International Civil Aviation Organization

AFI PLANNING AND IMPLEMENTATION REGIONAL GROUP (APIRG)
METEOROLOGY SUB-GROUP EIGHTH MEETING (MET/SG/8)

(Nairobi, Kenya, 25-27 June 2007)

Agenda Item 3: WAFS in the AFI region

SUMMARY OF RECENT AND FORTHCOMING DEVELOPMENTS TO THE WAFS AND SADIS

(Presented by WAFC London)

Summary

This paper describes WAFS and SADIS developments since the last AFI MET Sub-Group meeting in April 2005. Some of these developments have had a direct impact on the end user. These impacts are raised in this working paper. A number of important developments are planned to the WAFS and SADIS in future years and these are highlighted in this paper for the consideration of the group.

1. Introduction

1.1 This paper presents developments to the WAFS and SADIS since the last meeting of the AFI MET Sub-Group. For more details of the activities of the WAFS and SADIS, users may wish to review information contained on the WAFSOPSG and SADISOPSG websites at URLs www.icao.int/anb/wafsopsg and www.icao.int/anb/sadisopsg respectively.

2. Recent Developments

2.1 SADIS FTP service and user guide

2.2 The SADIS FTP service was operationally launched in July 2005. It offers approved SADIS users with an alternative, high-quality internet based solution for receiving WAFS and OPMET data. The SADIS FTP service is an ICAO-approved distribution system and an integral part of the SADIS service, complementing, and providing backup for, the SADIS 1G and 2G satellite services. To assist users intending to access this service, the SADIS Provider State has produced a SADIS FTP user guide. The document, titled "*SADIS FTP Service*" is available as a link from the SADISOPSG website via URL: www.icao.int/anb/sadisopsg. The document is reviewed on a regular basis and updated as required. The most recent copy, version 4.0, was published in October 2006.

2.3 ***Suggested action:*** *Approved SADIS users who have internet capabilities, but do not have an active SADIS FTP account, are invited to contact the SADIS Provider State seeking access to the service. Details can be found in the SADIS FTP Service document (outlined above) or through their State Met Authority.*

2.4 Cessation of WAFS T4 formatted wind and temperature and significant weather charts

2.5 On 01 July 2005, the WAFS wind and temperature charts in T4 format were removed from the WAFS broadcasts. The cessation of these mature products was uneventful from the perspective of the WAFCs. WAFS users were informed well in advance of this action. However, a small number of users were clearly unprepared for the cessation of the charts. On 01 December 2006, the WAFS significant weather (SIGWX) charts in T4 format were removed from the WAFS broadcasts – in line with WAFSOPSG Conclusion 3/9. Again, users were informed well in advance of this action and encouraged to utilise the BUFR encoded SIGWX and portable network graphics (PNG) equivalent products.

2.5.1 ***Suggested action:*** *No action required.*

2.6 Provision of PNG formatted SIGWX charts

2.6.1 To minimise the impacts for end users of the cessation of T4 formatted SIGWX charts, outlined above, and BUFR migration issues, the WAFS Provider States have provisioned PNG formatted SIGWX charts on the WAFS broadcasts since mid-late 2005. On the SADIS 1G and 2G satellite broadcasts, these products are available as bulletinsed PNGs (i.e. enclosed by a WMO telecommunications wrapper). The 'envelope' is necessary to enable these charts to be transmitted via satellite. For a product recipient to be able to display these charts, the 'envelope' needs to be removed by a client workstation system. On SADIS FTP, these products are available as unbulletinsed PNGs (i.e. with their WMO telecommunications wrapper removed). This enables SADIS FTP users to display the products via commercial off-the-shelf (COTS) applications, including internet web browsers. High-level and medium-level SIGWX forecasts in PNG format are available for standard ICAO regions. Refer to 3.6 (below) for information relating to the intended longevity of these products.

2.6.2 ***Suggested action:*** *All approved SADIS workstation vendors have software that can visualise the PNG formatted SIGWX charts. Users who cannot view these products are encouraged to contact their workstation/software vendor with a view to obtaining a software upgrade which includes PNG viewing capabilities.*

2.7 BUFR encoded WAFS SIGWX forecasts and BUFR guideline documentation

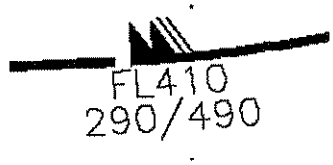
2.7.1 Since July 2005, the WAFS Provider States have produced BUFR encoded SIGWX forecasts for dissemination over the WAFS broadcasts (SADIS and ISCS). Global high-level (SWH) and regional medium-level (SWM) SIGWX forecasts in BUFR format are available for approved users. A WAFS workstation and/or software visualisation suite is required to visualise the BUFR encoded products. It is recommended that WAFS users unable to visualise the BUFR data contact their workstation/software vendor with a view to obtaining a software upgrade. *Consideration needs to be given to the financing and implementation of subsequent software upgrades that may be required should the BUFR standards change in future.*

2.7.2 To assist users and workstation vendors intending to utilise BUFR encoded WAFS SIGWX forecasts, the WAFS Provider States has compiled a BUFR guideline document, that is reviewed on a regular basis and updated as required. The document, titled "*Representing WAFS significant weather (SIGWX) data in BUFR*" is available as a link from the WAFSOPSG website via URL: www.icao.int/anb/wafsopsg/. The most recent copy, version 4.0, was published in March 2007.

2.7.3 ***Suggested action:*** *All approved SADIS workstation vendors have software that can visualise the BUFR encoded SIGWX data. Users who cannot decode and view this data are encouraged to contact their workstation/software vendor with a view to obtaining a software upgrade which includes BUFR decoding and viewing capabilities.*

2.8 Revision to jet depth depiction on SIGWX products

2.8.1 On 26 July 2006, both WAFCs implemented the revision to jet depth depiction on WAFS SIGWX products (PNG and BUFR). The format uses the highest and lowest flight levels of the 80 KT jet wind core, and replaces the earlier plus/minus notation. Any users having difficulty displaying the jet depth should contact their workstation/software vendor for an upgrade. An example of the new notation is now provided:



2.8.2 ***Suggested action:*** *It is suggested that users contact their software vendor with a view to obtaining a software upgrade which includes the revised BUFR depiction scenario for jetstream depth. Users of the PNG SIGWX charts will note that the charts already depict the revised jet depth format.*

2.9 WAFS/SADIS workstation evaluations

2.9.1 The SADIS Provider State, on behalf of ICAO, has completed a further (second) evaluation of WAFS/SADIS workstations. Eight WAFS visualisation systems can now be considered compliant to the SADISOPSG software criteria. Details of these systems and the results obtained from the latest software evaluations are available from URL: www.metoffice.gov.uk/sadis/software/index.html.

2.9.2 ***Suggested action:*** *Users are invited to study the results of the software evaluations (from URL above) and consider using this information as a component to their future procurement processes for new or upgraded workstation software.*

2.10 International SADIS Seminars

2.10.1 Two international SADIS seminars were held during 2006 – in Bangkok (14-15 July) and Paris (25-26 September). The purpose if these events was to provide SADIS stakeholders with the opportunity to get together to discuss any issues associated with the migration from the legacy SADIS 1G service to the newer SADIS 2G service. A high level of commitment to the seminar was given by hardware and software vendors, and a good number of SADIS users attended the events, taking advantage of the unique opportunity provided to discuss their requirements directly with suppliers. Both seminars were held back-to-back with other international meetings held at the ICAO regional offices, and it is believed that this facilitated wide participation from users.

2.10.2 ***Suggested action:*** *No immediate action required, although users may choose to monitor the SADISOPSG website for details of any possible future events of this nature (URL: http://www.icao.int/anb/sadisopsg/).*

2.11 Trust Fund in support of LDC members to access WAFS products

2.12 A Trust Fund has been established to support the Commission for Aeronautical Meteorology (CAeM) in its efforts to assist Least Developed Country (LDC) Members to ensure that their NMHS has sustainable access to WAFS products by the most appropriate means. The Trust Fund will be used to assist LDC Members to meet the target date of 31 December 2008 for the replacement of first generation SADIS installations, where all other reasonable means have been demonstrably exhausted, and thereby to ensure sustainable access to WAFS products by the most appropriate means, in conformance with ICAO provisions.

2.13 The Commission has reviewed and endorsed the Terms of Reference of the Trust Fund, and requested that the Secretary-General of WMO manage and administer the Fund in accordance with WMO Financial Regulations.

2.13.1 ***Suggested action:*** *LDC Member States seeking more information about the Trust Fund, including Terms of Reference, should contact the WMO Secretary-General for further information.*

2.14 AFS Output performance indicators

2.15 WAFSOPSG Conclusion 2/11 invited the WAFCs to implement a number of measures that would quantify the accuracy and availability of specified WAFS products. In response to this conclusion, both WAFCs are pleased to report that web pages containing output performance indicator and timeliness statistics have been implemented. Each WAFC maintains a separate web site. The statistics are updated monthly.

2.16 WAFC London performance indicators are available for viewing from the following URL: http://www.metoffice.gov.uk/icao/index.html.

2.17 WAFC Washington performance indicators are available from the following URL: http://www.emc.ncep.noaa.gov/gmb/icao/ncep_scores.html.

2.18 These pages provide RMS vector wind errors and RMS temperature errors for 6 geographic regions: North Atlantic, Asia, North Pacific, Northern Hemisphere, Tropics, and Southern Hemisphere. Timeliness of transmission for selected GRIB and BUFR bulletins are also made available.

2.18.1 ***Suggested action:*** *Regularly review the performance indicator information available to users.*

2.19 WAFS Change Notice Board

2.20 WAFSOPSG Conclusion 2/4 invited the WAFCs to develop a 'tracking system' for inclusion on the WAFSOPSG web site. The WAFCs are pleased to report that such a facility became available in May 2005 and is available as a link from the WAFSOPSG website via URL: www.icao.int/anb/wafsopsg/. This 'Notice Board' is updated on a regular basis by the WAFCs.

2.21 ***Suggested action:*** *Users are invited to access the WAFS Change Notice Board on a regular basis so that they remain up to date with developments pertaining to the WAFS.*

2.22 AFC Backup tests

2.23 The WAFCs have continued to carry out a series of backup tests since the last regional MET SG meeting. The intention of these tests is to confirm the resilience and effectiveness of the current backup plan, which now includes BUFR encoded and PNG formatted SIGWX products. A backup test schedule and chronology of recent tests are available to view as links from the WAFSOPSG website via URL: www.icao.int/anb/wafsopsg/. The backup tests have continued to be largely transparent to end users.

2.23.1 ***Suggested action:*** *Users are invited to access the information available from the WAFSOPSG website on a regular basis so that they can keep abreast of recent and forthcoming tests.*

2.24 FS gridded forecasts of icing, turbulence and convective clouds

2.25 For a number of years, regional guidance on where aircraft might encounter icing and turbulent conditions has been provided by WAFC forecasters in the graphical form of SIGWX charts and (more recently) BUFR data. In April 2003, WAFC London began developing software that would allow the Centre to produce global forecasts relating to icing and turbulence in the form of gridded numerical data. Since 25 October 2006, WAFC London gridded forecasts of icing, turbulence and convective cloud have been available for approved users to access on a *trial and evaluation basis* from the SADIS FTP service. WAFC Washington has also been developing equivalent products, and these are expected to become available on SADIS FTP around mid-2007. Refer to 3.8 (below) for information on the intention and future development of these gridded products.

2.25.1 ***Suggested action:*** *Note this information. .*

3. Future Developments

3.1 SADIS FTP enhancements

3.1.2 A number of enhancements to the SADIS FTP service are expected to be completed over the next 2 to 3 years. Work is already underway at the SADIS Provider State (UK Met Office) to roll-out these enhancements within the timescales endorsed at SADISOPSG/11. The enhancements are primarily focussed on the security and integrity of the service (e.g. preventing internal or external attacks on networks or servers), as well as migration of the service onto dual servers, thus providing failover resilience of the service during interruptions or outages.

3.1.3 ***Suggested action:*** *Note this information. The SADIS FTP enhancements are expected to be largely transparent to end-users.*

3.2 Planned termination of the SADIS 1G Service

3.2.1 The SADIS first generation (1G) satellite service has been in operation for over 10 years, and is now considered a legacy system. In 2004, the SADIS second generation (2G) service was implemented, utilising the internet protocol (IP) to disseminate the WAFS and OPMET data, and superseding the SADIS 1G service. All new installations since then have taken the form of SADIS 2G

VSAT receiver systems. Pre-existing SADIS 1G users have been encouraged to migrate to procuring a SADIS 2G upgrade, in readiness for the planned termination of SADIS 1G on 31 December 2008 (SADISOPSG Conclusion 9/15). Users with failing SADIS 1G hardware have found that purchasing new SADIS 2G technology to be the most financially prudent option, rather than investing in maintaining the older units. For many, the cost of the indoor SADIS 2G hardware is approximately 50% cheaper than the cost of equivalent SADIS 1G units which are increasingly difficult and expensive to support. More information on SADIS 2G is available from URL: http://www.metoffice.gov.uk/sadis/sadis2g.html

3.2.2 ***Suggested action:*** *Users of the legacy SADIS 1G service are strongly advised to consider procurement of a SADIS 2G receiver system upgrade, well ahead of the planned termination date to SADIS 1G (31 December 2008). More information is available from the above URL.*

3.3 Development of a back-up data supply for SADIS

3.4 In recent years, various options have been investigated for changes in the back-up configuration of SADIS. These were considered necessary to overcome short-period interruptions experienced in the event of a failure of data supply to the SADIS service. The optimum short-term solution is the installation of an ISCS/2 receiver system on the premises of the SADIS Gateway (UK NATS). This work is currently underway, and will allow a comprehensive data supply back-up without the need for direct coordination between the SADIS and ISCS Provider States - which had turned out to be difficult during past periods of contingency. Establishment of a permanent link between WAFC Washington and the SADIS Gateway site is considered to be the ideal solution, and may be considered in future years.

3.4.1 ***Suggested action:*** *Note this information.*

3.5 Advancement of the lead time of issuance of WAFS SIGWX forecasts

3.5.1 In order to meet the needs of long-haul flights, the WAFS Provider States have been invited, by the 3rd meeting of the WAFSOPSG, to advance the lead time of issuance of WAFS SIGWX forecasts. At present, BUFR and PNG formatted WAFS SIGWX products are issued at approximately 13.5 hours ahead of validity. In time for WAFSOPSG/4 (February 2008), the WAFCs will advance the lead time of issuance of SIGWX forecasts in the BUFR code form to:

a) 17 hours for high levels (SWH); and
b) 16 hours for medium levels (SWM).

3.5.2 Furthermore, PNG formatted SIGWX products (SWH and SWM) will be issued with a lead time of 16 hours. During periods of WAFC backup, the WAFCs will be required to issue the SIGWX forecasts with a lead time of 15 hours.

3.5.3 WAFS users will be advised six months before the implementation of this change on the WAFSOPSG website (Change Implementation Notice Board), via URL: http://www.icao.int/anb/wafsopsg/. Administrative messages will also be broadcast over SADIS and ISCS services notifying users of the intended implementation date. End-user workstation systems that automatically schedule the generation of products based on the WAFS SIGWX forecasts may require an upgrade in readiness for this change

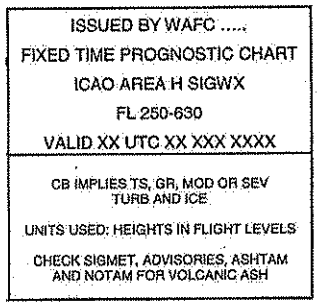
3.6.4 ***Suggested action:*** *Users are encouraged to monitor the implementation date planned by the WAFCs on the WAFSOPSG website, and they should contact their workstation supplier to identify whether an upgrade will be required to accommodate this change.*

3.7 Update to the depiction of features on WAFS SIGWX charts

3.7.1 In line with WAFSOPSG Conclusion 3/3, the WAFS Provider States have been invited to:

a) adopt the use of revised text in the legend boxes of WAFS SIGWX charts;
b) ensure that the thunderstorm symbol (TS) is not used on WAFS SIGWX forecasts; and
c) ensure that explicit slight levels be displayed for jet depths and tropopause heights on WAFS SIGWX forecasts, even when these are outside of the bounds of the forecast concerned.

3.7.2 For b) and c), the WAFCs have already introduced these into standard working practices. For a), the revised legend box text will be introduced at the same time that Amendment 74 to ICAO Annex 3 takes effect (07 November 2007). An example of the revised legend box text is now provided:



3.7.3 These changes affect the BUFR-encoded format and PNG formatted WAFS SIGWX products. End-users who utilise the BUFR data may require a software upgrade to accommodate the changes outlined.

3.7.4 ***Suggested action:*** *Users are encouraged to contact their workstation supplier to identify whether an upgrade will be required to accommodate this change – particularly those users who generate SIGWX products from the BUFR encoded WAFS data.*

3.8 Amendment 74 changes to ICAO Annex 3

State Letter AN 10/1.1-07/11 outlined the adoption by the Council of Amendment 74 to the *International Standards and Recommended Practices, Meteorological Service for International Air Navigation* (Annex 3 to the Convention on International Civil Aviation). The principle components of this amendment to Annex 3, with respect to WAFS provision, are:

a) elimination of the need to amend significant weather (SIGWX) forecasts and the introduction of altitude of the standard WAFC flight levels;
b) introduction of the requirement to provide WAFS charts for standard ICAO areas of coverage;
c) upgrading the provisions in order to foster the use of WAFS forecasts;
d) elimination of surface fronts, convergence zones and clouds other than CB and TCU from the high- and medium-level SIGWX forecasts;

e) prioritisation of plotting volcanoes, tropical cyclones and radiation symbols on WAFS SIGWX charts; and
f) advancement of the lead time of issuance of SIGWX forecasts;

3.8.2 A number of other (non-WAFS related) changes are planned, and users are encouraged to refer to the State Letter detailed above for clarification. The Council has decided that Amendment 74 will become applicable on 07 November 2007, except for the provisions outlined at a) and f) above, and the extension of the validity period of an aerodrome forecast and other amendments related to aeronautical meteorological codes which will become applicable on 05 November 2008.

3.8.3 ***Suggested action:*** *Users should note the changes proposed by Amendment 74 to Annex 3 and identify whether a local software upgrade and/or changes in working practice are required to accommodate the changes.*

3.9 PNG formatted SIGWX charts

3.9.1 In accordance with WAFSOPSG Conclusion 3/9, the WAFS Provider States have been invited to continue the provision of PNG formatted SIGWX charts at least until 2010, *as a backup to* BUFR encoded SIGWX forecasts – this is in case of any missing or corrupt BUFR data, and also so that a definitive standard of the SIGWX forecasts exists for compliancy testing purposes.

3.9.2 ***Suggested action:*** *Ideally, users should adopt the use of the BUFR encoded SIGWX data at the earliest opportunity, and utilise the PNG SIGWX charts as a backup to BUFR. This may involve a workstation software upgrade. Users should be aware that the PNGs may not be available after 2010, depending on the outcome of discussions at future WAFSOPSG and SADISOPSG meetings. Petitions to the planned cessation of the PNG charts should be made to relevant WAFSOPSG members.*

3.10 WAFS gridded forecasts of icing, turbulence and convective cloud

3.10.1 Section 2.12 (above) outlined the provision of these products, for trial and evaluation purposes, on the SADIS FTP service. In accordance with WAFSOPSG Conclusion 3/13, WAFSOPSG members from IATA, IFALPA and user States have been invited to evaluate these trial products, with a view to fostering their future implementation.

3.10.2 Initial guidelines and models for the visualisation of these gridded forecasts are expected to be reviewed at WAFSOPSG/4 (February 2008), in view of their future inclusion in Annex 3. ICAO, in co-ordination with WMO, will prepare a plan for convening regional seminars on the use of these gridded forecasts in order to assist States and WAFS users to implement the new provisions, to be presented at WAFSOPSG/4.

3.10.3 ***Suggested action:*** *Note this information and monitor the development of these gridded products, including the proposed establishment of regional seminars, through the WAFSOPSG.*

3.11 Migration plan to GRIB2 code form

3.11.1 The WAFS Provider States, in co-ordination with WMO, have been invited to develop a detailed implementation plan for the transition from GRIB1 to GRIB2 code form within the WAFS, for endorsement by the WAFSOPSG/4 meeting. The current expectation is that the WAFS Provider States will begin parallel broadcasts of WAFS forecasts in GRIB2 code form in 2009 or 2010. The parallel broadcasts are necessary to afford WAFS workstation vendors and users the opportunity to

upgrade their workstations to receive and successfully process the GRIB2 data. On overlap period of at least 2 years is currently anticipated, and any decision to cease production of GRIB1 data will be agreed at subsequent WAFSOPSG meetings based on feedback from all members.

3.11.2 ***Suggested action:*** *Note this information and monitor the development of GRIB2 WAFS data through the WAFSOPSG – particularly the timeframes planned for parallel broadcasting of GRIB1 and GRIB2 data, and eventual discontinuation of GRIB1 data. Member concerns over GRIB2 migration timescales should be expressed to the APIRG.*

3.12 Improvements in the spatial and temporal resolution of WAFS upper-air forecasts

3.12.1 The WAFSOPSG member from IATA, in co-ordination with the WAFS Provider States, is soon to begin an analysis of the WAFC costs and benefits to aviation that would be realised by improvements in the vertical, horizontal and temporal resolutions of WAFS upper-air forecasts. At present, the benefits of moving to higher resolution data (such as reducing the current 6-hourly time-step interval to 3-hourly) are not yet fully understood. And, the WAFSOPSG/3 meeting agreed that further work should be done in this area. The results of this analysis are expected to be reviewed by the WAFSOPSG/4 meeting.

3.12.2 ***Suggested action:*** *Note this information and monitor progress of high resolution data through the WAFSOPSG.*

4. Action by the Meeting

4.1 The AFI MET Sub-Group is invited to review the content of this paper and to consider the suggested actions.
