Outcomes of Meteorological Divisional meeting (July 2014) relating to the World Area Forecast System

The International Civil Aviation Organization (ICAO) Meteorology (MET) Divisional Meeting was held in Montréal, between 7 and 18 July 2014 (MET/14), in part conjointly with the Fifteenth Session of the WMO Commission for Aeronautical Meteorology (CAeM-XV). The participation of Member States of both organisations, as well as invited international organisations, provided the international civil aviation community the opportunity to address, as a whole, issues vital to the current and future provision of aeronautical meteorological services.

Outcomes from MET/14 included the development of 29 recommendations setting forth global objectives and implementation timelines, and directing the course of work for enhancing the provision of meteorological services to international air navigation for the next decade or more. A report on the discussions, including details of the recommendations from MET/14, is available on the following website: www.icao.int/Meetings/METDIV14/Pages/default.aspx

With regard to the World Area Forecast System (WAFS), the ICAO MET Divisional Meeting recommended that an appropriate ICAO expert group, in close coordination with WMO, should be tasked to further develop the requirements of the WAFS consistent with the Global Air Navigation Plan including integration into the System Wide Information Management (SWIM) environment.

As a consequence, the World Area Forecast Centres (WAFCs) have developed a roadmap as a basis for the future development of the WAFS in the timeframes of the Aviation System Block Upgrade (ASBU) modules. The upgrades envisaged are split into two timeframes, those to be delivered during ASBU 0 (2013-2018) and those during blocks 1 and 2 (2018-2028). The main deliverables are presented in the tables below.

### Table 1: World Area Forecast System deliverables in support of ASBU block 0 (2013-2018).

<table>
<thead>
<tr>
<th>ID</th>
<th>DELIVERABLE</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Implement improved turbulence algorithms including the replacement of turbulence potential with turbulence severity (i.e. eddy dissipation rate (EDR)).</td>
</tr>
<tr>
<td>2</td>
<td>Implement improved icing algorithms including the replacement of icing potential with icing severity.</td>
</tr>
<tr>
<td>3</td>
<td>Global and regional verification of WAFS forecasts by utilising data provided by States and user organisations.</td>
</tr>
</tbody>
</table>

### Table 2: World Area Forecast System deliverables in support of ASBU block 1 and 2 (2018-2028).

<table>
<thead>
<tr>
<th>ID</th>
<th>DELIVERABLE</th>
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<tbody>
<tr>
<td>4</td>
<td>Implement cumulonimbus cloud ensemble based prediction system.</td>
</tr>
<tr>
<td>5</td>
<td>Implement turbulence type forecasts (e.g. convection, jet-stream shear, terrain) utilising eddy dissipation rate (EDR).</td>
</tr>
<tr>
<td>6</td>
<td>Implement finer grid resolution for WAFS data.</td>
</tr>
<tr>
<td>7</td>
<td>Implement calibrated probabilistic forecasts for icing, turbulence and cumulonimbus cloud.</td>
</tr>
<tr>
<td>8</td>
<td>Provide partial dataset of meteorological information suitable for integration into flight planning, flight management and air traffic management (ATM) decision support systems for en-route weather.</td>
</tr>
<tr>
<td>9</td>
<td>Implement significant weather forecasts (SIGWX) in XML/GML format as a replacement to SIGWX in BUFR format.</td>
</tr>
<tr>
<td>10</td>
<td>Make available WAFS data via the System Wide Information Management (SWIM).</td>
</tr>
</tbody>
</table>

MET/14 Delegates, ICAO headquarters, 7-18 July 2014, Montréal, Canada.
Cessation of the SADIS satellite based services

The satellite platform (Intelsat 904) from which the SADIS 2G data is transmitted will be decommissioned on 31 July 2016. Although a replacement satellite will be launched, it will not be able to provide the current downlink frequencies that are used by SADIS 2G systems. Accordingly, the SADIS Provider, in coordination with ICAO and the SADISOPSG, has undertaken a study of the options available. The results of this study were presented to the first meeting of the Meteorological Panel (METP/1), convening 20 to 24 April in Montréal, Canada.

At the METP/1 meeting, it was agreed that the SADIS 2G broadcast should be withdrawn on 31 July 2016, and that there would be no replacement satellite based service. This was considered to be the most cost effective and most practicable way forward.

Many readers will be aware that the SADIS 2G service has been providing essential meteorological aviation data to the international aviation community since September 2004. It was preceded by the SADIS 1G service (1995-2008). Both SADIS 2G and its predecessor have provided very reliable service to Europe, Africa, the Middle East, and western and central parts of Asia for two decades.

An internet based service (Secure SADIS FTP), has been available since November 2010, and that was preceded by the successful SADIS FTP service (2001-2012). With increasing use of the internet and with the approaching end of life of the current satellite based platform, it is now considered an appropriate time to begin to withdraw the satellite based service.

Readers will be pleased to note that the Secure SADIS FTP service will continue into the future and is unaffected by the changes to SADIS 2G.

All users of the SADIS 2G service who have not yet arranged Secure SADIS FTP accounts are encouraged to contact the SADIS Manager (chris.tyson@metoffice.gov.uk) at the earliest opportunity. Users may wish to review the ‘Overview of process to migrate from SADIS 2G to Secure SADIS FTP’ diagram below, to assist in the process.

Finally, the SADIS Provider wishes to take this opportunity to thank all partners, stakeholders and users for making the SADIS 2G (and 1G) services so successful over the last 20 years.

Overview of process to migrate from SADIS 2G to Secure SADIS FTP

1) Obtain credentials to access Secure SADIS FTP from SADIS Manager, chris.tyson@metoffice.gov.uk
2) Contact SADIS Workstation provider to establish detailed requirements relating to internet connectivity, and any necessary updates to SADIS Workstation software
3) Establish a contract and connection with an Internet Service Provider
4) In collaboration with SADIS Workstation supplier, using credentials provided by SADIS Manager, configure and check system is connecting to the Internet, and accessing Secure SADIS FTP
5) Use Secure SADIS FTP for normal SADIS Workstation operations

Recommendations:
- It is strongly recommended that SADIS 2G users update their systems to use Secure SADIS FTP
- Contact SADIS Workstation supplier at the earliest opportunity to determine the necessary system specific steps that would be required
- Contact the SADIS Manager at the earliest opportunity to ensure credentials and are made available
- For resilience and redundancy, use an Internet Service Provider with high levels of availability, and where possible, consider having an alternative Internet Service Provider as a backup
- Where possible, scale quotes from several Internet Service Providers
- Arrange suitable support and maintenance contracts with the SADIS workstation provider and Internet Service Provider
- Arrange suitable system protection - such as uninterruptible power supplies (UPS)
Verification data for WAFS harmonised Cb and CAT data

WAFC London is pleased to inform all users of WAFS harmonised gridded forecasts of cumulonimbus cloud (Cb) and CAT data that verification data is now available on the WAFC London Performance Indicators webpage. To access the data, the following link can be used: www.metoffice.gov.uk/public/weather/aviation-wafc/#?tab=wafcPerformance

Users may select the Cb and CAT verification data from the ‘Parameter’ drop-down. This will give access to Relative Operating Characteristic (ROC) curves and full contingency tables. Users may also select from several regions where sufficient verification data is available, and for verification of T+12, T+24 and T+36 forecasts. Figure 1 illustrates the selection interface.

The verification data for these parameters is particularly important since it permits users to appropriately set their operational thresholds based on their business models. Figure 2 provides an example Relative Operating Characteristic (ROC) curve and corresponding contingency table. These examples relate to providing verification data for moderate or greater Clear Air Turbulence (CAT) forecasts in WMO Region 2 (see figure 3). ROC curves provide an indication of the skill of a forecast. By way of explanation, a forecast has most skill when the plotted line (in this case blue with crosses) has a perfect hit rate (Hit Rate = 1) and zero false alarm rate (False Alarm Rate = 0); i.e. the closer the plotted curve approaches the top left of the diagram, the more skilful the forecast. The diagonal line from bottom left to top right represents ‘no skill’.

![Figure 1: WAFC London Performance Indicators. Example of available options for verification data relating to WAFS harmonised gridded forecasts of cumulonimbus cloud (Cb) and CAT.](image1)

![Figure 2: Example ROC curve (left) and contingency table (right) for moderate or greater CAT within the WMO Area 2 domain.](image2)
A contingency table provides the fundamental information from which a whole range of statistical analysis may be undertaken. Users may assess the most appropriate hit rate/false alarm rate that best suits their business needs and assign an appropriate threshold at which to be alerted. For example, referring to figure 2; if the business needs require a hit rate of 85% (0.8513 in the ‘Hit Rate column’), then the threshold to assign would be 1.26 (‘Threshold’ column in the same row).

This would mean that 85% of moderate or greater turbulence events would be correctly identified, with an expected false alarm rate of 39% (0.3915 in the False Alarm Rate column in the same row). The same information can be obtained graphically from the ROC curve.

Availability of alphanumeric OPMET data on Secure SADIS FTP at 1 minute intervals

On 29 October 2014, the Secure SADIS FTP service was updated to make available alphanumeric OPMET data at one minute intervals. This was achieved by providing additional files and folders that permit more frequent updates than the normal five minute update cycle.

Users of Secure SADIS FTP may wish to ensure that their software can take advantage of these one minute updates. Full details are available in the ‘Secure SADIS FTP User Guide’ which can be found in the ‘DOCUMENTATION’ folder of Secure SADIS FTP and also from the SADISOPSG web pages (under ‘Guidance Material’).

WAFC backup test schedule for 2015

The 2015 WAFC backup test schedule is available on the WAFSOPSG web pages. From the home page (www.icao.int/safety/meteorology/WAFSOPSG), select ‘Operational Information’ from the left hand sidebar, and select ‘Forthcoming and Historical Record of WAFC Backup Tests’.
Useful contact points and web addresses

There are three very important websites that we would encourage all WAFC and SADIS users to visit frequently. All of the sites give a wealth of useful information.

**WAFSOPSG**

WAFSOPSG is the ICAO body that oversees the production of WAFS forecasts produced by WAFC London and WAFC Washington. The link below will take you to its home page. Links on the left hand side bar will provide access to important and useful information.

www.icao.int/safety/meteorology/wafsopsg/Pages/default.aspx

**SADISOPSG**

SADISOPSG is the ICAO body that oversees the SADIS service. The link below will take you to its home page. Links on the left hand side bar will provide access to important and useful information.

www.icao.int/safety/meteorology/sadisopsg/Pages/default.aspx

**Met Office SADIS pages**

As the SADIS Provider, the Met Office, based in the United Kingdom, maintains its own web pages providing essential information relating to SADIS.

www.metoffice.gov.uk/aviation/sadis
The Nineteenth meeting of the SADIS Operations Group (SADISOPSG/19) convened 27 to 29 May 2014, London, United Kingdom. The main outcomes of the SADISOPSG/19 meeting were:

- The annual review of the operational efficacy of the SADIS services and agreement that the service continues to meet the approved operational requirements.
- Review of the SADIS Inventory.
- Endorsement of a range of technical modifications to the Secure SADIS FTP service to ensure ongoing efficiency of the system.
- Update of the SADIS Gateway Mid-life upgrade project, due to become operational in 2015.