



*International Civil Aviation Organization*

**TWELFTH MEETING OF THE  
COMMUNICATIONS/NAVIGATION/SURVEILLANCE AND  
METEOROLOGY SUB-GROUP OF APANPIRG (CNS/MET SG/12)**

Bangkok, Thailand, 21 – 25 July 2008

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

- 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/11 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/11 in July 2007 and is included as Appendix A to this paper for review and necessary updating by this meeting.

**Agenda Item 8 (3)**

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:

<b>Item</b>	<b>Task/Stage of Implementation of WAFS</b>	<b>Anticipated Date</b>
12	Procurement of SADIS 2G hardware by SADIS user States	Early 2008
13	Termination of the SADIS 1G service	1 January 2009
14	Launch of trial gridded forecasts of icing, turbulence and convective clouds	25 October 2006 (WAFS London) Mid-2007 (WAFS Washington)
15	Regional seminars on the use of the gridded forecasts	2008 and 2009

2.3 As regards Item (12) on State’s implementation of SADIS 2G, based on the SADIS operational efficacy survey results in March 2008 and subsequent updates received from States, only 8 out of 16 SADIS user States/Territories (50%) had implemented 2G (Appendix B). This is less than the 70% global implementation level. Experts attending the CNS/MET SG/12 meeting may wish to provide any further updates on the status of 2G implementation in their States and discuss ways to ensure smooth transition when the 1G service will be terminated on Monday, 5 January 2009 (Item 13).

2.4 As regards Item (14) on the launch of trial gridded forecasts of icing, turbulence and convective clouds by the WAFCS, the meeting will be pleased to note that the trial gridded forecasts produced by WAFS Washington have been made available on the NOAA FTP site (<ftp://ftp.ncep.noaa.gov/pub/data/nccf/com/gfs/para/gfs.<yyyymmddHH>>, where yyyymmdd is the date and HH is model run time: 00, 06, 12 and 18Z). Pictorial representations of the WAFS Washington forecasts are also available on the Internet at: <http://aviationweather.gov/testbed/globalgrids>. Examples of pictorial representations of forecasts from both WAFS London and WAFS Washington are available at: <http://www.emc.ncep.noaa.gov/mmb/gtrojan/WAFVN/gifs/>.

2.5 As regards Item (15) on the regional seminars on the use of the gridded forecasts, they have been re-scheduled to 2010 as per the latest WAFS long term plan 2008-2012 updated by WAFSOPSG/4 (Appendix C).

2.6 The meeting may like to note the following milestones in the WAFS long term plan 2008-2012 and consider the necessary changes to the regional implementation plan in Appendix A:

- (a) Workshop on the new gridded forecasts of cumulonimbus clouds, icing and turbulence (**September 2009**)

- (b) WAFCs make available web-based WAFS forecasts, providing objective forecasts of the gridded cumulonimbus clouds, icing and turbulence (**December 2009**)
- (c) Enabling clauses in Annex 3 for the use of gridded WAFS forecasts for cumulonimbus clouds, icing and turbulence (**November 2010**)
- (d) Confirm date for the cessation of satellite broadcast of forecasts in the GRIB1 code form and WAFS SIGWX forecasts in the BUFR code form and PNG chart form (**February 2011**)

2.7 As regards the milestone “elimination of the requirement to include radioactive clouds, and sand- and dust-storms in SIGWX forecasts” scheduled in the long term plan for November 2010, the meeting may wish to note that the ANC, at its third meeting of the 178<sup>th</sup> session in May 2008, decided that all the SIGWX items would be retained as currently reflected in Appendix 2 of Annex 3.

2.8 Hong Kong, China has conducted an evaluation of the trial gridded forecasts of icing, turbulence and convective clouds provided by WAFS London and WAFS Washington. Observations are presented in a separate information paper for the meeting.

### 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 D) and formulate the following decision:

**Decision 12/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 xx to the report;
- (b) the work programme and composition of the WAFS Implementation Task Force be amended as given in Appendix xx to the report.

### 4. OTHER ISSUES IN RELATION TO WAFS IMPLEMENTATION

4.1 At WAFSOPSG/4, the following Decisions were formulated on the correction and amendment of SIGWX forecasts issued by the WAFCs in case of errors identified in the forecasts and receiving updated volcanic ash or tropical cyclone advisories respectively:

***Decision 4/5 — Corrections to WAFS SIGWX forecasts***

*That, in case of errors in WAFS SIGWX forecasts (in the BUFR code and PNG chart forms):*

- a) no corrections to WAFS SIGWX forecasts in the BUFR code and PNG chart forms be required to be provided by the WAFS Provider States in view of cost implications on WAFS users; and*
- b) an administrative message drawing attention to the error identified be issued.*

**Decision 4/9 — Inclusion of information on SIGWX forecasts related to volcanic ash and tropical cyclones**

*That, the WAFIC Provider States continue to:*

*a) ...*

*b) ensure consistency of SIGWX forecasts by ignoring any volcanic ash or tropical cyclone advisories received between the issuance times of the SIGWX forecast in BUFR code form (T-17 hours ahead of validity) and the corresponding SIGWX in PNG chart form (T-16 hours ahead of validity).*

*Note. — The updated advisory information will be taken into account in the subsequent SIGWX forecasts (issued 6 hours later).*

4.2 On the other hand, para. 2.2.4 of Annex 3 recommends that “*When the quality system indicates that meteorological information to be supplied to the users does not comply with the stated requirements, and automatic error correction procedures are not appropriate, such information should not be supplied to the users unless it is validated with the originator*”. Para. 3.3.8.16 of the joint ICAO/WMO Manual/Guide on the Quality Management System (QMS) for the Provision of Meteorological Service for International Air Navigation (ICAO Doc 9873 / WMO No. 1001) also recommends “*In the event that nonconforming products are detected after delivery, the organization has to take appropriate action regarding the effects, or potential effects, of the nonconformity, for example issuance of correction messages*”.

4.3 Reading para. 4.1 and 4.2 together, the following questions have been asked:

- (a) Would the QMS provisions in Annex 3, which are expected to be upgraded to Standards in Amendment 75 in 2010, be applied to WAFS?
- (b) Should the meteorological offices stop supplying to the users the WAFS SIGWX forecasts with identified errors or consistently missing SIGWX features?

4.4 In connection with question (a), the ANC has tasked the WAFSOPSG to assess the implications both for WAFS users and WAFIC Provider States if the WAFIC Provider States rendered their practices in full compliance with the QMS principles as far as the update of the forecasts are concerned. As regards question (b), the meeting might like to discuss in particular the specific action that the meteorological offices should take when an administrative message drawing attention to errors identified in the current WAFS SIGWX forecasts is received or when an advisory of volcanic ash or tropical cyclone is received indicating inconsistency between the advisory and the current WAFS SIGWX forecasts, noting the provisions in para. 2.1.1 (as per Amendment 74) and 2.1.2 of Appendix 2 to Annex 3 regarding the use of WAFS products:

“2.1.1 Aerodrome meteorological offices shall use forecasts issued by the WAFICs in the preparation of flight documentation, whenever these forecasts cover the intended flight path in respect of time, altitude and geographical extent, unless otherwise agreed between the meteorological authority and the operator concerned.

2.1.2 In order to ensure uniformity and standardization of flight documentation, the WAFS GRIB and BUFR data received shall be decoded into standard WAFS charts in accordance with relevant provisions in this Annex, and the meteorological content and identification of the originator of the WAFS forecasts shall not be amended.”

and consider formulating the following draft Conclusion:

**Draft Conclusion 12/xx — Use of WAFS SIGWX forecasts**

That, ICAO be invited to provide the necessary SARPs and guidance for the meteorological offices regarding the use of WAFS SIGWX forecasts for the following scenarios:

- a) when an administrative message drawing attention to errors identified in the current WAFS SIGWX forecasts (in the BUFR code and PNG chart forms) is received; and
- b) when an advisory of volcanic ash or tropical cyclone is received indicating inconsistency between the advisory and the current WAFS SIGWX 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.

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# **ASIA/PAC WAFS Implementation Plan and Procedures**

10<sup>th</sup> Edition - July 2007

# **ASIA/PAC WAFS Implementation Plan and Procedures**

**10th Edition - July 2007**

## **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 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. Development and utilization of gridded forecasts of icing, turbulence and convective clouds.
- h. 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 101<sup>st</sup> Terrace  
Kansas City, Missouri  
USA 64153-2371
- ii. E-mail addressed to: [larry.burch@noaa.gov](mailto: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](mailto:nigel.gait@metoffice.com)
- iii. Fax number: + 44 (1392) 885 681

**Distribution of WAFS Products**

7. 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

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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**

8. 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 31 December 2008. 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>.

### **Indicative Timetable for Implementation of WAFS**

9. 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)**

10. 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)**

11. 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.

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

#### **WAFC Washington**

- i. NWS/Aviation Weather Center  
7220 NW 101<sup>st</sup> 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*

<b>Item</b>	<b>Task/Stage of Implementation of WAFS</b>	<b>Anticipated Date</b>
1	W AFC 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 WAFCs 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	1 January 2009

<b>Item</b>	<b>Task/Stage of Implementation of WAFS</b>	<b>Anticipated Date</b>
14	Launch of trial gridded forecasts of icing, turbulence and convective clouds	25 October 2006 (WAFc London) Mid-2007 (WAFc Washington)
15	Regional seminars on the use of the gridded forecasts	2008 and 2009
16	WAFcs begin parallel broadcast of WAFS forecasts in the GRIB2 code form	November 2009
17	Broadcast of forecasts in the GRIB 1 code form ceases	November 2011

**Status of States' Implementation of SADIS 2G in Asia/Pacific (June 2008)**

<b>State/Territory</b>	<b>SADIS 2G Implemented (Y/N)</b>	<b>Planned Date for Implementation</b>
Bangladesh	N	No information available.
China	N	July 2008
Hong Kong, China	Y	
Macao, China	N	End 2008
D.P.R. of Korea	Y	
India	N	No information available.
Lao P.D.R.	N	No information available.
<i>Malaysia</i>	<i>N</i>	<i>Not expected. Malaysia withdrew from the SADIS Programme on 31 May 2008, at their request.</i>
Maldives	N	No information available.
Mongolia	N (SADIS reception not operational)	No information available.
Myanmar	N (SADIS reception via FTP only)	Myanmar seeking assistance through the WMO Trust Fund set up for WAFS/SADIS implementation to assist LDC members. Possible 2008 implementation.
Nepal	Y	
Pakistan	Y	
Republic of Korea	Y	
Sri Lanka	Y	
Thailand	Y	
Viet Nam	Y	

Appendix G to the Report

APPENDIX G

WAFS LONG-TERM PLAN FOR THE YEARS 2008-2012

WAFS MILESTONES	WAFSOPSG MEETING SCHEDULE	ICAO Annex 3 Amendment Cycle
<b>February 2008:</b> <ul style="list-style-type: none"> <li>WAFCs implement the earlier issuance times of WAFS SIGWX forecasts on 06 February 2008 at 1900 UTC (for products valid at 1200 UTC on 07 February 2008).</li> </ul>	WAFSOPSG/4	
<b>April 2008 to September 2009:</b> <ul style="list-style-type: none"> <li>WAFCs develop and test WAFS forecasts in the GRIB 2 code form, encompassing higher-resolution data, as well as gridded cumulonimbus cloud, icing and turbulence forecasts.</li> </ul>		
<b>April 2008 to December 2009:</b> <ul style="list-style-type: none"> <li>WAFCs develop and test web-based distribution of WAFS forecasts, providing objective forecasts of gridded cumulonimbus cloud, icing and turbulence, derived from the GRIB 2 data. WAFCs undertake a verification study of these web-based objective forecasts.</li> </ul>		
<b>September 2009:</b> <ul style="list-style-type: none"> <li>GRIB 2 available on ISCS and SADIS FTP services, in parallel with GRIB 1.</li> <li>Workshop on the new gridded forecasts of cumulonimbus clouds, icing and turbulence.</li> </ul>	WAFSOPSG/5	
<b>September 2009 to November 2011:</b> <ul style="list-style-type: none"> <li>WAFS workstation vendors develop GRIB 2 decoders and software to enable the visualization of WAFS upper-air forecasts (including higher-resolution fields and gridded cumulonimbus cloud, icing and turbulence forecasts).</li> </ul>		
<b>December 2009:</b> <ul style="list-style-type: none"> <li>WAFCs make available web-based WAFS forecasts, providing objective forecasts of the gridded cumulonimbus clouds, icing and turbulence.</li> </ul>		
<b>January 2010 to November 2010:</b> <ul style="list-style-type: none"> <li>Regional training seminars on the gridded WAFS forecasts of cumulonimbus clouds, icing and turbulence, with particular focus on the web-based distribution of WAFS forecasts.</li> </ul>		

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WAFSOPSG/4

WAFS MILESTONES	WAFSOPSG MEETING SCHEDULE	ICAO Annex 3 Amendment Cycle
<b>November 2010:</b> <ul style="list-style-type: none"> <li>• Enabling clauses in Annex 3 for the use of gridded WAFS forecasts for cumulonimbus clouds, icing and turbulence;</li> <li>• Elimination of the requirement to include radioactive clouds, and sand- and dust storms in SIGWX forecasts.</li> </ul>		Amendment 75
<b>February 2011:</b> <ul style="list-style-type: none"> <li>• Confirm date for the cessation of satellite broadcast of forecasts in the GRIB1 code form, and WAFS SIGWX forecasts in the BUFR code form and PNG chart form.</li> </ul>	WAFSOPSG/6	
<b>March 2011 to May 2012:</b> <ul style="list-style-type: none"> <li>• Study of the planned Initial Operating Capability (IOC) of Network Centric Operations for potential WAFS applications.</li> </ul>		
<b>November 2011 to November 2013:</b> <ul style="list-style-type: none"> <li>• WAFS end-user workstations upgraded to accept GRIB 2 code form.</li> </ul>		
<b>September 2012:</b> <ul style="list-style-type: none"> <li>• Consideration of the results of the study of the planned IOC of Network Centric Operations for potential WAFS applications (to be referred to the conjoint ICAO/WMO MET Divisional Meeting)</li> <li>• Consideration of any other proposals related to the future of WAFS to be tabled for the conjoint ICAO/WMO MET Divisional Meeting.</li> </ul>	WAFSOPSG/7	
<b>Milestone beyond the 5-year period</b>		
<b>November 2013:</b> <ul style="list-style-type: none"> <li>• Cessation of WAFS forecasts in the GRIB 1 code form, WAFS SIGWX forecasts in the BUFR code form and PNG chart form)</li> </ul>		(Amendment 76)

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## 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 arrangement of training and providing user's feedback on the utilization of gridded forecasts of icing, turbulence and convective clouds.
- (c) Coordinating the migration of GRIB1 to GRIB2 WAFS data.
- (d) Coordinating the provision of assistance to States to ensure that WAFS can be effectively implemented in the Asia and Pacific Regions.
- (e) Providing inputs (via the CNS/MET SG) to APANPIRG on the regional planning and development of WAFS for coordination with the WAFSOPSG.
- (f) 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.