



International Civil Aviation Organization

## WORKING PAPER

AN-Conf/14-WP/203

31/7/24

Revision No. 1

15/8/24

(Information Paper)

English only

# FOURTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 26 August to 6 September 2024

## Agenda Item 3: Air Navigation System Performance Improvement

### 3.1: Proposals to improve the efficiency of air navigation services contributing to LTAG

#### UPDATE ON CHANGES TO THE PROVISION OF WORLD AREA FORECAST INFORMATION

(Presented by the United Kingdom and the United States)

#### REVISION NO. 1

##### EXECUTIVE SUMMARY

This paper presents an update on the provision of the World Area Forecast System (WAFS) information by the two World Area Forecast Centres (WAFCs) operated by the United Kingdom and the United States. A forthcoming amendment to International Civil Aviation Organization (ICAO) Annex 3 – *Meteorological Service for International Air Navigation*, includes several important changes to the WAFS significant weather (SIGWX) forecasts as part of the commitment by the two WAFCs to continuously improve the service. Due to unique, unforeseen circumstances, the two WAFCs will implement the changes to the WAFS information prior to the applicability date of the next amendment to Annex 3.

## 1. INTRODUCTION

1.1 It is essential that aviation decision-makers are informed about meteorological conditions along planned routes of flights, as well as at departure and arrival aerodromes. To meet the meteorological information needs of aviation decision-makers, in the early 1980s the International Civil Aviation Organization (ICAO) developed the requirements for the World Area Forecast System (WAFS) to provide seamless forecasting of upper air winds, temperatures, and significant weather hazards to enhance the efficiency and safety of international flight operations.

1.2 To provide WAFS information to the global aviation community, ICAO established two World Area Forecast Centres (WAFCs). One is operated by the United Kingdom Met Office (WAFCLondon) and one is operated by the United States National Oceanic and Atmospheric Administration's National Weather Service (WAFCWashington).

1.3 The WAFCs produce and disseminate two primary types of WAFS information for aviation decision-makers. Significant Weather (SIGWX) charts provide a broad overview of forecast global weather

conditions, including the location of the jet stream and areas of potentially hazardous weather conditions, such as cumulonimbus clouds, turbulence, icing, erupting volcanoes, and tropical cyclones. The SIGWX charts are produced every six hours. The WAFCs also produce gridded data sets for wind and temperature, as well as hazardous meteorological phenomena, including cumulonimbus clouds, clear air turbulence, and icing. The gridded data sets can be integrated into and visualized by flight planning software.<sup>1</sup>

1.4 Since the inception of the WAFS, the two WAFCs have collaborated to develop and implement improvements in the information available for aviation decision-makers. The improvements in the WAFS information are included in amendments to ICAO Annex 3 – *Meteorological Service for International Air Navigation*, with the WAFCs implementing the improved information by the applicability date of each amendment to Annex 3.

## 2. DISCUSSION

2.1 For the past several years, the WAFCs have been developing improvements to the WAFS SIGWX forecasts that will be implemented and available to aviation decision-makers in November 2024.<sup>2</sup>

2.1.1 The new SIGWX forecasts will be produced for 15 timesteps (T+6, T+9, T+12, T+15, T+18, T+21, T+24, T+27, T+30, T+33, T+36, T+39, T+42, T+45, and T+48), four times daily.

2.1.2 The new SIGWX forecasts will span flight level (FL) 100 to FL600. The new forecasts will also include the following features: jet stream information, tropopause height contours, areas of moderate and severe turbulence (this includes clear air turbulence (CAT) and orographic turbulence), areas of occasional and frequent cumulonimbus clouds (and cumulonimbus top information), areas of moderate and severe icing, and volcano, tropical cyclone and nuclear emergency markers.

2.1.3 The new SIGWX forecasts are designed for digital use where aviation decision-makers can control the map projection, zoom level, colour schemes, and the ability to toggle individual features on and off.

2.1.4 The new SIGWX forecasts will, for the first time, allow users to see forecasts produced from a meteorological model run valid much closer to the time of flight (currently 24 hours, but will become 6-hours) and to plan flights much further into the future. It will also be possible to see the movement and evolution of features over a time sequence.

2.1.5 The new SIGWX forecasts will be provided in the ICAO Meteorological Information Exchange Model (IWXXM) format and will need to be visualized by the end user or a software provider system before it can be used for flight briefing purposes. (Note: IWXXM schema information is available at <https://schemas.wmo.int/iwxxm/2023-1/>.)

2.1.6 The existing T+24 SIGWX charts, a set of medium and high-level charts for 17 map areas, will continue to be produced until November 2028. The medium level SIGWX chart will span FL100 to FL450 and the high level SIGWX chart will span FL250 to FL600. (Note There is a small decrease in the span of the high level SIGWX chart from FL630 to FL600.) The associated digital binary universal form for the representation of meteorological data (BUFR) files will be produced until November 2026.

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<sup>1</sup> Source: <https://www.metoffice.gov.uk/services/transport/aviation/regulated/mo-wafc>. Accessed 10 July 2024.

<sup>2</sup> Source: [https://www.icao.int/aimnavigation/METP/MOG\\_WAFS\\_Reference\\_Documents/WAFS\\_SIGWX\\_flyer\\_\(Apr2024\).pdf](https://www.icao.int/aimnavigation/METP/MOG_WAFS_Reference_Documents/WAFS_SIGWX_flyer_(Apr2024).pdf). Accessed 10 July 2024.

2.1.7 The appearance of the existing T+24 SIGWX chart will also change.

- a) The charts produced by the WAFCs will be provide in colour.
- b) Embedded (EMBD) Cumulonimbus Clouds will no longer be included which means there will no longer be areas of “ISOL EMBD CB,” “OCNL EMBD CB” or “FRQ EMBD CB”. It is important to note that there will be more areas of “OCNL CB” depicted as many areas, which may previously have been in one of the “EMBD” categories will in fact meet the criteria for “OCNL CB”.
- c) The tropopause will be shown as contours instead of spot heights.
- d) Areas of CAT will become areas of turbulence, which include both CAT and orographic turbulence.
- e) On the medium-level SIGWX charts, the combined in-cloud icing and turbulence areas will be replaced with areas of moderate and severe icing only which will be depicted with a “T” line style to allow them to be differentiated from the cumulonimbus areas.

2.1.8 Further information on the upcoming changes to SIGWX information is available at <https://www.metoffice.gov.uk/services/transport/aviation/regulated/wafs-2023/>.

2.2 The ICAO Meteorology Panel (METP) originally recommended an amendment to Annex 3 that included the changes to the SIGWX forecasts in June 2021 with an expected applicability date of November 2023. The two WAFCs planned significant system upgrades and staffing changes based on that schedule. Due to deferments that occurred during the preliminary and final reviews of the proposed amendment by the ICAO Air Navigation Commission, the amendment is now expected to be applicable in November 2025. However, both WAFCs are nearing completion of the planned system upgrades and staffing changes, so neither is able to further delay implementation of the changes to the SIGWX forecasts.

2.3 Due to the early implementation of the changes to the SIGWX forecasts by the two WAFCs, the United Kingdom and the United States will file differences with the relevant Standards and Recommended Practices in Annex 3. The planned implementation date is 26 November 2024.

2.4 This paper is part of a larger communication effort to ensure the international aviation community is aware of the forthcoming changes to the SIGWX forecasts prior to the applicability of the amendment to Annex 3, so aeronautical meteorological information providers and users are able to plan accordingly to utilize the improved information when it becomes available in November 2024.

2.5 The two provider States and the WAFCs are working closely with the ICAO Secretariat and Members of the METP, including representatives from aviation user groups, to ensure the international aviation community is aware of the changes to the SIGWX forecasts prior to the applicability date of the forthcoming amendment to Annex 3. In addition to this paper, information will be published on the websites of both WAFCs, disseminated through relevant user groups (e.g., International Air Transport Association, International Federation of Air Line Pilots’ Associations), webinars, and an Aeronautical Information Circular published by the United Kindgom Civil Aviation Authority. The information flyer describing the changes to the SIGWX forecast information is included in the appendix to this paper.

### 3. CONCLUSION

3.1 The 14th ICAO Air Navigation Conference is invited to note the information provided in this paper and refer relevant civil aviation authorities and meteorological authorities, as well as aviation decision-makers to the WAFC-London and WAFC-Washington websites for additional information about the changes to the WAFS SIGWX forecasts.

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## APPENDIX

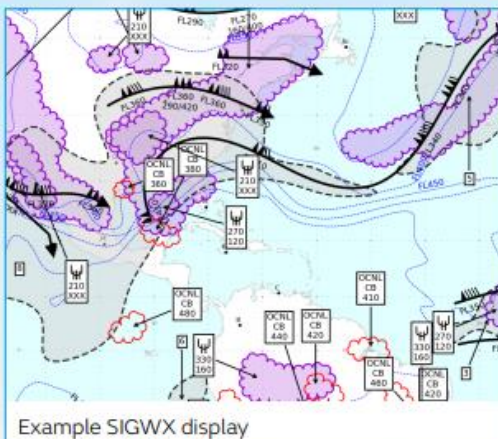


# Changes to WAFS SIGWX Forecasts

In November 2024 the World Area Forecast System (WAFS) SIGWX charts will be changing as the London and Washington World Area Forecast Centres (WAFCs) introduce multi-timestep SIGWX forecasts for the first time.

What is new:

- Forecasts will be produced for T+6, T+9, T+12, T+15, T+18, T+21, T+24, T+27, T+30, T+33, T+36, T+39, T+42 and T+48 timesteps, four times daily.
- The SIGWX forecasts will span FL100 to FL600
- The SIGWX forecasts will include the following features:
  - Jet stream information
  - Tropopause height contours
  - MOD and SEV Turbulence areas (this includes clear air and orographic turbulence)
  - OCNL and FRQ cumulonimbus areas, and cumulonimbus top information
  - MOD and SEV Icing areas
  - Volcano, tropical cyclone and nuclear emergency markers
- This new data is designed for digital use where users can control the map projection, zoom level, colour schemes, and are able to toggle individual features on and off.
- The new SIGWX forecasts will be provided in IWXXM format and will need to be visualised by you or your software providers systems before you can use it for briefing purposes. IWXXM schema information is available here: <https://schemas.wmo.int/iwxxm/2023-1/>



### IWXXM Format

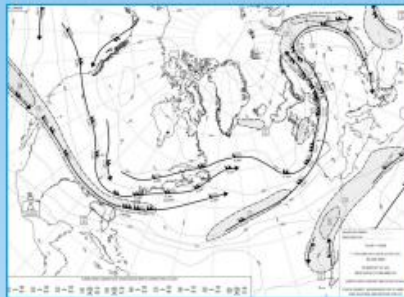
IWXXM SIGWX data is now available on the new SADIS API and WIFS APIs for testing and set up purposes.

Please contact the SADIS and WIFS provider for information: [wifs.admin@noaa.gov](mailto:wifs.admin@noaa.gov) or [SADISManager@metoffice.gov.uk](mailto:SADISManager@metoffice.gov.uk)

Note: you may have seen earlier communications on changes to the WAFS SIGWX that involved retiring the medium-level SIGWX products in July 2024. This flyer supersedes that information.

#### What about the existing T+24 WAFS SIGWX charts?

- The medium and high level SIGWX charts for 17 map areas that are produced by WAFS London and WAFS Washington will continue to be produced until Nov 2028.
  - Medium level SIGWX will span FL100 to FL450
  - High level SIGWX will span FL250 to FL600 (note: there will be a small decrease in the upper limit from FL630 to FL600)



The appearance of the T+24 WAFS produced SIGWX charts will change a little:

- **Embedded (EMBD) cumulonimbus clouds will no longer be included which means that there will not be any areas of "ISOL EMBD CB"**, Only OCNL and FRQ amounts of cumulonimbus will be shown.
- Tropopause will be shown as contours (as a thin dashed line) instead of spot heights.
- CAT areas will become "Turbulence" areas, which encompasses CAT and orographic turbulence types. MOD and SEV Turbulence areas will be shown
- Cumulonimbus bases will not be shown in the cumulonimbus labels. These are almost always "XXX" even in the medium level SIGWX.
- On medium level SIGWX charts, the combined in-cloud icing and turbulence areas will be replaced with areas of MOD and SEV icing.
- Jet stream information, volcano, tropical cyclone and nuclear emergency markers will not change.

Further information on the upcoming SIGWX changes is available on at  
<https://www.metoffice.gov.uk/services/transport/aviation/regulated/wafs-2023/>

#### What do you need to do?

1. Make sure that your software provider or IT department is aware of the upcoming changes and encourage them to start setting up systems to pull test data from the new SADIS or WIFS API.
2. Upgrade systems to be able to visualise the new IWXXM format SIGWX data sets.

Users are encouraged to switch to using the new multi-timestep SIGWX forecasts as soon as possible after the go live date in November 2024 as the new SIGWX offers greatly improved situational awareness extending out to the T+48 forecast period as well as the ability to get SIGWX forecasts valid at the time of the flight which were produced from a more recently produced set of UK and US model data.

Note: ICAO Annex 3 will not reflect the new SIGWX forecasts until November 2025. The UK and US will be filing a difference against Annex 3 in November 2024 to facilitate the changes related to embedded cumulonimbus clouds that are described in this flyer.

Please contact [wifs.admin@noaa.gov](mailto:wifs.admin@noaa.gov) or [SADISManager@metoffice.gov.uk](mailto:SADISManager@metoffice.gov.uk) for further information on the changes or to arrange access to the SADIS and WIFS API's