and BUFR migration:

- (a) A suggestion for the continual provision of WAFS products in the T4 chart form through the Internet-based back-up services beyond Amendment 73 to Annex 3 was not supported in consideration of the additional cost in acquiring the visualization software for T4 charts;
- (b) APANPIRG/14 Conclusion 14/31, which called for the WAFSOPSG to consider the requirement for automatic production of SIGWX charts for the standard ICAO chart areas from BUFR coded WAFS products to be included into the set of minimum

requirements to be achieved by the WAFS workstation manufacturers was not supported. The reason was that the provision requiring the availability of WAFS forecasts for fixed areas of coverage would have to be addressed to Contracting States and it would not be possible to place specific requirements for the WAFS workstation manufacturers in Annex 3;

- (c) Guidelines related to the depiction of meteorological and other features on WAFS forecast charts derived from the BUFR and GRIB data should be completed by the WAFS Provider States as a matter of urgency;
- (d) Guidance for the elimination of “edge effects” by BUFR visualization software was formulated;
- (e) A list of software vendors who meet the high-level criteria concerning the depiction of meteorological and other features on WAFS forecast charts derived from the BUFR and GRIB data should be developed by the WAFS Provider States, and should be placed on the WAFSOPSG website upon completion;
- (f) The impact of migration from GRIB1 to the GRIB2 code form will be studied.

1.2.2 Other items:

- (a) There is no need to introduce a new forecast in the T4 chart form with the area of coverage “L” to cover polar routes in view of the availability of global WAFS forecast in the GRIB and BUFR code forms;
- (b) In response to APANPIRG/14 Conclusion 14/34, adequate notification procedures for significant changes to the WAFS operation will be developed by the WAFS Provider States;
- (c) The updated WAFS back-up procedures are available on the WAFSOPSG website;
- (d) IATA reiterated no operational requirement for WAFS SWM forecasts;
- (e) The depiction of SIGWX in the WAFS forecasts should be harmonized with every effort to minimize differences between the products issued by the two WAFS;
- (f) The feasibility and advisability of extending the lead time for issuance of SIGWX forecasts to 16 hours will be studied by the WAFS Provider States;
- (g) Clouds other than CB and TCU will be eliminated from SWM;
- (h) The feasibility and desirability of the WAFS providing feedback on the quality of MET information included in the ADS messages to the operators concerned will be assessed and, if found feasible, appropriate procedures will be developed;
- (i) The feasibility of replacing WAFS SWM forecasts by new global WAFS output products for turbulence, icing, and CB and TCU clouds in grid point format will be studied;
- (j) Forecasts of height above ground level of the standard WAFS flight levels will be included in the list of WAFS forecasts to be provided by the WAFS in the GRIB code form.

2. REGIONAL PROGRESS

2.1 The progress of WAFS implementation in the ASIA/PAC Regions has been tracked by the document “ASIA/PAC WAFS Implementation Plan and Procedures” developed and maintained by the WAFS/I TF since 1998. This document was last updated by CNS/MET SG7 in July 2003 and is included as the Appendix to this paper for review and necessary updating by CNS/MET SG8.

2.2 The meeting is invited to review the progress of WAFS implementation in the ASIA/PAC Regions against the “Indicative Timetable for Implementation of WAFS” given in the

“ASIA/PAC WAFS Implementation Plan and Procedures” (see Attachment 1 of Appendix), in particular the progress of the following items which are already due or will be due for completion soon: -

Item	Task/Stage of Implementation of WAFS	Anticipated Date
3	Training in the operational conversion of GRIB forecasts to Wind / Temp charts	late 2002 (SADIS) late 2004 / early 2005 (ISCS)
6	Training in the operational conversion of BUFR to SIGWX charts	late 2002 (SADIS) late 2004 / early 2005 (ISCS)
8	The satellite distribution by the two WAFCs of global SWH and of SWM for limited geographical areas in BUFR format	June 2003 (SADIS) September 2003 (ISCS)

2.3 As regards items 3 and 6, it is understood that the SADIS and ISCS Provider States have kindly agreed to provide a conjoint training on the operational use of GRIB and BUFR coded WAFS products for both SADIS and ISCS user States in the ASIA/PAC Regions in late 2004/early 2005. The exact dates for the conjoint training are being coordinated. As regards item 8, while the satellite distribution of global SWH in BUFR format by WAFS London had become operational in June 2003, the satellite distribution of global SWH in BUFR format by WAFS Washington and SWM for limited geographical areas in BUFR format by WAFS London has not yet been achieved. An update from the WAFS Provider States in these regards will be useful to States in their preparation for the migration to BUFR.

3. ISSUES IN THE MIGRATION TO GRIB AND BUFR

3.1 In the last meeting, the CNS/MET SG realized that, based on the results of the ASIA/PAC GRIB/BUFR regional survey in 2003, 83% of ASIA/PAC States/Territories had yet to acquire the capability to operationally convert BUFR coded WAFS products into SIGWX charts and 69% of States/Territories had yet to acquire the capability to operationally convert GRIB coded WAFS products into Wind/Temp charts. In view of these results, APANPIRG/14 Conclusion 14/30 urged ASIA/PAC States to start the necessary preparations for the migration to the operational use of GRIB and BUFR coded WAFS products as a matter of urgency, if they had not already done so. Furthermore, States having difficulties in the migration to the operational use of GRIB and BUFR coded WAFS products were encouraged to urgently approach WMO for assistance under the WMO Voluntary Cooperation Programme (VCP). Participants of this meeting might like to provide an update on the progress of their States in the preparation for the migration to GRIB and BUFR.

3.2 As of the date of the meeting, only 11½ months are left prior to the removal of T4 facsimile products from the satellite broadcast on 1 July 2005. States should also be aware of the WAFSOPSG/1 decision that WAFS products in the T4 chart form will not be made available through the Internet-based back-up services beyond Amendment 73 to Annex 3 (see para.1.2.1(a) above). It is therefore imperative for States to *complete*, as a matter of urgency, the necessary preparations, viz. acquisition of appropriate equipment, workstations, software and training, for the migration to the operational use of GRIB and BUFR coded WAFS products.

3.3 To complete the preparation for the migration to GRIB and BUFR, in addition to the acquisition of the appropriate equipment, workstations and software, States should be aware that, in

the provision of Annex 3 compliant WAFS forecast charts for fixed areas of coverage as part of the flight documentation, there is a need for the meteorological offices concerned to perform manual checking and adjustments (e.g. to remove residual obscuration/overlapping of features) of SIGWX charts generated from BUFR coded WAFS products. The extent of the manual operations required would likely depend on the functionalities of the specific visualization software package used (e.g. availability of automatic de-cluttering or auto-placement function). In this connection, the meeting is invited to note the following developments that have taken place since WAFSOPSG/1:

- (a) Revised guidelines on the depiction of SIGWX features on WAFS forecast charts derived from BUFR have been developed by the WAFC Provider States and provided to software manufacturers in January 2004 (see para.1.2.1(c)-(d) above); and
- (b) A further evaluation of the different BUFR visualization software packages has been conducted by WAFC London in March 2004 and results have been made available on the SADIS website (<http://www.metoffice.com/sadis/software/index.html>) (see para.1.2.1(e) above). It is however noted that a significant number of the software packages continue to exhibit non-compliant issues, some of which having flight safety implications, e.g. tropical cyclone symbol missing/obscured. Further details on these technical issues identified by the WAFC London evaluation can be found in WP/10 submitted to SADISOPSG/9 (<http://www.icao.int/ANB/SADISOPSG/meetings/sadis9/wp/wp10.pdf>).

3.4 In view of the above discussions, it is important that both SADIS and ISCS user States in the ASIA/PAC Regions should be made aware of the evaluation results of the visualization software packages and make full use of the conjoint training on the operational use of GRIB and BUFR coded WAFS products to be held in late 2004/early 2005. The meeting may wish to consider the following draft conclusion:

Draft Conclusion 8/xx – States' Actions for the Migration to the Operational Use of GRIB and BUFR Coded WAFS Products

That,

- (a) ASIA/PAC States be urged to complete, as a matter of urgency, the necessary preparations for the migration to the operational use of GRIB and BUFR coded WAFS products, if they have not already done so, prior to the removal of T4 facsimile products from the satellite broadcast on 1 July 2005;
- (b) States be encouraged to review the GRIB and BUFR visualization software evaluation results available on the WAFSOPSG and SADIS websites and ensure that software packages capable of producing WAFS forecast charts fully compliant with Annex 3 are acquired;
- (c) States arrange for appropriate personnel to attend the conjoint training on the operational use of GRIB and BUFR coded WAFS products to be held in the ASIA/PAC Regions in late 2004/early 2005.

3.5 As the next meeting of the CNS/MET SG will be close to or after 1 July 2005, the date of removal of T4 facsimile products from the satellite broadcasts, this meeting might like to consider the need for contingency measures in the event that the necessary preparations for the migration to the operational use of GRIB and BUFR coded WAFS products have not been completed by the deadline.

4. ISCS UPGRADE

4.1 Since the last meeting of the CNS/MET SG, the following developments took place in the ASIA/PAC Regions in respect of the upgrade of the ISCS:

- (a) December 2003 – on-site upgrade of the VSAT receivers and the network interface for supporting TCP/IP by MCI, the contractor of the new ISCS system;
- (b) February 2004 – provision of the PD Receive Client software by MCI to States. Start of the TCP/IP broadcast; and
- (c) Mid-April 2004 – missing data problem of the TCP/IP broadcast appeared. Only about a third to half of the normal amount of T4 charts and GRIB data could be received from the TCP/IP broadcast at certain sites.

4.2 At the time of writing of this paper (late May 2004), the missing data problem of the TCP/IP broadcast appeared to have been largely fixed. WAFS Washington had also indicated that the X.25 broadcast would be extended until 30 June 2004. ISCS user States having difficulties in meeting the ISCS transition schedule might like to consider using the SADIS Internet-based back-up service or the NWS Internet-based file server (<http://weather.gov/tg/dataproduct.html>) as an interim solution for reception of WAFS products and data. To ascertain the current status of the ISCS transition, the ICAO Asia and Pacific Office had requested pertinent information from ASIA/PAC States in April 2004.

4.3 In the light of the SADIS experience, it will be useful for each ISCS user State to nominate an operational personnel to act as an ISCS focal point so that updated status of the ISCS implementation could be readily received in the future. This will also facilitate coordination of ISCS operational matters, such as the quick migration of ISCS sites in the ASIA/PAC Regions from Intelsat satellite 176 to Intelsat satellite 174 in June 2004. In this connection, the meeting may wish to consider the following draft conclusion:

Draft Conclusion 8/xx – Nomination of ISCS Focal Points

That, ICAO invites each ISCS user State in the ASIA/PAC Regions to nominate an operational personnel to act as an ISCS focal point to facilitate coordination of ISCS related matters.

5. ACTION BY THE MEETING

5.1 The meeting is invited to:

- (a) note the information in this paper;
- (b) consider necessary changes to the “ASIA/PAC WAFS Implementation Plan and Procedures”;
- (c) agree on the proposed draft conclusions; and
- (d) consider further action to be taken to foster WAFS implementation in the ASIA/PAC Regions.



ASIA/PAC WAFS Implementation Plan and Procedures

6th Edition - July 2003

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Introduction

1. The Asia/Pacific WAFS Implementation Plan and Procedures has been revised to take account of progress already made and in recognition of the impact of the migration to GRIB and BUFR.

The Implementation of WAFS

2. This plan is based on the understanding that the implementation of WAFS in the Asia/Pacific Regions involves:

- a. Production and dissemination by the WAFCs of global forecast winds, temperatures, tropopause height, tropopause temperature and humidity in GRIB format.
- b. The transfer of responsibility for the production for SWH from RAFCs to the two WAFCs, and hence the closing down of the RAFCs.
- c. The implementation of a communication system/s for the distribution of WAFS products in the Asia/Pacific Regions, to all the States that require the products in support of international air navigation. This will be achieved via satellite broadcast (SADIS and ISCS/2). States may need to use an alternative distribution system.
- d. The production and distribution (via satellite broadcast) by the WAFCs, of Global, quality controlled SWH (FL 250 - 630) in BUFR format.
- e. The production and distribution (via satellite broadcast) by the WAFCs of quality controlled SWM (FL 100 - 250) in BUFR format over limited geographical areas where required by PIRGs.
- f. The capability of States to convert BUFR and GRIB messages to graphical products on an operational basis.

SIGWX Charts

3. The table below shows the status of the SIGWX charts and responsible WAFCs.

Chart area & responsible WAFC	
G	London (SWH)
K	London (SWH)
D	London (SWH)
J	Washington (SWH)
E	London (SWH)

F	Washington (SWH)
I	Washington (SWH)
M	Washington (SWH)

4. There will be an ongoing requirement for NMSs to monitor the quality of WAFC products.

5. Action required to be taken by States to adhere to the provision of Annex 3 to ensure the relevant advisories for tropical cyclones, volcanic ash, the accidental release of radio active material and SIGMETs are made available to the WAFCs in a timely manner.

6. The SIGWX charts produced by WAFC Washington are also available on the US NWS Aviation Weather Center Internet site at: <http://www.nws.noaa.gov/iscs>. All WAFC London products are available on a password controlled internet-based FTP site, together with appropriate GRIB and BUFR decoding facilities.

7. States are encouraged to send comments to the WAFCs about the quality and accuracy of SIGWX on a frequent and regular basis. Contact details for comments are:

WAFC Washington

- i. NWS/Aviation Weather Center
Attention: Mr Mike Campbell
7220 NW 101st Terrace
Kansas City, Missouri
USA 64153-2371
- ii. E-mail addressed to: mike.campbell@noaa.gov
- iii. Fax number: 1 816 880 0650

WAFC London

- i. The Met. Office
Attention: Mr. Nigel Gait
Civil Aviation Branch
Sutton House
London Road Bracknell
Berkshire RG12 2SY, United Kingdom
- ii. E-mail addressed to: nigel.gait@metoffice.com
- iii. Fax number: +44 (1344) 854 156

Distribution of WAFS Products

8. Most States in the Asia/Pacific Regions are receiving wind, temperature and humidity forecasts in GRIB, and SIGWX in T4 facsimile format from the two WAFCs by VSAT, either SADIS or ISCS/2. A range of WAFS products are available via the Internet and through bilateral arrangements with neighbouring national meteorological services.

9. The two WAFCs will distribute by satellite broadcast Global, quality controlled SWH and quality controlled SWM for limited geographical areas (Note: WAFc London started the operational distribution of Global, quality controlled SWH by satellite broadcast in June 2003) . Once suitable decoding and visualization software has been acquired by States in the Asia/Pacific Regions, to provide them with the ability to operationally construct graphical SIGWX from the BUFR messages, and graphical products from the GRIB messages, the T4 facsimile format charts will be eliminated from the satellite broadcasts.

Indicative Timetable for Achieving the Final Phase of WAFS

10. The table given in Attachment 1 provides an indicative timetable for the implementation of WAFS within the Asia/Pacific Regions.

Volcanic Ash Advisory Centres (VAACs)

11. The VAACs will have an ongoing role of monitoring WAFS SIGWX charts that cover their areas of responsibility, and advising the appropriate WAFc to ensure the accurate inclusion of the volcanic ash symbol.

Tropical Cyclone Advisory Centres (TCAC)

12. The TCACs will have an ongoing role of monitoring WAFS SIGWX charts that cover their areas of responsibility, and advising the appropriate WAFc to ensure the accurate inclusion of the tropical cyclone symbol.

ASIA/PAC WAFS Implementation Plan and Procedures**Attachment 1***Indicative Timetable for Implementation of WAFS*

Item	Task/Stage of Implementation of WAFS	Anticipated Date
1	WAFS London products on access controlled internet site	completed
2	The establishment of back-up distribution arrangements for WAFS products	completed
3	Training in the operational conversion of GRIB forecasts to Wind / Temp charts	late 2002 (SADIS) late 2004 / early 2005 (ISCS)
4	All states that receive GRIB products capable of converting GRIB forecasts to Wind / Temp charts	early 2005
5	Removal of T4 Facsimile Wind / Temp charts from the satellite broadcast	1 July 2005
6	Training in the operational conversion of BUFR to SIGWX charts	late 2002 (SADIS) late 2004 / early 2005 (ISCS)
7	States having the ability to operate the decoding software to convert BUFR SIGWX messages into graphical format	early 2005
8	The satellite distribution by the two WAFSs of global SWH and of SWM for limited geographical areas in BUFR format	June 2003 (SADIS) September 2003 (ISCS)
9	Removal of T4 Facsimile SIGWX products from the satellite broadcast	1 July 2005