INTERNATIONAL CIVIL AVIATION ORGANIZATION

Seventh Meeting of the APIRG Infrastructure and Information Management Sub-Group (IIM/SG7)

Dakar, Senegal, 5 - 8 August 2024

Agenda Item 3 : ***Achievements in Infrastructure and Information Management***

Item 3.5. Other Air Navigation initiatives

WP3.5G new SADIS API services

(Presented by UK MetOffice)

SUMMARY
This paper provides information on the new SADIS API services, new higher resolution World Area Forecast System (WAFS) gridded data sets, and WAFS Significant Weather (SIGWX) forecasts. On 26 November 2024 when the new WAFS SIGWX forecasts are introduced there will be changes to the content and appearance of the T+24 high and medium level SIGWX forecasts. Action by the meeting in paragraph 3
REFRENCE(S): ▪ ICAO Global Air Navigation Plan https://www4.icao.int/ganpportal/ ▪ *Proposals for the amendment of Annex 3, New PANS-MET* ▪ *MET Panel related Reports*
Relates to **ICAO Strategic Objectives**: ***A – Safety; B - Air Navigation Capacity and Efficiency; E - Environmental Protection***

1. INTRODUCTION

1.1 This paper provides some information on the recent upgrade to the WAFS gridded sets, introduction of the new WAFS SIGWX forecasts and the introduction of the new SADIS and WIFS API systems for distributing the WAFS data.

1.2 All of these changes have been agreed though the ICAO MET Panel Meteorological Operations Group (MOG) at its annual meetings.

1.3 Information specifically relating to changes to the T+24 WAFS SIGWX forecasts will be presented at the Workshop that proceeds this meeting (on 8 July). The slides are included as Attachment A for completeness.

2. DISCUSSIONS

SADIS API AND WIFS API

2.1 WAFC London and WAFC Washington have worked closely together to develop the next generation of SADIS (operated by WAFC London) and WIFS (the backup to SADIS operated by NOAA). Both systems are SWIM compliant and use the Open Geospatial Consortium Environmental Data Retrieval (OGC-EDR) API framework https://ogcapi.ogc.org/edr/. There is a high degree of harmonization in how data is requested and returned by both systems.

2.2 There are three parts to data available on the SADIS API:

- WAFS Gridded data - fully operational
- WAFS OPMET data - fully operational
- WAFS SIGWX data - available in test mode now. The new WAFS SIGWX forecasts are expected to become operational on 26 November 2024.

2.3 Existing SADIS users are encouraged to register for these new systems to retrieve data, and to start setting up their systems to process and visualize the data.

- Information on the SADIS API and how to register is available using the following link: https://www.metoffice.gov.uk/services/transport/aviation/regulated/sadis/info/sadis-api

HIGHER RESOLUTION WAFS GRIDDED DATA

2.4 With the introduction of the SADIS API, higher resolution WAFS gridded data sets were introduced. Table 1 gives a summary of what is available gridded WAFS data sets.

2.5 The 0.25 degree data sets are provided as regional tiles, see figure 1, to make the data volume more manageable for those organizations who may struggle with it. A globally coverage data set is also available for anyone who needs it.

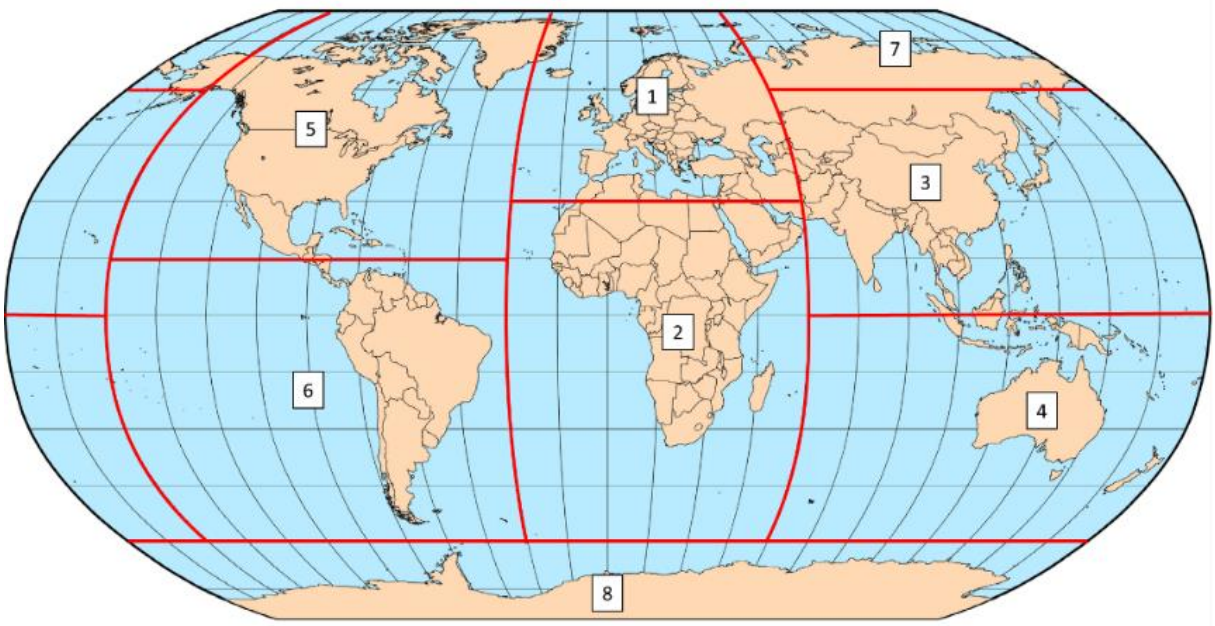

Figure 1 – Regions/Tiles of data that will be made available on the SADIS APIs

2.6 The full new WAFS gridded data set is not yet listed in ICAO Annex 3, but will be when Amendment 82 becomes effective in November 2025 (note this amendment will also introduce the new PANS-MET which is where much of the information about the WAFS data will go)

0.25-degree horizontal resolution WAFS gridded data	**1.25-degree horizontal resolution WAFS gridded data**
Parameters • Wind U/V - 56 vertical levels from FL050 to FL600 • Temperature - 56 vertical levels from FL050 to FL600 • Geospatial Height - 56 vertical levels from FL050 to FL600 • Relative Humidity - 14 vertical levels from FL050 to FL180 • Tropopause height and Tropopause temperature • Max wind height, and max wind u/v • Icing Severity - 26 vertical levels from FL050 to FL300 • Turbulence Severity - 36 vertical levels from FL100 to FL450 • Cumulonimbus Extent, Base and Top WAFC London and WAFC Washington data is available.	**Parameters** • Wind U/V – 17 vertical levels from FL050 to FL530 • Temperature – 17 vertical levels from FL050 to FL530 • Geopotential Height – 17 vertical levels from FL050 to FL530 • Relative Humidity – 5 vertical levels from FL050 to FL180 • Tropopause height and Tropopause temperature • Max wind height, and max wind u/v WAFC London and WAFC Washington data is available.
Forecast Timesteps: • T+06 to T+24 at 1-hourly intervals • T+27 to T+48 at 3-hourly intervals[1] • T+54 to T+120 at 6-hourly intervals[2] *Note:* *[1]Icing, Turbulence and Cumulonimbus data will stop at T+48* *[2]WAFC London data past T+66 will only be produced for the 00Z and 12Z model runs* Data is available as global and regional tiles	**Forecast Timesteps:** • T+06 to T+36 at 3-hourly intervals Data is available as global tiles only.

Table 1 – WAFS gridded data available on the new SADIS API

WAFS SIGWX

2.7 A presentation regarding the SIGWX changes will be given during the II7 Meeting. The key changes are also summarized in the following sections.

New WAFS SIGWX

2.8 Both WAFCs have been working on a major upgrade to the WAFS SIGWX forecasts. Currently only a 24-hour SIGWX forecast is produced 4 times daily (based off the 00, 06, 12 and 18 UTC model data) and this no longer meets the needs of the aviation industry particularly for short-haul flight and ultra-long haul flights. The new automated SIGWX will provide forecasts for 6-hour to 48-hour period (at 3 hourly intervals) and will be issued 4 times daily.

2.9 The SADIS API will provide access to the new WAFS SIGWX forecasts.

2.10 In a change to information presented at the MET SG/27 meeting, the implementation date for the new SIGWX forecasts has been delayed until 26 November 2024.

2.11 The new SIGWX forecasts will be provided in a new IWXXM format using this schema: https://schemas.wmo.int/iwxxm/2023-1/WAFSSigWxFC.xsd along with a set of accompanying charts that can be used for cross checking that the IWXXM data has been correctly displayed. The charts are not intended to be briefing charts. An example is shown in figure 2.

2.12 The new SIGWX covers FL100 to FL600 in a single forecast and includes the following:

- Jet Stream information
- Tropopause contours
- Areas of moderate (MOD) and severe (SEV) icing
- Areas of Occasional (OCNL) and Frequent (FRQ) cumulonimbus clouds and the cumulonimbus top. Information on whether the cumulonimbus clouds are embedded or not will not be included.
- Areas of moderate (MOD) and severe (SEV) turbulence. This turbulence could be clear air turbulence (CAT) or orographic turbulence.

2.13 The new SIGWX is designed for digital use, and will enable different SIGWX features to be toggled on and off, the map area, projection and colours to be customized according to user needs, and the movement and development/dissipation of features identified.

2.14 Users requiring charts for briefing purposes are expected to create them from the digital data set.

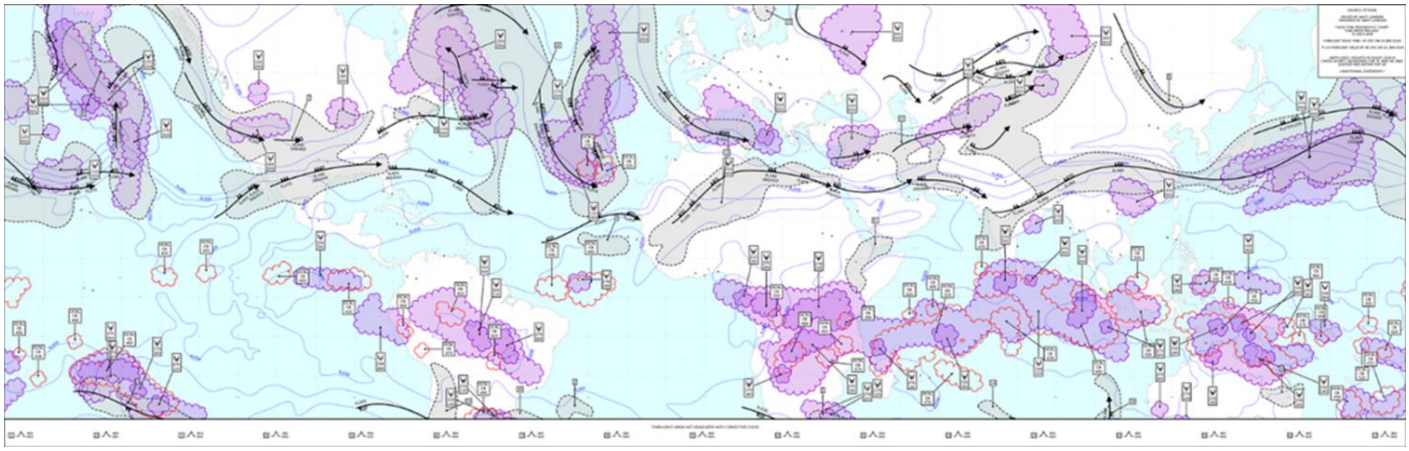

Figure 2 – Example new SIGWX visualization "cross-check chart"

T+24 WAFS SIGWX

2.15 At the same time the new SIGWX forecasts are introduced there will be changes to the existing T+24 SIGWX forecasts. Previously it was announced that the medium level SIGWX forecasts would be retired but after feedback it the WAFC's have decided to continue to provide them. There will however be changes to the content and appearance of both the high and medium level T+24 forecasts.

2.16 The T+24 SIGWX charts will continue to be provided via the old SADIS FTP and WIFS systems only until November 2028 (when those systems are retired), and the BUFR format SIGWX data will be retired in November 2026.

2.17 The key changes to the T+24 SIGWX forecasts are as follows:

- Embedded cumulonimbus cloud will not be included. This means you will not see ISOL EMBD CB, OCNL EMBD CB or FRQ EMBD CB any more. Instead you will see only areas of OCNL CB (i.e areas where there is between 50 and 75% coverage) and FRQ CB (areas where there is greater than 75% coverage).
    - It is important to note that many of the areas that are currently forecast as ISOL EMBD CB will not simply disappear, but may instead be depicted as OCNL CB.
    - Forecasting EMBD CB is a very subjective exercise and difficult to verify. Hence the current SIGWX provision means that large areas of ISOL EMBD CB are forecast and there is limited ability for users to identify where there are specific concentrations of CB.
- CAT areas will become "turbulence areas" as they will be created from the WAFC turbulence data which forecasts both CAT and orographic turbulence types. Areas of moderate and severe turbulence will be indicated.
- Tropopause height will change to contours on the WAFC produced charts, and will provide users with better information on the characteristics of the tropopause.
- On the medium level SIGWX in-cloud turbulence will not be shown. What are currently combined in-cloud icing and turbulence areas will become icing only.
- The upper boundary of the high level SIGWX forecasts will change from FL630 to FL600.

2.18 The T+24 PNG images produced by the WAFC's will change in appearance with the introduction of colour and a new line style for icing areas. A new style T+24 high level chart is shown in figure 3.

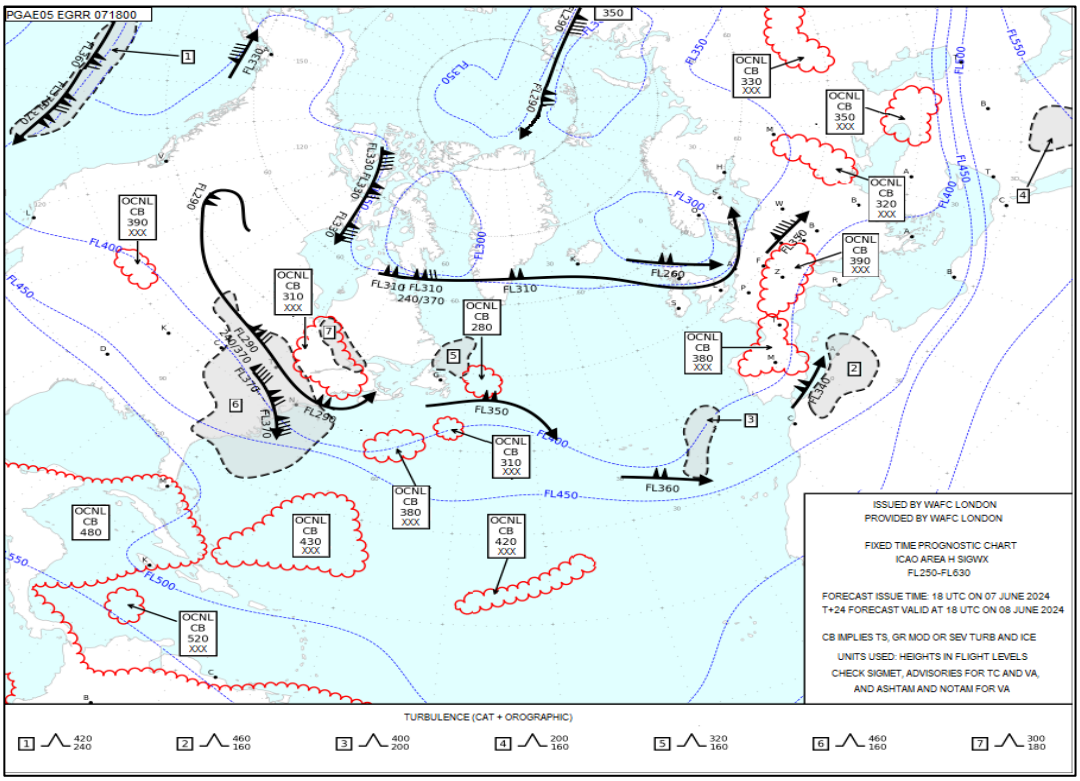

Figure 3 – WAFC produced T+24 high level SIGWX style from 26 November 2024 SIGWX

2.19 On the T+24 medium level SIGWX charts areas of icing will be depicted as shown in figure 4 so that they can be more easily identified, especially if the chart is printed without colour.

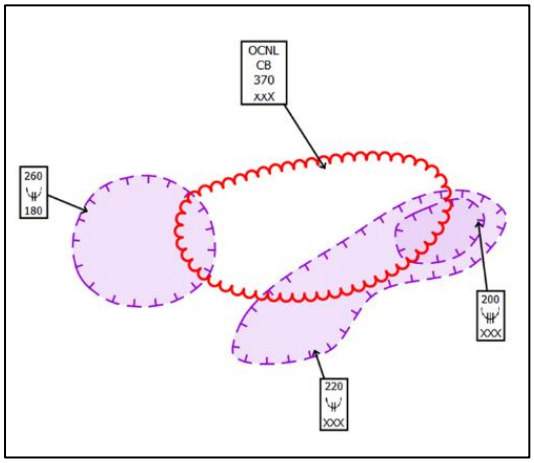

Figure 4, T+24 Medium level icing style from 26 November 2024.

2.20 Constraints in what the BUFR code can accommodate means that there will be some differences between the WAFC produced T+24 charts and those that are created from the BUFR data. Tropopause data will be provided in the form of spot heights (as it is now) and the medium level "MCLOUD" file which contains cumulonimbus and icing information will the cumulonimbus and icing features will not overlap (like they are in figure 4) so that visualization code is able to use existing rules for clear label placement.

2.21 An updated SIGWX flyer has been produced, and is included as Attachment A. This describes the new SIGWX forecasts as well as the changes to the current T+24 SIGWX forecasts. Additional information on the SIGWX changes is also provided here: https://www.metoffice.gov.uk/services/transport/aviation/regulated/wafs-2023. Please share the flyer or website address with your regulator, airlines, operators, flight planning organizations and other aviation stakeholders in your State.

2.22 The new WAFS SIGWX forecasts will not be included in ICAO Annex 3 when they launch, but will be included when Amendment 82 becomes effective in November 2025. Both WAFCs are liaising with their State regulators to file a difference against the applicable Annex 3 provisions to notify airspace users of the changes to the T+24 SIGWX forecasts between 26 November 2024 and November 2025 (when Amendment 82 to Annex 3 becomes effective).

CONCLUSION

2.23 The WAFCs have now implemented a major upgrade to the provision of WAFS gridded data sets, and users are encouraged to start getting their systems set up to use this new data and the new APIs.

2.24 Introduction of the new SIGWX forecasts in November 2024 brings a big improvement in the SIGWX forecast provision and aviation users are encouraged to move over to use the new IWXXM format SIGWX data sets as soon as possible after 26 November 2024. There will be will be changes to the existing T+24 forecasts that operators and relevant stakeholders in your State should be made aware of these changes, and the flyer included as Attachment A is shared with them.

3. ACTIONS BY THE MEETING

3.1 The meeting is invited to:

a) Note the information in this paper

b) Talk to their technical team or software provider about the upcoming SIGWX changes and prepare to start using the new IWXXM format SIGWX data sets.

3.2 **Draft Action – SADIS API**

The SADIS user States /Organizations make plans to upgrade their systems to be able to visualize the higher resolution WAFS gridded data sets and new IWXXM SIGWX data sets, and use the new SADIS API.

3.3 **Draft Action – T+24 WAFS SIGWX Changes in November 2024**

That operators and aviation stakeholders in each State are made aware of the upcoming T+24 SIGWX changes planned for 26 November 2024 by sharing the SIGWX flyer or by directing them to https://www.metoffice.gov.uk/services/transport/aviation/regulated/wafs-2023

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