



International Civil Aviation Organization

**THIRTEENTH MEETING OF THE
COMMUNICATIONS/NAVIGATION/SURVEILLANCE AND
METEOROLOGY SUB-GROUP OF APANPIRG (CNS/MET SG/13)**

Bangkok, Thailand, 20 – 24 July 2009

Agenda Item 8: Implementation of the World Area Forecast System (WAFS)

8(3): Review the status of implementation and utilization of the WAFS products

REGIONAL PROGRESS IN WAFS IMPLEMENTATION

(Presented by Chairman, WAFS Implementation Task Force)

SUMMARY

This paper reports on the progress of WAFS implementation in the ASIA/PAC Region.

This paper relates to

Strategic Objectives:

A: Safety – Enhance global civil aviation safety

D: Efficiency – Enhance the efficiency of aviation operations

Global Plan Initiatives:

GPI-18 Aeronautical information

GPI-19 Meteorological Systems

1. INTRODUCTION

1.1 This paper reports on the progress of WAFS implementation in the ASIA/PAC Region subsequent to CNS/MET SG/12 and discusses the follow-up actions that are needed to ensure implementation and utilization of the WAFS products in the ASIA/PAC Region.

2. REGIONAL PROGRESS

2.1 The progress of WAFS implementation in the ASIA/PAC Region 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 SG/12 in July 2008 and is included as Appendix A to this paper for review and necessary updating by this meeting.

2.2 The meeting is invited to review the progress of WAFS implementation in the ASIA/PAC Region against the “Indicative Timetable for Implementation of WAFS” given in the ASIA/PAC WAFS Implementation Plan and Procedures (see Attachment 1 of Appendix A), in

particular the progress of the following items which are already due for completion or will be due for completion within the next year:

Item	Task/Stage of Implementation of WAFS	Anticipated Date
13	Termination of the SADIS 1G service	5 January 2009
15	Implementation of ISCS G3 service	2009
16	Workshop on gridded forecasts of icing, turbulence and convective clouds	September 2009
17	WAFCs begin parallel broadcast of WAFS forecasts in the GRIB2 code form	September 2009
18	Termination of the ISCS G2 service	31 December 2009
19	WAFCs provide web-based gridded forecasts of icing, turbulence and convective clouds	December 2009

2.3 As regards Item (13), the SADIS 1G service was terminated in January 2009 as scheduled. Experts attending the CNS/MET SG/13 meeting may wish to provide any further updates on any issues with the SADIS 2G implementation in their States.

2.4 As regards Items (15) and (18), the following advisory information has been posted on NOAA's website (<http://www.nws.noaa.gov/iscs/advisorys.htm>) regarding the implementation of the ISCS G3 service:

"The contract for the current system (ISCS-G2) will expire 31 December 2009. As of that date, the United States will no longer broadcast ISCS meteorological and aviation weather products via the ISCS-G2, but will use the ISCS-G3 to broadcast ISCS products. Planning is underway for the transition to the ISCS-G3 from the current ISCS-G2. A contract for the ISCS-G3 will be awarded in 2010. The ISCS-G3 will provide improved performance compared to that of the current system. No resources will be required of your site personnel to complete the transition of your site. We are working with your workstation provider on the ISCS-G3 connection requirements for your existing ISCS workstation. A detailed transition schedule will be posted on this web page as soon as it is available. After award of the contract for the ISCS-G3, we will be posting advisory bulletins on this web page to keep you advised on the progress of the transition."

The ISCS Provider State is expected to provide further details at the CNS/MET SG/13 meeting regarding the transition schedule for planning by the ISCS user States in the Asia/Pacific Region.

2.5 As regards Item (16), a workshop on the gridded forecasts of cumulonimbus clouds, icing and turbulence will be convened at the ICAO EUR/NAT Office, Paris, France, 14 to 15 September 2009. Additional information related to the workshop will be placed on the WAFSOPSG website (<http://www.icao.int/anb/wafsopsg/>).

2.6 As regards Items (17) and (19), the WAFc Provider States are expected to provide further details at the CNS/MET SG/13 meeting regarding the broadcast of WAFS forecasts in the GRIB2 code form and the web-based provision of gridded forecasts of icing, turbulence and convective clouds for planning by the WAFS user States in the Asia/Pacific Region.

3. FUTURE WORK PROGRAMME

3.1 In the light of the above discussion, the meeting may wish to consider the necessary changes to the ASIA/PAC WAFS Implementation Plan and Procedures, and to review the work programme and composition of the WAFS/I TF (Appendix B) and formulate the following decision:

Decision 13/xx – ASIA/PAC WAFS Implementation Plan and WAFS Implementation Task Force

That,

- (a) the ASIA/PAC WAFS Implementation Plan and Procedures be amended as shown in Appendix _ to the report;
- (b) the work programme and composition of the WAFS Implementation Task Force be amended as given in Appendix _ to the report.

4. ISSUES ON THE WAFS TRIAL GRIDDED FORECASTS

Compatibility and Quality Issues

4.1 The single most important WAFS subject that needs to be considered by this meeting is perhaps the planned operational implementation of the WAFS trial gridded forecasts and the proposal to replace the current SIGWX forecast charts, for both the high and medium levels, with these gridded forecasts. In this connection, further to the observations presented in the 11th and 12th meetings of the CNS/MET SG, Hong Kong, China has provided an information paper on “Further Observations on WAFS Trial Gridded Forecasts” for the CNS/MET SG/13 meeting. The following findings are brought to the attention of the group:

- (a) **Compatibility of forecasts of the two WAFcS** – The trial gridded forecasts of the two WAFcS have yet to be harmonized, as evidenced by the difference maps (i.e. maps showing the absolute difference in the forecasts of the two WAFcS for the same parameter at the same valid time) which, in most cases, appear to be the union of the forecasts of the two centres, indicating little agreement between them. The WAFS Science Coordination Meeting held on 20-21 April 2009 also acknowledged that for the CAT forecasts, the “*percentage overlap of all forecasts between UK and US ~20%*”. Indeed, “*gridded forecasts from WAFc London and WAFc Washington must be compatible*” is recognized by ICAO to be one of the key issues that need to be resolved;
- (b) **Quality issues: seasonal aspects** – When the gridded forecasts for different seasons are considered, additional issues are revealed: (i) the tendency of WAFc London to forecast large values of in-cloud turbulence (FL180) at high latitudes; (ii) the tendency of WAFc London to forecast large values of maximum icing potential (FL180) at high latitudes, which is not supported by the latest scientific findings on

the climatology of icing at such locations; (iii) the tendency of WAFc London to forecast stationary large values of CAT (FL340) near mountainous regions. Noting that the 2009 Science Coordination Meeting has conducted verification of the trial gridded forecasts for November 2008 - January 2009, it is imperative for the WAFcs to conduct verification for the other seasons. Indeed one of the working papers produced by the WAFcs for the WAFSOPSG/5 meeting noted that “*The WAFS forecasts in the GRIB 2 code form for cumulonimbus clouds, icing and turbulence will be included as soon as their quality is deemed acceptable for operational flight planning applications by the WAFSOPSG*”;

- (c) **Quality issues: CB diurnal variation** – When the gridded forecasts for different times of the day are considered, it is found that both WAFcs tend to over-forecast CB occurrence over land, e.g. southern China. In addition, WAFc London tends to over-forecast CB occurrence in general. Indeed, the 2009 WAFS Science Coordination Meeting acknowledged that further work would need to be undertaken by the WAFcs for improving the CB gridded forecasts, including to “*look at diurnal variations of forecasts (manual and automatic), particularly in tropics*”;
- (d) **Quality issues: CB associated with TC** – When the CB gridded forecasts for a number of TC cases are considered, it is found that the forecasts of both WAFcs cannot distinguish the CB associated with the TC, i.e. the users cannot tell from the CB gridded forecasts whether or not a TC is present. There is a need to consider including safety-related SIGWX features, including TC, in the high “at-a-glance” products for the users (see para. 4.2 below).

Visualization Issues

4.2 Hong Kong, China has also produced an information paper on “Visualization of the WAFS Trial Gridded Forecasts” for CNS/MET SG/13, highlighting the possible use of concatenation and interpolation methods for improving the visualization of the WAFS gridded forecasts especially for long-haul flights. In particular, route-specific high “at-a-glance” cross-sectional charts and route-specific horizontal strip charts (see the information paper for examples) are proposed to be utilized for visualizing the gridded forecasts in the flight documentation. The WAFcs have also proposed some high “at-a-glance” SIGWX products generated from the gridded forecasts for high (HG-SWH) and medium levels (HG-SWM) (Ref.: WAFSOPSG/5-WP/15), comprising:

HG-SWH

- (a) Composite maximum clear-air turbulence field representing 300hPa (FL300), 250hPa (FL340) and 200hPa (FL390);
- (b) CB horizontal cloud extent; and
- (c) 250hPa (FL340) wind speed and direction, ≥ 80 knots.

HG-SWM

- (d) Maximum icing field representing 700hPa (FL100);
- (e) CB horizontal cloud extent; and
- (f) 400hPa (FL240) wind speed and direction, ≥ 60 knots.

See Figure 1 for an example each of the HG-SWH and HG-SWM charts. The meeting may wish to note that these HG charts do not depict SIGWX features including TC, VA clouds, radioactive clouds, and sand- and dust-storms. As pointed out in para. 2.4 of the accompanying information paper on visualization of the WAFS trial gridded forecasts and in para. 2.7 of the accompanying information paper on further observations on the WAFS trial gridded forecasts, the inclusion of such safety-related information in the future visualization models for the gridded forecasts should indeed be considered, in consultation with the users.

Verification Issues

4.3 As regard the subject of verification for addressing the various quality issues with the trial gridded forecasts, the meeting may like to recall that the CNS/MET SG/10 held in July 2006 invited the WAFSOPSG to further develop WAFS output performance indicators, in particular, to consider evaluating the SIGWX forecasts, in particular TC and VA symbols, in order to measure the harmonization of these forecasts issued by the two WAFCs (Draft Conclusion 10/23). After endorsement by APANPIRG/17, this proposal was subsequently considered by the WAFSOPSG/4 meeting in February 2008, but the group decided that the evaluation of the SIGWX forecasts proposed by the APANPIRG would be sufficiently addressed in the systematic comparison of WAFS SIGWX forecasts with the gridded forecasts and that no additional action would be required.

4.4 In the 2009 WAFS Science Coordination Meeting, the WAFCs presented some verification results for icing, turbulence and CB and concluded that (see WAFSOPSG/5-WP/14):

- (a) Verification of in-cloud turbulence was not performed, recognizing that algorithms for in-cloud turbulence are not as well developed (mature) as those for clear-air turbulence;
- (b) The UK gridded icing product appears to outperform the US gridded icing product at the trace (0.1) threshold for both mean and maximum attributes;
- (c) In verifying the gridded icing product against medium-level BUFR SIGWX forecasts, both the UK and US grids appeared to outperform the forecaster-generated SIGWX forecasts;
- (d) The UK and US gridded CAT product appeared to show equivalent skill. There were slight differences in score as forecast range increased, and there were also some latitudinal variations;
- (e) In verifying the gridded CAT product against BUFR SIGWX forecasts, both the UK and US grids showed equivalent or greater skill than the forecaster-generated SIGWX forecasts; and
- (f) In respect of CB verification, the results were inconclusive. This was partly due to the fact that it had only been possible to verify the gridded CB products against lighting data in November 2008 and January 2009. In some areas, the US manually produced CB forecasts appeared to outperform the gridded data and the UK manual product. However, within the high air traffic zones between 20N and 50N, the UK gridded CB product appeared to perform the best.

4.5 We have tried to summarize from the presentations at the 2009 WAFS Science Coordination Meeting the following information on the verification performed by the WAFCs:

Forecast verified	Period	Parameters verified	Data used as “ground truth” for verification	Verification metrics considered	Criteria for counting hit and false alarm
Icing	Nov 2008 – Jan 2009	Maximum & mean icing potential at FL100 & FL140	CloudSat Icing Potential (CLIP) product (derived from CloudSat cloud classification data and numerical model temperature forecast)	POD ⁺ & FAR [^]	Icing potential thresholds - 0.1, 0.3 & 0.5 CLIP – trace icing
CAT	Nov 2008 – Jan 2009	CAT potential [@]	Global Aircraft Data Set (GADS) based on British Airways fleet of Boeing 747-400 aircraft	POD & FAR	CAT potential thresholds – numerous GADS – DEVG [#] >= 2 m/s
In-cloud Turbulence	Not verified				
CB	Nov 2008 & Jan 2009	UK - convective rainfall rate* US - ??	UK Sferics data	POD & FAR	Unknown

+ POD = probability of detection, or hit rate

^ FAR = false alarm rate (the exact formulation being clarified with the WAFCs)

@ No indication on whether the maximum or mean turbulence potential was considered, and whether or not the forecasts for all flight levels were verified

DEVG = Derived equivalent vertical gust

* Not a product of the CB gridded forecasts

4.6 While further details on the verification of the gridded forecasts are expected to be provided by the WAFCs at the CNS/MET SG/13 meeting, there are apparently the following issues to be addressed:

- (a) **In-cloud turbulence** – until such time systematic verification for the related products is done, it would appear that the quality of the in-cloud turbulence gridded products is doubtful for acceptance for operational flight planning applications, in particular noting that the algorithms for in-cloud turbulence are not as well developed (mature) as those for clear-air turbulence (para. 4.4(a));
- (b) **Icing** – unlike the CAT products which are verified using flight data as ground truth, the icing products at different thresholds (i.e. 0.1, 0.3, 0.5) are verified using another icing potential product (CLIP), with the “trace icing” criterion, derived from satellite cloud classification data and numerical model temperature forecast. Furthermore, a scientific paper on CLIP mentioned “*It is important to note that our algorithm only states where icing conditions have the potential to exist rather than stating exactly where within the clouds exactly the icing does or does not exist. We use the CloudSat data to identify the cloud locations, which it is able to do very well. The existing CloudSat products do not allow us to easily gain additional insight into what parts of the clouds actually contain icing. For our purposes, identifying the potential for icing, which is important from an aviation safety perspective, is sufficient. Therefore our algorithm should be considered as a biased representation of icing conditions in the atmosphere. In the absence of a true measure of icing conditions the amount of*

*bias cannot be known*¹. In view of this, we are not sure if the “trace icing” criterion for CLIP represents a level considered *significant* by the aviation users and whether or not an appropriate balance has been struck between maximizing the POD while minimizing the FAR at the same time. There is an apparent need for: (i) the WAFCs to justify the use of this verification method for icing, viz. to verify the WAFS icing potential products based on another icing potential product which by itself is subject to verification against pilot reports; (ii) the WAFSOPSG to systematically develop and agree on the WAFS output performance indicators for verifying the gridded forecasts, and (iii) the WAFCs to calibrate the relevant thresholds of the algorithms so that the gridded forecasts will be compatible with the user’s expectation/perception formed in using the existing SIGWX forecasts;

- (c) **CAT** – similar to the above comments on icing, it is noted that numerous thresholds were considered in verifying the CAT products, and in particular, the verification is performed with reference to the criterion $DEVG \geq 2$ m/s based on aircraft data. An immediate question on the use of this criterion is whether or not there is any correspondence with the moderate/severe or EDR thresholds for *significant* turbulence adopted by ICAO. Points (ii) and (iii) in para. 4.6(b) above are apparently relevant and need to be addressed;
- (d) **CB** – due to the apparent lack of information on the verification scheme for the CB products, it is rather difficult to provide specific comments but points (i)-(iii) in para. 4.6(b) should be relevant and need to be addressed for the systematic verification of the CB products.

4.7 In view of the above discussions, it is apparent that the identified issues in the compatibility, quality, verification, calibration and visualization of the gridded forecasts of the two WAFCs need to be satisfactorily addressed before these trial products could be considered suitable for operational use. In particular, the WAFS output performance indicators for verifying the WAFS gridded forecasts should be systematically developed and agreed, the thresholds for the gridded forecast algorithms should be calibrated for compatibility with user’s expectation/perception, and the inclusion of safety-related SIGWX features in the future visualization models for the gridded forecasts should be considered in consultation with the users. The meeting may wish to formulate the following draft Conclusion:

Draft Conclusion 13/xx – Suitability of WAFS Gridded Forecasts of icing, turbulence and cumulonimbus clouds for operational use

That,

- (a) the identified issues in the compatibility, quality, verification, calibration and visualization of the gridded forecasts of the two WAFCs need to be satisfactorily addressed before these trial products could be considered suitable for operational use;

¹ Kay, M.P., C. Lu, S. Madine, J. Luppens Mahoney, and P. Li, 2009: [Detecting cloud icing conditions using CloudSat datasets](#). Preprints, 23rd Conference on Weather Analysis and Forecasting, 1-5 June, Omaha, NE, Amer. Met. Soc.

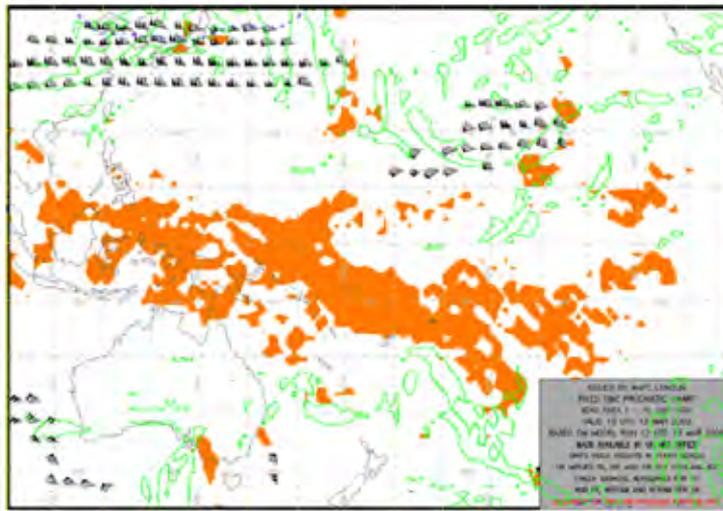
- (b) the WAFSOPSG be invited to systematically develop and agree on the WAFS output performance indicators for verifying the WAFS gridded forecasts;
- (c) the WAFCs, in consultation with IATA and IFALPA, be invited to calibrate the thresholds for the gridded forecast algorithms for compatibility with user's expectation/perception; and
- (d) the WAFSOPSG be invited to consider the inclusion of safety-related SIGWX features in the future visualization models for the gridded forecasts.

5. ACTION BY THE MEETING

5.1 The meeting is invited to:

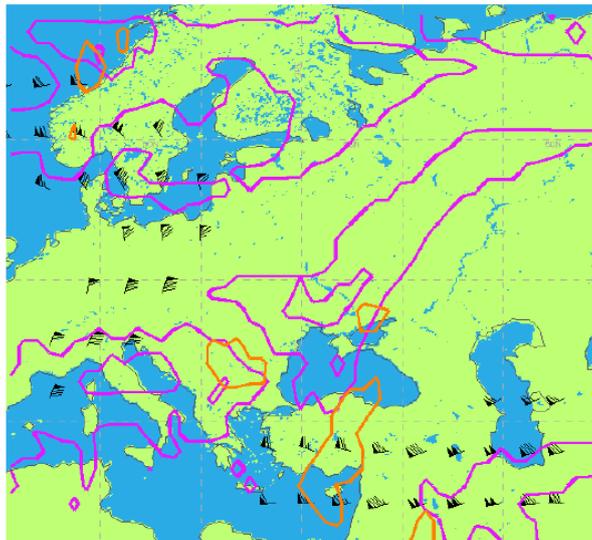
- (a) note the information in this paper;
- (b) agree on the proposed draft conclusion and decision; and
- (c) consider further actions to be taken to foster WAFS implementation in the ASIA/PAC Region.

HG-SWH



Green = Composite maximum CAT at 300, 250 and 200hPa (FL300, 340, 390); Orange = CB horizontal extent; Black = Wind fleches $\geq 80KT$ at 250hPa (FL340)

HG-SWM



Pink = Maximum icing at 700hPa (FL100); Orange = CB horizontal extent; Black = Wind fleches $\geq 60KT$ at 400hPa (FL240).

Figure 1. Examples of the HG-SWH and HG-SWM charts proposed by the WAFCs



ASIA/PAC WAFS Implementation Plan and Procedures

11th Edition - July 2008

ASIA/PAC WAFS Implementation Plan and Procedures

11th Edition - July 2008

Introduction

1. The Asia/Pacific WAFS Implementation Plan and Procedures has been revised to take account of progress made in the region.

The Implementation of WAFS

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

- a. Production and dissemination by the WAFCs of global forecast winds, temperatures, tropopause height, tropopause temperature and humidity in GRIB format.
- b. The implementation of a communication system/s for the distribution of WAFS products in the Asia/Pacific Region, 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.
- c. The production and distribution (via satellite broadcast) by the WAFCs, of Global, quality controlled SWH (FL 250 - 630) in BUFR format and in PNG format for the ICAO standard areas.
- d. The production and distribution (via satellite broadcast) by the WAFCs of quality controlled SWM (FL 100 - 250) in BUFR format and in PNG format over limited geographical areas where required by PIRGs.
- e. The capability of States to convert current BUFR and GRIB messages to graphical products on an operational basis.
- f. Transition from SADIS 1G to SADIS 2G service.
- g. Transition from ISCS G2 to ISCS G3 service.
- h. Development and utilization of gridded forecasts of icing, turbulence and convective clouds.
- i. Transition from GRIB1 to GRIB2 WAFS data.

Appendix A

SIGWX Forecasts

3. There will be an ongoing requirement for NMSs to monitor the quality of WAFC products.
4. 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 radioactive material and SIGMETs are made available to the WAFCs in a timely manner. The WAFS Implementation Task Force will coordinate with the ICAO Secretariat and the VAACs in the Region to also make available ASHTAMs and NOTAMs for VA to the WAFCs in a timely manner.
5. The SIGWX forecasts 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 and WAFC Washington products are available on the internet-based SADIS FTP server, together with appropriate GRIB and BUFR decoding facilities (Note: not including the visualization software).
6. States are encouraged to provide inputs to the surveys on the operational efficacy of SADIS and ISCS/2 for the purpose of improving the quality of service and 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 Larry Burch
Deputy Director
7220 NW 101st Terrace
Kansas City, Missouri
USA 64153-2371
- ii. E-mail addressed to: larry.burch@noaa.gov
- iii. Fax number: 1 816 880 0650

WAFC London

- i. The Met. Office
Attention: Mr. Nigel Gait
International Aviation Manager
Fitzroy Road
Exeter
Devon EX1 3PB
United Kingdom
- ii. E-mail addressed to: nigel.gait@metoffice.com
- iii. Fax number: +44 (1392) 885 681

Gridded Forecasts of Icing, Turbulence and Convective Clouds

7. Gridded forecasts of icing, turbulence and convective clouds are made available on a trial basis by the two WAFCs via the Internet for evaluation by NMSs. Visualization of the gridded forecasts to provide “at a glance” products for flight planning purposes is being developed by the WAFCs. Regional training will be provided to WAFS users on the utilization of the gridded forecasts.

Distribution of WAFS Products

8. The two WAFCs distribute by satellite broadcast global forecast winds, temperatures, tropopause height, tropopause temperature and humidity in GRIB format, global quality controlled SWH and quality controlled SWM for limited geographical areas in PNG and BUFR formats. Suitable decoding and visualization software is required by States in the Asia/Pacific Region to operationally construct graphical SIGWX from the BUFR messages. The provision of PNG formatted SIGWX charts is expected to continue at least until 2010.

Transition from SADIS 1G to SADIS 2G service

9. On 12 November 2004, WAFC London launched the SADIS 2G service that was required as a result of SADISOPSG Conclusion 9/15. This new service is available to new and current SADIS users. The current SADIS 1G service will continue to be available in addition to the SADIS 2G service until 5 January 2009. States should arrange for the procurement of the necessary hardware, and as necessary, compliant visualization software for transition to the SADIS 2G service in time. Guidance material for users accessing the SADIS 2G broadcast is available at the SADIS web site – <http://www.metoffice.gov.uk/sadis/index.html>.

Transition from ISCS G2 to ISCS G3 service

10. WAFC Washington plans to implement the ISCS G3 service and to terminate the existing ISCS G2 service by 31 December 2009. Upon advice of the implementation plan from WAFC Washington, States should make the arrangements for the installation of the necessary hardware for transition to the ISCS G3 in time.

Indicative Timetable for Implementation of WAFS

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

Volcanic Ash Advisory Centres (VAACs)

12. The VAACs are encouraged to monitor WAFS SIGWX forecasts that cover their areas of responsibility, and to advise the appropriate WAFC to ensure the accurate inclusion of the volcanic ash symbol.

Tropical Cyclone Advisory Centres (TCAC)

13. The TCACs are encouraged to monitor WAFS SIGWX forecasts that cover their areas of responsibility, and to advise the appropriate WAFC to ensure the accurate inclusion of the tropical cyclone symbol.

14. The operational contact points in the WAFCs for coordination with the VAACs and TCACs are:

WAFC Washington

- i. NWS/Aviation Weather Center
7220 NW 101st Terrace
Kansas City, Missouri
USA 64153-2371
- ii. Tel: TBD

WAFC London

- i. The Met. Office
Attention: WAFC London Forecaster
Fitzroy Road
Exeter
Devon EX1 3PB
United Kingdom
- ii. Tel: 00-44-1392-884926 or 00-44-1392-884908

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	Completed
4	All states that receive GRIB products capable of converting GRIB forecasts to Wind / Temp charts	Completed
5	Removal of T4 Facsimile Wind / Temp charts from the satellite broadcast	Completed
6	Training in the operational conversion of BUFR to SIGWX charts	Completed
7	States having the ability to operate the decoding software to convert BUFR SIGWX messages into graphical format	Completed
8	The satellite distribution by the two WAFSs of global SWH and of SWM for limited geographical areas in BUFR format	Completed
9	Launch of SADIS 2G service	Completed
10	SADIS 2G seminar for ASIA/PAC States	Completed
11	Removal of T4 Facsimile SIGWX products from the satellite broadcast	Completed
12	Procurement of SADIS 2G hardware by SADIS user States	Early 2008
13	Termination of the SADIS 1G service	5 January 2009

Item	Task/Stage of Implementation of WAFS	Anticipated Date
14	Launch of trial gridded forecasts of icing, turbulence and convective clouds	25 October 2006 (WAFS London) Early 2008 (WAFS Washington)
15	Implementation of ISCS G3 service	2009
16	Workshop on gridded forecasts of icing, turbulence and convective clouds	September 2009
17	WAFS begin parallel broadcast of WAFS forecasts in the GRIB2 code form	September 2009
18	Termination of the ISCS G2 service	31 December 2009
19	WAFS provide web-based gridded forecasts of icing, turbulence and convective clouds	December 2009
20	Regional training on the use of the gridded forecasts	2010-11
21	WAFS end-user workstations upgraded to accept the GRIB2 code form	November 2011 – November 2013
22	Broadcast of WAFS forecasts in the GRIB 1 and WAFS SIGWX forecasts in the BUFR code form and PNG chart form ceases	November 2013

ASIA/PAC WAFS IMPLEMENTATION TASK FORCE**1. Terms of Reference**

Expedite the implementation of the World Area Forecast System (WAFS) in the Asia and Pacific Regions.

2. Work Programme

The work to be addressed by the ASIA/PAC WAFS Implementation Task Force (WAFS/I TF) includes:

- (a) Coordinating the migration of SADIS 1G service to 2G service in the Asia and Pacific Regions.
- (b) Coordinating the migration of ISCS G2 service to ISCS G3 service in the Asia and Pacific Regions.
- (c) Coordinating the arrangement of training and providing user's feedback on the utilization of gridded forecasts of icing, turbulence and cumulonimbus clouds.
- (d) Coordinating the migration of GRIB1 to GRIB2 WAFS data.
- (e) Coordinating the provision of assistance to States to ensure that WAFS can be effectively implemented in the Asia and Pacific Regions.
- (f) Providing inputs (via the CNS/MET SG) to APANPIRG on the regional planning and development of WAFS for coordination with the WAFSOPSG.
- (g) Keeping the ASIA/PAC WAFS Implementation Plan and Procedures up to date.

The work is expected to be carried out primarily by correspondence.

3. Composition

The Task Force is composed by experts from:

Australia; Hong Kong, China (Chairman); India; Japan; New Zealand; Singapore; Thailand; United Kingdom; United States and IATA.