Guidelines for interpreting World Area Forecast Centre Significant Weather forecasts

0. Contents

1. Introduction

1.1. The World Area Forecast Centres (WAFCs) are responsible for producing WAFC Significant Weather (SIGWX) forecasts as specified by the International Civil Aviation Organization (ICAO).

1.2. There are two WAFCs. WAFC London (based at the United Kingdom's Met Office headquarters in Exeter) and WAFC Washington (based at the United States of America's Aviation Weather Service offices in Kansas City, Missouri).

1.3. There are two height ranges for which the WAFCs produce SIGWX forecasts.

'High Level SIGWX' forecasts (SWH) are valid between flight level (FL) 250 and FL630, Both WAFCs produce SIGWX forecasts covering the entire globe for this height range.

'Medium Level SIGWX' forecasts (SWM) are valid between FL100 and FL450[1] for four specified regions of the globe. WAFC London is responsible for three of these, and WAFC Washington is responsible for one. The details are provided in section 2.3.2.

1.4. Both WAFCs produce their SIGWX forecasts in a digital format known as 'BUFR'[2]. This permits the end user to generate bespoke and custom visualisations relevant to the flight or flights being undertaken. This also permits overlaying of the SIGWX forecast with other features (navigation aids for example) as the user wishes. Note, the processing of the SIGWX BUFR data is beyond the scope of this document.

1.5. Additionally, for purposes of contingency, each WAFC produces a subset of ICAO Fixed Areas of Coverage in the Portable Networks Graphic (PNG) format. Taken together, the PNG images issued by the WAFCs give complete coverage of the globe. It should be noted that the PNG versions of WAFC SIGWX are provided only as a backup to the WAFC SIGWX BUFR datasets.

1.6. In the unlikely event that one of the WAFCs is unable to produce its SIGWX forecasts, the other WAFC will take over the production process. This ensures that a full set of WAFC SIGWX forecasts will always be issued and is accomplished in such a way to be as transparent as possible to the users. The processes are tested every 3 months.

1.7. In order to ensure that users of WAFC SIGWX forecasts are able interpret and understand the WAFC SIGWX forecasts fully, more details are provided in the following sections.

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[1] The upper limit to the forecast (FL450) exceeds the stated requirement in ICAO Annex 3 of FL250 for Medium Level SIGWX.

[2] Binary Universal Form for the Representation of meteorological data, developed and maintained by the World Meteorological Organization (WMO)

2. Overview

2.1. Validity time and production schedule

2.1.1. WAFC SIGWX forecasts are 24 hour forecasts. That means that they represent the expected weather 24 hours after the time of observation/analysis.

2.1.2. Clearly, from a given analysis it takes some time to produce a forecast, and as such WAFC SIGWX forecasts are issued 7 hours after the 'analysis' time, and therefore are available 17 hours before their specified validity. Exceptionally, if one WAFC is required to backup the other at short notice, the SIGWX forecasts may be issued 2 hours later than the normal schedule (see 2.1.4 below).

2.1.3. WAFC SIGWX forecasts are provided for 'fixed validity times'. This is as specified in ICAO Annex 3 – *Meteorological Service for International Air Navigation* and ICAO Doc 8896 – *Manual of Aeronautical Meteorological Practice*. However, ICAO have noted, in ICAO Doc 8896, that the WAFC SIGWX forecasts are 'usable' for a period of time extending from 3 hours before to 3 hours after the stated 'fixed' validity time.

2.1.4. The WAFC SIGWX forecasts are produced and made available to a routine schedule by both WAFCs, as noted in Table 1.

Analysis time	Fixed Validity time	Normally made available	Latest availability time
(DD) 0000 UTC	(DD+1) 0000 UTC	(DD) 0645-0700 UTC	(DD) 0900 UTC
(DD) 0600 UTC	(DD+1) 0600 UTC	(DD) 1245-1300 UTC	(DD) 1500 UTC
(DD) 1200 UTC	(DD+1) 1200 UTC	(DD) 1845-1900 UTC	(DD) 2100 UTC
(DD) 1800 UTC	(DD+1) 1800 UTC	(DD+1) 0045-0100 UTC	(DD+1) 0300 UTC

Table 1: Availability schedule for WAFC SIGWX. DD represents day of month, i.e. '18'means 18th day of the month.

Example 1: WAFC SIGWX forecasts based upon an analysis time of 0600 UTC on 12th February 2017 will have a fixed validity time of 0600 UTC on 13th February 2017 and would normally be expected to be made available between 1245 and 1300 UTC on 12th February 2017.

Example 2: WAFC SIGWX forecasts based upon an analysis time of 1800 UTC on 31st September 2017 will have a fixed validity time of 1800 UTC on 1st October 2017 and would normally be expected to be made available between 0045 and 0100 UTC on 31st September 2017.

Example 3: In the event that one WAFC were required to backup the other, then WAFC SIGWX forecasts based upon an analysis time of 1200 UTC on 20th June 2017 will have a fixed validity time of 1200 UTC on 21st June 2017 and would be expected to be made available no later than 1500 UTC on 20th June 2017.

2.2. Vertical extent of WAFC SIGWX forecasts

2.2.1. As noted in the introduction, WAFC SIGWX forecasts are issued to cover two different height ranges. Medium Level SIGWX (SWM) covers the height range FL100 to FL450[3]. High Level SIGWX (SWH) covers the height range FL250 to FL630.

	Vertical extent	WAFC London	WAFC Washington
SWH	FL250-FL630	Global coverage	Global coverage
SWM	FL100-FL450	EURO MEA/MID ASIA SOUTH	NAT

Table 2: Vertical extent and domain of WAFC SIGWX forecasts.

2.3. Horizontal extent of WAFC SIGWX forecasts

2.3.1. SWH forecasts cover the entire globe.

2.3.2. It is important to note that SWM forecasts **do not** cover the entire globe, and are only issued to cover four specific regions, as noted below.

	EURO	MEA/MID	ASIA SOUTH	NAT
Projection	Polar Stereographic	Mercator	Mercator	Polar Stereographic
Top Left	46˚ 33'N 56˚ 34'W	44˚ 00'N 17˚ 00'E	36˚ 00'N 53˚ 00'E	44˚ 39'N 101˚ 43'W
Top Right	58˚ 42'N 68˚ 24'E	44˚ 00'N 70˚ 00'E	36˚ 00'N 108˚ 00'E	50˚ 42'N 60˚ 17'E
Bottom Left	21˚ 23'N 21˚ 36'W	10˚ 00'N 17˚ 00'E	00˚ 00'N 53˚ 00'E	17˚ 11'N 54˚ 06'W
Bottom Right	26˚ 21'N 33˚ 25'E	10˚ 00'N 70˚ 00'E	00˚ 00'N 108˚ 00'E	19˚ 38'N 9˚ 57'E

Table 3: The domains of WAFC SWM areas.

It is essential that any visualisations of SWM forecasts clearly identify (by cross hatching for example) the areas of the globe for which forecast information is not provided. This is to ensure that the absence of features in areas not covered by the SWM forecasts are not interpreted as areas that are free from potential hazardous weather.

2.4. WAFC SIGWX data formats

[3] The upper limit to the forecast (FL450) exceeds the stated requirement in ICAO Annex 3 of FL250 for Medium Level SIGWX.

2.4.1. As noted in the introduction, the primary data format of WAFC SIGWX forecasts is the WMO BUFR format. This permits software to provide bespoke visualisations (on screen or hard copy) specific to the area of interest, i.e. to cover the specific route.

2.4.2. WAFC SIGWX forecasts are also provided in PNG image format for 'ICAO Fixed Chart Areas', as specified in ICAO Annex 3. Strictly, these are a backup to the BUFR format.

3. Interpreting WAFC SIGWX forecasts.

Note: The information provided in this section presumes the user has access to a correctly visualised soft/hard copy of WAFC SIGWX BUFR data; or the PNG formatted charts issued directly by the WAFCs. It is beyond the scope of this document to describe how software should process WAFC SIGWX BUFR data.

It is the responsibility of software providers to correctly process WAFC SIGWX BUFR data to meet the required standards of visualisation. Information is available in the Representing WAFC Significant Weather (SIGWX) data in BUFR available via the ICAO webpage:http://www.icao.int/airnavigation/METP/MOG/Pages/WAFS.aspx

3.1. Legend information

3.1.1. The legend provides essential information identifying the issuer, the provider, the area of coverage, the height range, and the validity time.

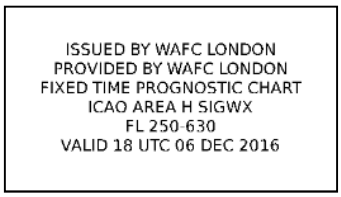


Figure 1: Legend from WAFC SIGWX PNG forecast chart indicating issuer, provider, ICAO area, height range, and validity time.

For PNG forecasts issued by the WAFCs, the 'ISSUED BY' and 'PROVIDED BY' will each specify the WAFC concerned.

If the image (visualised on screen or in hard copy) is generated from BUFR data by an entity other than one of the WAFCs, then the 'ISSUED BY' will specify the source of the WAFC BUFR data being used (i.e. WAFC London or WAFC Washington) and The 'PROVIDED BY' will specify the organisation that is visualising the data. Only the WAFCs are permitted to issue WAFC SIGWX forecasts in PNG format where both the 'ISSUED BY' and 'PROVIDED BY' fields reference WAFC London/WAFC Washington.

Visualisations of WAFC SIGWX (including the PNG versions issued by the WAFCs) based upon the ICAO Fixed Areas should indicate the chart area concerned. In the example above, that is ICAO AREA H. See Appendix A for more detail of the ICAO areas.

The vertical extent of the forecast will be indicated. In the example, the range is FL250-630, and is therefore High Level SIGWX (SWH).

In the event that a correction (see 5 with regard to amendment and correction policies) is issued, the legend will indicate the PNG is a correction. Visualisations of WAFC SIGWX BUFR data should similarly indicate that the data is corrected.

3.2. User 'Advisory' information.

3.2.1. A standard legend advising users of the hazards to expect in cumulonimbus cloud (CB); the units used, and guidance to check SIGMET, Tropical Cyclone Advisory, Volcanic Ash Advisory, ASHTAM and NOTAM for Volcanic Ash is included.

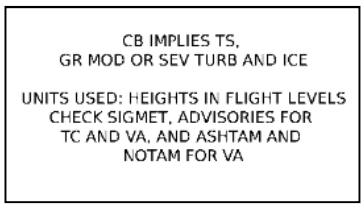


Figure 2: Legend from WAFC SIGWX PNG forecast chart providing advisory information.

In the event that a radiological incident is identified on a WAFC SIGWX forecast, additional information urging users to consult SIGMET and NOTAM relating to the radiological incident is included.

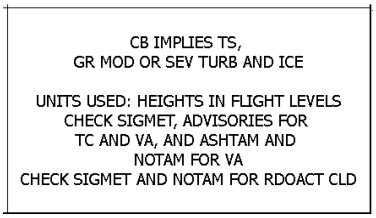


Figure 3: Legend from WAFC SIGWX PNG forecast chart providing advisory information in the event of a radiological incident.

4. Features provided in WAFC SIGWX forecasts

4.1. Jetstreams

4.1.1. Jetstream information is indicated in WAFC SIGWX forecasts when the jet core equals or exceeds 80KT.

The jet is depicted as a thick, continuous line.

The direction and speed of the jet is depicted by the 'wind fleche' (also known as feather and pennant) symbols.

Half feathers correspond to 5 KT
Feathers correspond to 10 KT
Pennants correspond to 50 KT

An arrow is also included at the end of the jet core (the arrow is omitted if the jet continues beyond the edge of a chart area to prevent the user assuming the strength of the wind has fallen below 80 KT at that point).

The orientation of the fleches on the jet core, as per convention, is such that the feathers/pennants are located on the low pressure (or low contour) side of the jetstream[4]. This means that in the *northern hemisphere* (and on the equator), the feathers/pennants are on the *left side* of the jet core as looking in the direction towards which the wind is blowing. In the *southern hemisphere* the feathers/pennants are on the *right side* of the jet core as looking in the direction towards which the wind is blowing. See also the example in 4.1.3

4.1.2. By way of description, the examples (northern hemisphere) below indicate;

A jet core of 75 knots (50+10+10+5)

A jet core of 105 knots (50+50+5)

The above indicates a jet core of 125 knots (50+50+10+10+5)

4.1.3. The flight level of the jet core is indicated at points along its length using the normal convention 'FL250' for 25000 FT; 'FL450' for 45000 FT etc.

[4] An easy way to remember this is to recall Buys Ballot's law '*In the Northern Hemisphere, if a person stands with their back to the wind, the atmospheric pressure is low to the left, high to the right*'. Accordingly, in the Southern Hemisphere if a person stands with their back to the wind, the atmospheric pressure is low to the right, and high to the left.

The above indicates a jet core of 145 knots, at an altitude of 32000 FT in the ICAO Standard Atmosphere (FL320)

The conventions described above will ensure that the user can always determine the direction of the jetstream. In those instances where the jetstream is in a more northerly or southerly direction, there should be no misunderstanding of the direction of the wind. The extreme case of an easterly jet is illustrated below.

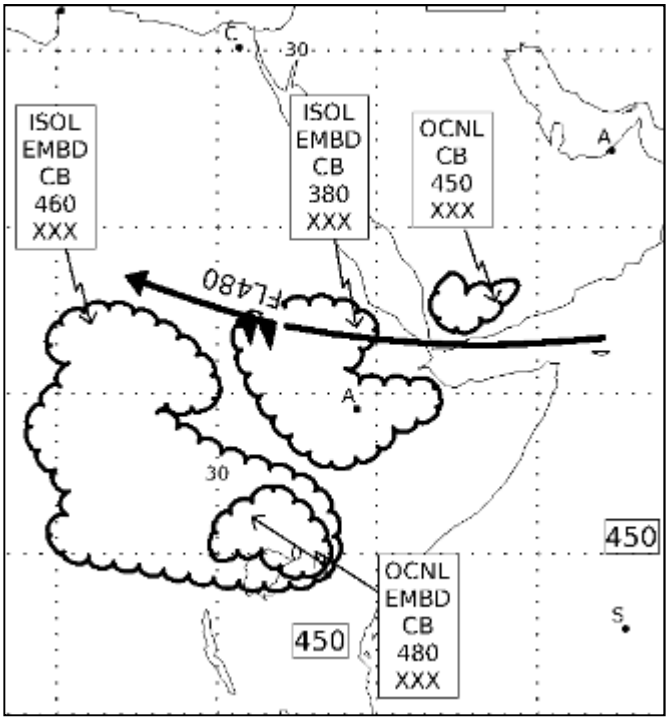


Figure 4: Example area of WAFC SIGWX forecast. Note the orientation of the jet pennants and flight level information indicating an *easterly* jetstream

The jetstream begins over the island of Socatra, with the wind flowing from east to west, a falling below 80 knots over the Sudan. Two pennants ('pointing' to the west-northwest) indicate a wind speed of 100 knots, and the core is at an altitude of FL480. In this instance the figures are deliberately 'upside down' and this helps confirm that jet is truly intended to indicate jet core winds from east to west.

Note also this example of an easterly jetstream in the southern hemisphere (over southern Sumatra).

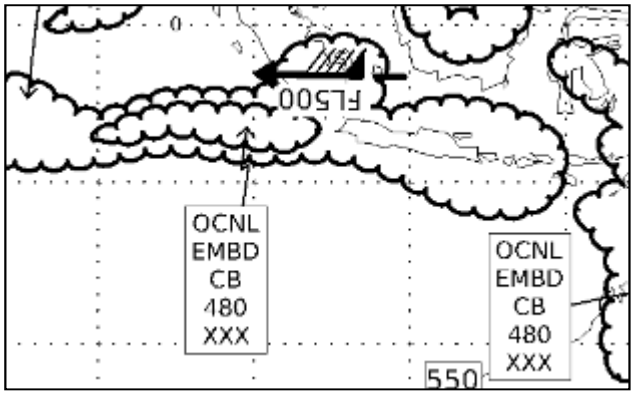


Figure 5: Easterly jetstream, just south of the equator.

The direction of the jet is always relative to the underlying map projection. This is relevant when viewing visualisations on, for example, a polar stereographic projection. In the example below, taken from the 'top right' corner of 'ICAO Area H'; the rightmost jet (FL370) may appear at first glance to be southerly (from the south). However, the map projection in this region (over Saudi Arabia) is such that the west-east direction is orientated from bottom to top. Review of the underlying grid and geographic features will demonstrate that the jetstream over Saudi Arabia at FL370 is from west to east.

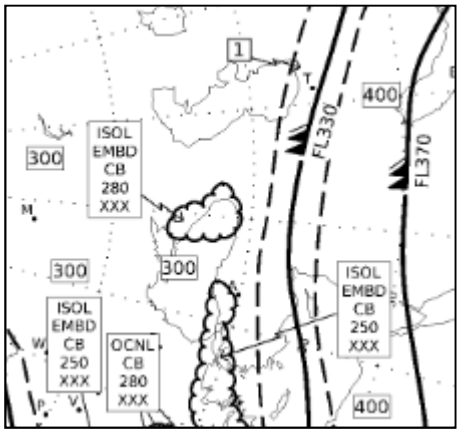


Figure 6: Illustrating the orientation of jetstreams on a polar stereographic projection, and demonstrating the jetstream directions are always with reference to the underlying graticule.

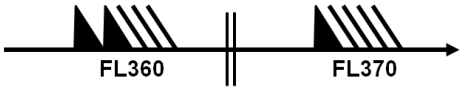
4.1.4. In the event that the maximum wind speed along the jet core is 120 knots or greater, then at the location of the maximum wind additional 'vertical extent' information will be provided. Upper and lower flight level information will be specified that define the depth through which winds of 80 knot or greater extend at that point. For example,

A jet core with wind speed increasing from 105 knots to a maximum of 125 knots then decreasing to 105 knots. The jet core is at FL380 and at the location

of the maximum wind speed the wind speed is 80 knots or greater between FL280 and FL420.

In the southern hemisphere, the same information would be indicated thus:

4.1.5. Change bars (two thin lines perpendicular to the jetcore line, may be used to indicate changes in windspeed of 20 KT along the jetstream where there is insufficient space to include pennant/feather symbols (northern hemisphere example below); or where the jetcore height changes by 3000 FT.



In the example above, the jet core has a wind speed of 130 knots and an altitude of FL360. At the point indicated by the 'change bars' (two, thin parallel lines perpendicular to the jetstream line) the wind speed is 110 knots, decreasing further to 90 knots as indicated by the pennant/feathers on the right.

4.2. Clear air turbulence (CAT)

4.2.1. Clear air turbulence (CAT) is often, though not exclusively, associated with jetstreams. Regions of CAT are delineated by dashed lines, and will be identified by either a reference number (in the case of WAFC London), or a direct 'call-out' symbol specifying the nature of the expected turbulence (WAFC Washington). In either case, the turbulence symbols used are standard.

Note: When visualising WAFC SIGWX forecasts processed from BUFR format, then the system may permit the user to choose which convention to follow.

4.2.2. WAFC SIGWX forecasts *only* indicate regions of moderate and/or severe CAT. Areas of light turbulence are not indicated on WAFC SIGWX forecasts.

4.2.3. WAFC London representation of CAT areas on their PNG forecast charts

4.2.3.1. WAFC London uses a separate Legend to indicate the areas and intensity of clear air turbulence (CAT) on its PNG charts. In the example below, the area of CAT is identified by the reference number 4.

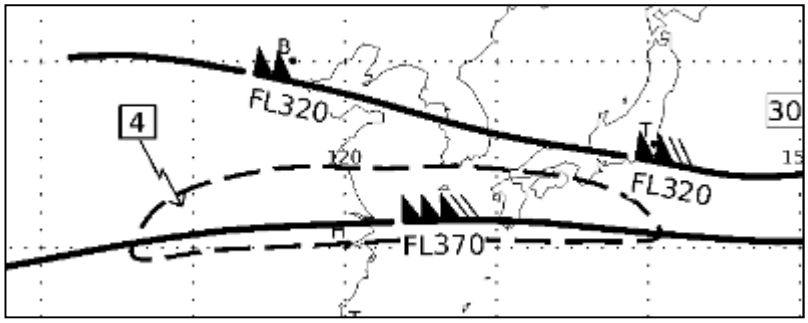


Figure 7: Example area of WAFC SIGWX forecast highlighting an area of CAT (within the dashed line). The number in the 'call-out' box should be cross referenced with the legend on the chart itself.

This needs to be cross referenced against the CAT legend that is provided on the chart itself.

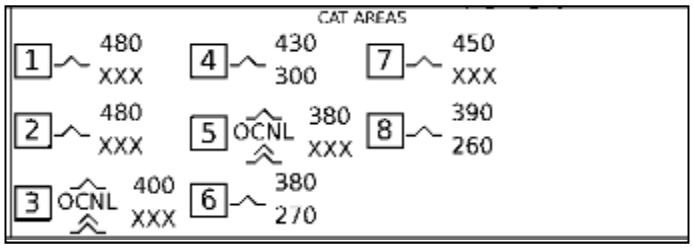
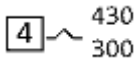


Figure 8: Legend on a WAFC London SIGWX Forecast indicating the severity of CAT.

In this instance, [4] refers to a region of moderate CAT, with base FL300 and TOP FL430.



From the same forecast chart, in the <u>southern hemisphere</u>, rather more complex areas of CAT are identified.

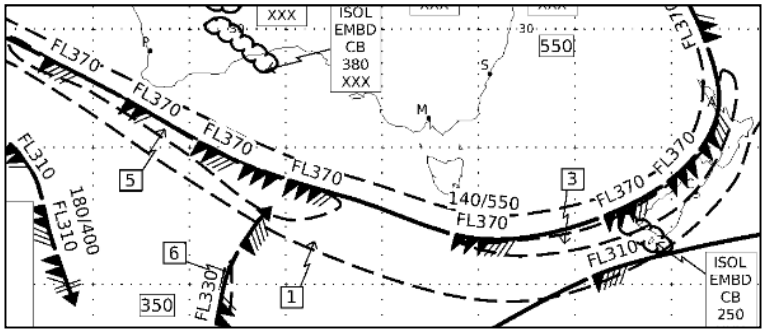


Figure 9: Example area of WAFC SIGWX forecast indicating several areas of CAT. On this particular occasion the CAT legend against which the numeric indicators should be referenced is reproduced in Figure 10

It can be seen, with reference to the legend (reproduced below), that there is an area [1] within which moderate turbulence from below FL250 (indicated by XXX) to FL480 may be encountered in association with the jetstream. Within that area, there are sub-regions [3] and [5]. Sub-region [3] is forecast to generate moderate, occasionally severe turbulence from below FL250 to FL400. Sub-

region [5] is forecast to generate moderate occasional severe turbulence from below FL250 to FL380.

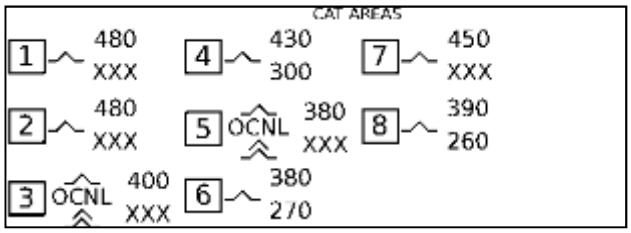


Figure 10: CAT severity in the WAFC SIGWX forecast referred to in Figure 9.

4.2.4. WAFC Washington representation of CAT areas on their PNG forecast charts

4.2.4.1. WAFC Washington makes use of symbols directly within the 'call-out' boxes to indicate the areas and intensity of clear air turbulence (CAT) on its PNG charts. In the example below, amongst other information, a region of CAT is indicated northeast of the Great Lakes, as far north as the southern coast of Hudson Bay, and extending southeast over Maine USA.

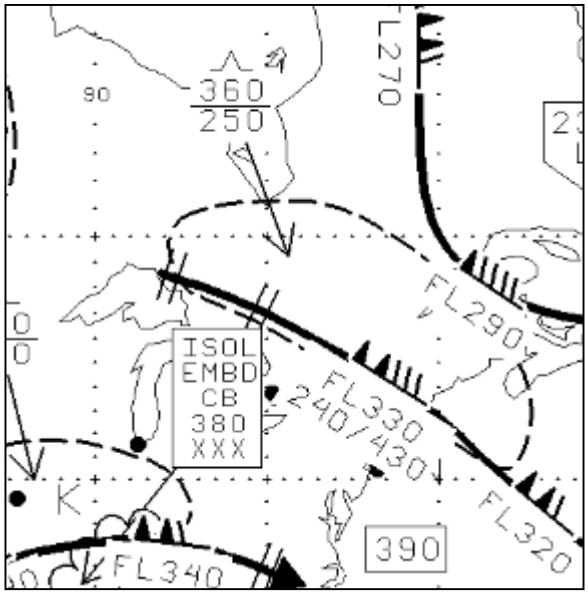


Figure 11: WAFC Washington identification of severity of turbulence.

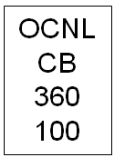
The 'call-out', repeated below…

… indicates moderate turbulence between FL250 and FL360.

4.3. Cumulonimbus cloud

4.3.1. Areas of cumulonimbus (CB) cloud are indicated by 'scalloped' lines. The areas so delineated will be identified using 'call-out' boxes that describe the horizontal extent of the CB, the base and top (in Flight Levels), and whether or not the CB cloud is forecast to be embedded within other cloud layers.

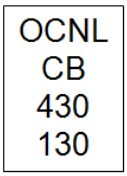
4.3.2. The convention is to identify the 'nature' of the CB (horizontal extent and whether or not embedded); with the base and top each represented by 3 numbers specifying the Flight Level. In the example below…



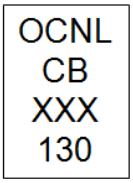
…the forecast is for occasional CB, with base FL100 and TOP FL360.

4.3.3. In many cases CB bases are below FL100 and as such even on SWM SIGWX forecasts, the base will be indicated as 'XXX', for example;

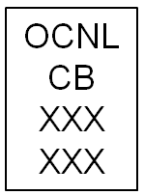
4.3.4. In SWM forecasts, especially during summer in middle eastern/north African countries, CB bases may be above FL100 and as such will be indicated as necessary.



In such circumstances the CB top may extend above FL450 and, therefore on SWM forecasts this would be indicated as 'XXX' (indicating the top extends above the upper limit of the forecast).



It is feasible, in SWM SIGWX forecasts, for CB to have a base below the lower bound of the forecast, and a top above the upper bound of the forecast, and this would be indicated thus:



On a SWM SIGWX forecast, the above would simply mean the CB base is below FL250 and extends above FL450. The SWH SIGWX forecast would indicate the upper limit to the CB.

4.3.5. It is important to note that **not all CB clouds** are, or are required to be, indicated on WAFC SIGWX forecasts. The CB clouds to be forecast on WAFC SIGWX forecasts are:

OCNL CB

CB cloud with maximum spatial coverage between 50% and 75% of the area concerned, not expected to be embedded within cloud layers.

FRQ CB

CB cloud with maximum spatial coverage greater than 75% of the area concerned.

ISOL EMBD CB

CB cloud with maximum spatial coverage less than 50%, and expected to be embedded within cloud layers and not readily recognised.

OCNL EMBD CB

CB cloud with maximum spatial coverage between 50% and 75% and expected to be embedded within cloud layers and not readily recognised.

CB cloud NOT indicated in WAFC SIGWX forecasts.

It is important to note that areas of 'ISOL CB' that are not embedded within other cloud layers are not, and are not required to be, identified in WAFC SIGWX forecasts. This means that CB with maximum spatial coverage less than 50% and not embedded within cloud layers ARE NOT indicated on WAFC SIGWX forecasts.

Example 1: The SWH example below (over Cote d'Ivoire, Ghana, Togo, Benin, and Nigeria) indicates an area of CB cloud described as 'ISOL EMBD CB', i.e. "*CB cloud with maximum spatial coverage less than 50%, and expected to be*

embedded within cloud layers and not readily recognised". The top of the CB clouds are expected to be FL440, and this is indicated by the 3 numeric figures '440'. The base of the CB is indicated as being 'XXX', and this means that the base is below the lower boundary of the WAFC SIGWX forecast. For SWH which covers a vertical from FL250 to FL630, 'XXX' means the base of the CB will be below FL250.

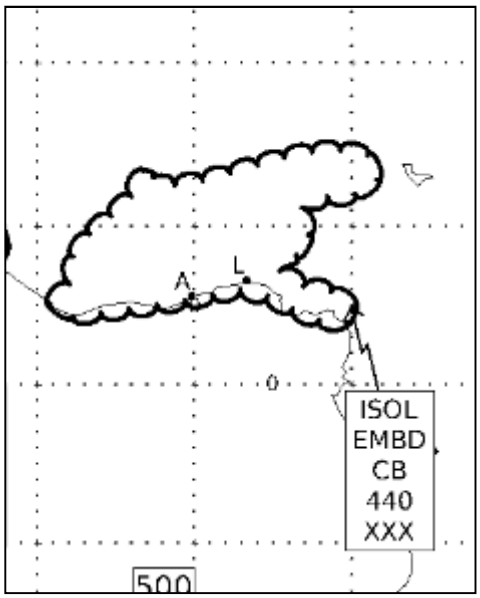


Figure 12: Example area of WAFC SIGWX forecast.

The 'call-out' boxes specifying the nature of the CB cloud will, in most cases, point to the relevant area of cloud using an arrowed line.

Example 2: Where there is sufficient space, the call-out box may be placed within the relevant area of cloud (and no arrow is required), and this is demonstrated in the example below with 3 areas of CB cloud.

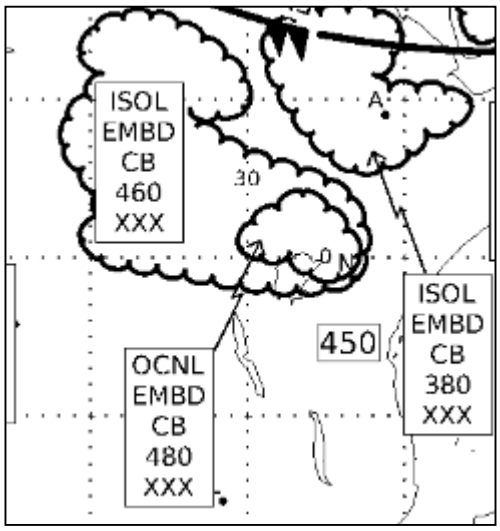


Figure 13: Example area of WAFC SIGWX forecast.

The larger area of CB is described by the 'call-out' that is positioned within the cloud area itself (ISOL EMBD CB base below FL250 (XXX) and top FL460).

A smaller sub-region is identified (Uganda) using a call-out box and arrow (OCNL EMBD CB base below FL250 (XXX) and top FL480).

A third region of CB cloud (Ethiopia, Sudan, Egypt) is also identified using a call-out box and arrow (ISOL EMBD CB base below FL250 (XXX) and top FL380).

Note, the absence of references to CB over other areas of the chart does not mean CB cloud will not be present. ISOL CB with maximum spatial coverage less than 50% and not embedded within cloud layers may be present.

4.4. Non-convective cloud associated with moderate or severe icing and/or moderate or severe turbulence.

4.4.1. Predominantly (though not exclusively) a feature of SWM, non-convective cloud that is associated with moderate or severe icing and/or moderate or severe turbulence is also identified. The areas are described by 'scalloped' lines.

4.4.2. Call-out boxes are used to provide information on the intensity (moderate or severe) of the turbulence and/or icing.

4.4.3. In the SWM example below, an area of non-convective cloud is identified over Thailand, Malaysia, northern Sumatra and the far south east of the Bay of Bengal.

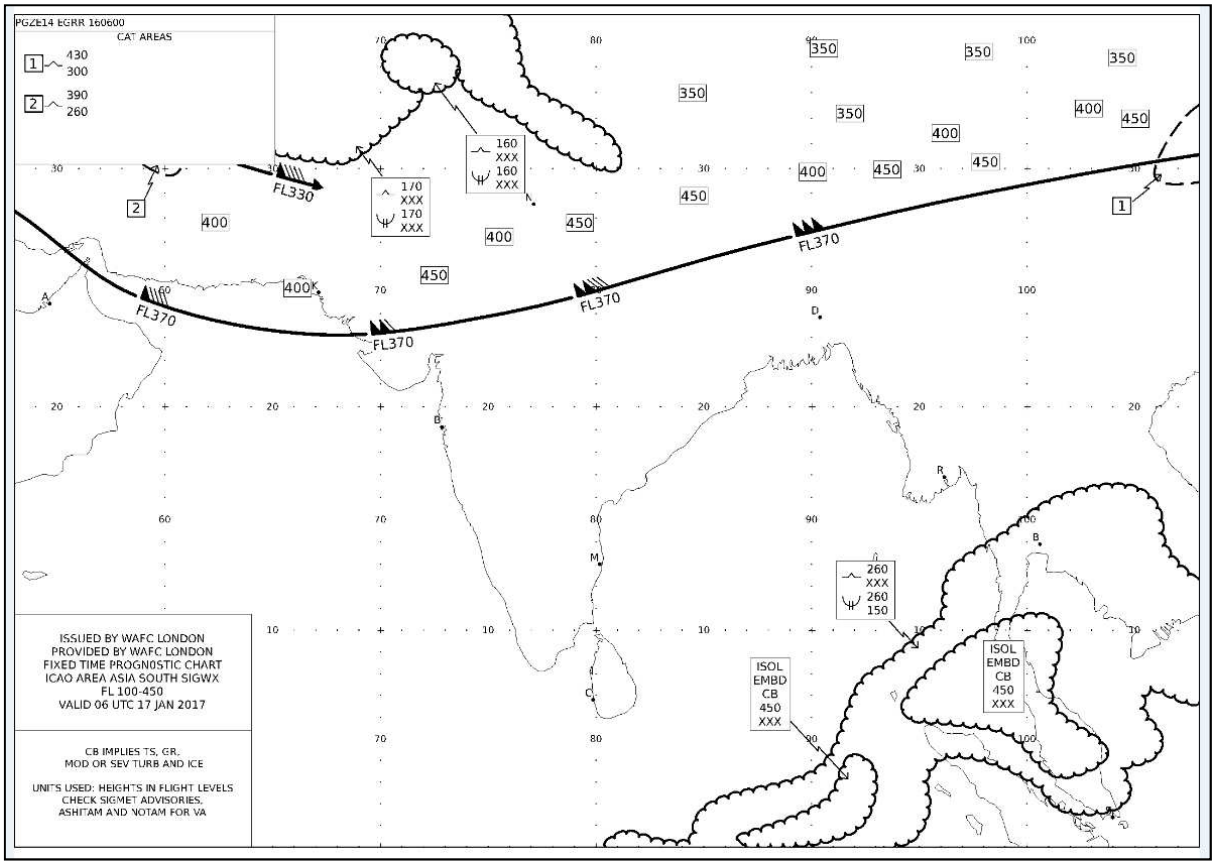
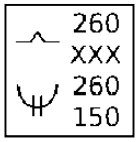
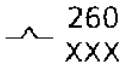


Figure 14: Example area of WAFC SIGWX forecast.

4.4.4. The symbols and characters in the 'call-out' box (repeated below) describe the forecast conditions. Considering the following:

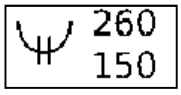


Taking each section separately, the upper combination of symbol and characters…



…indicates that moderate turbulence is forecast from below FL100 (the lower bound of the forecast) as therefore represented by XXX, up to FL260.

The lower combination of symbol and characters indicates that…



…moderate icing is forecast from FL150 to FL260.

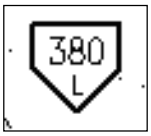
4.4.5. It should be noted that the absence of 'cloud areas' in WAFC SIGWX forecasts does not mean there will be no cloud. For example, there may well be cloud layers over Sri Lanka with base FL100 and top FL140 but if they are not expected to generate moderate/severe icing and/or moderate/severe turbulence the cloud area will not be indicated.

4.4.6. Cloud layers that are expected to give only light turbulence and/or light icing will not be indicated on WAFC SIGWX forecasts.

4.5. Flight level of tropopause

4.5.1. The height of the Tropopause, expressed as a flight level, is provided at locations where there is expected to be:

Tropopause low…

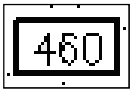


…with the above representing a Tropopause low of FL380

Tropopause high…

…with the above representing a Tropopause high of FL450

and spot heights..



…with the above indicating a 'spot; height of FL460.

4.6. Tropical Cyclones

4.6.1. Tropical Cyclones are indicated on WAFC SIGWX forecasts using the symbols below:

Tropical cyclone (northern hemisphere)

Tropical cyclone (southern hemisphere)

4.6.2. They are included on the basis of information provided from the Tropical Cyclone Advisory Centres and from Tropical Cyclone SIGMETs. Note, the centre of the symbol represents the centre of the tropical cyclone.

4.6.3. Additionally, a 'call-out' box will be positioned in proximity to the symbol with the name of the Tropical Cyclone (or 'NN' if not formally named), and the latitude and longitude. (Note in visualisations from BUFR data only the first 8 characters[5] of the Tropical Cyclone name will be provided).

4.7. Location of volcanic eruptions

4.7.1. The location of volcanic events that are producing ash clouds of significance to aircraft operations will be identified on WAFC SIGWX forecasts, using the symbol below:

4.7.2. The 'dot' in the base of the symbol represents the location of the eruption.

4.7.3. Additionally, a 'call-out' box will be positioned in proximity to the symbol with the name of the volcano (if known) and the latitude and longitude.

4.8. Location of a release of radioactive materials into the atmosphere of significance to aircraft operations

4.8.1. The location of a release of radioactive materials into the atmosphere of significance to aircraft operations will be identified on WAFC SIGWX forecasts, using the symbol below:

4.8.2. The centre of the symbol represents the location of the incident.

4.8.3. Additionally, a 'call-out' box will be positioned in proximity to the symbol with the name of the site (if known) and the latitude and longitude of the source.

[5] This is due to a limitation of the BUFR table used to convey the name of the Tropical Cyclone.

4.9. Location of widespread sandstorm/dustorm

4.9.1. The location of expected widespread sandstorm/dustorm will be indicated by the symbol below

4.10. Major aerodrome 'city' identifiers

4.10.1. Cities served by major aerodromes are indicated on the WAFC SIGWX PNG charts. The convention is for the initial letter of the city to be placed next to a dot indicating the location of the aerodrome. In the example below, Perth, Darwin, Melbourne and Sydney can be located (P, D, M, and S respectively).

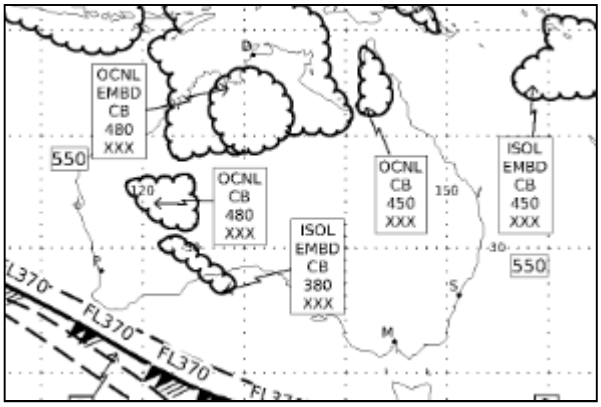


Figure 15: Illustrating the identification of cities with major aerodromes, Perth (P); Darwin (D), Melbourne (M) and Sydney (S).

4.11. WMO Bulletin Identifier.

4.11.1. The SIGWX forecasts issued by a WAFC in PNG format indicate, in the top left corner, the recognised WMO Abbreviated Header Line (or bulletin header). In the example below:

PGCE05 represents the reference to the specific chart.
EGRR represents the WAFC issuing the data (in this case WAFC London. KKCI represents WAFC Washington). In the case of a backup situation, this will remain the same even if the data is issued by the other WAFC.
161200 represents the day of the month (16 in this case) and the hour in UTC (1200 in this case) of the analysis on which the forecast is based. *Note, this time will always be 24 hours earlier than the validity time of the forecast as specified in the main legend on the PNG forecasts.*

4.11.2. In the event of a correction being issued the bulletin ID will be appended by 3 characters 'CCx' where 'x' will be 'A' for the first correction, 'B' for a second correction and so on.

4.11.3. Only the WAFCs may identify visualisations of WAFC SIGWX forecasts using EGRR and KKCI.

5. Amendments and Corrections to WAFC SIGWX forecasts.

5.1. Amendment

5.1.1. It is important to note that WAFC SIGWX forecasts are NOT subject to amendment.
5.1.2. In the event that in the light of subsequent information the evolution of the atmosphere is expected to differ from that of the originally issued SIGWX forecast, then the forecast is not subject to amendment.

5.2. Correction

5.2.1. In the event that a distinct error is identified, then WAFC SIGWX forecasts will be re-issued. The process for re-issuance is beyond the scope of this guide. However, information on the procedure is available in Appendix F of the SADIS User Guide (Part 2 – Technical), available from the ICAO Website http://www.icao.int/airnavigation/METP/MOG/Pages/SADIS.aspx ..

5.3. Difference between an amendment and a correction.

5.3.1. An amendment is defined as a different evolution of the atmosphere to that originally expected on the basis of information available at the time of issuance.

5.3.2. A correction is defined as a distinct error that is clearly inconsistent with what was known at the time of issue.

5.3.3. By way of examples:

Example 1: If, when originally issued, a jetstream height was indicated as FL390, and on subsequent information (new 'model' data') it was identified that

the height is more likely to be FL410; then the original forecast will not be re-issued as an amendment.

Example 2: If, when originally issued, a jetstream height was indicated as FL430, and on subsequent review it was identified that the height should have been FL340 (through inadvertent transposition of figures), then that would be a distinct error, and a correction would be issued.

6. Contacting the WAFCs for further information.

6.1. If further information is required, then the WAFCs can be contacted;

WAFC London:

Service Desk Met Office, Fitzroy Road, Exeter, Devon, EX1 3PB, United Kingdom Tel from UK: 01392 886666 Tel from outside UK: +44 1392 885680 E-mail: enquiries@metoffice.gov.uk

WAFC Washington:

Matt Strahan Chief, International Operations Branch Aviation Weather Center, 7220 NW 101st Terrace, Room 101, Kansas City, Missouri 64153-2371, United States Phone: +1 (816) 584 7203 Fax: +1 (816) 880 0650 Email: matt.strahan@noaa.gov

APPENDIX A: ICAO Fixed areas of coverage of WAFS forecasts in chart form

(from Appendix 8 to ICAO Annex 3 – *Meteorological Service for International Air Navigation*

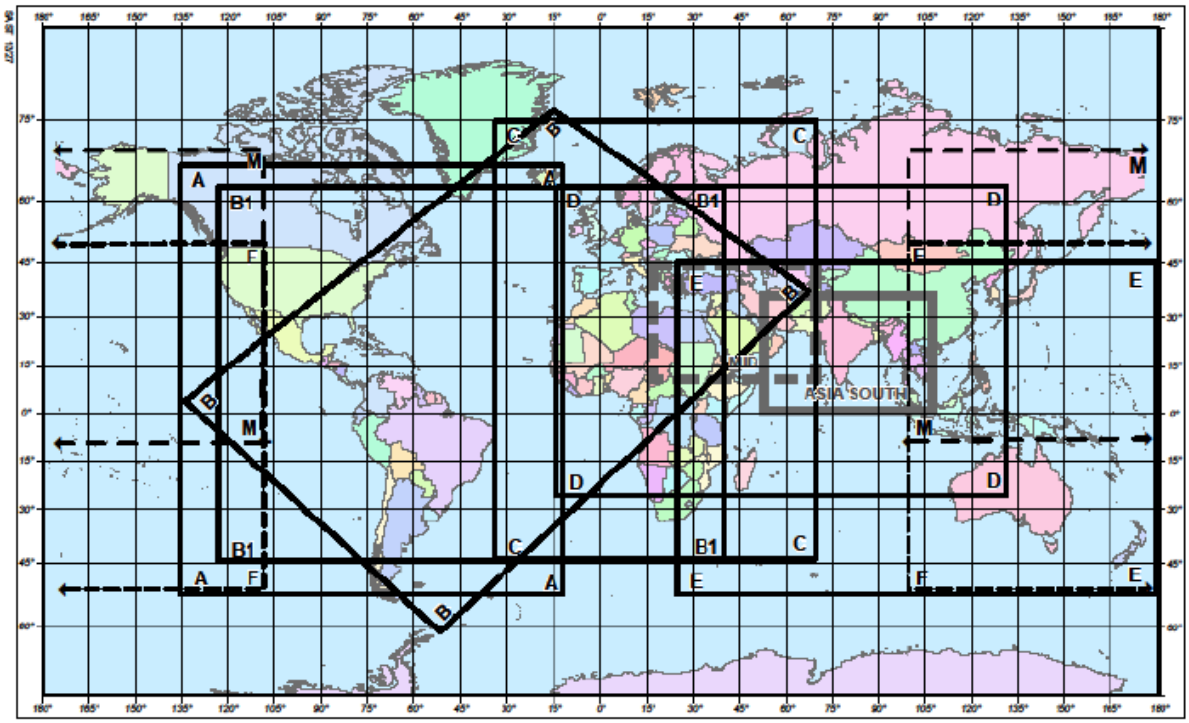


CHART	LATITUDE	LONGITUDE	CHART	LATITUDE	LONGITUDE
A	N6700	W13724	D	N6300	W01500
A	N6700	W01236	D	N6300	E13200
A	S5400	W01236	D	S2700	E13200
A	S5400	W13724	D	S2700	W01500
ASIA	N3600	E05300	E	N4455	E02446
ASIA	N3600	E10800	E	N4455	E18000
ASIA	0000	E10800	E	S5355	E18000
ASIA	0000	E05300	E	S5355	E02446
B	N0304	W13557	F	N5000	E10000
B	N7644	W01545	F	N5000	W11000
B	N3707	E06732	F	S5242	W11000
B	S6217	W05240	F	S5242	E10000
B1	N6242	W12500	M	N7000	E10000
B1	N6242	E04000	M	N7000	W11000
B1	S4530	E04000	M	S1000	W11000
B1	S4530	W12500	M	S1000	E10000
C	N7500	W03500	MID	N4400	E01700
C	N7500	E07000	MID	N4400	E07000
C	S4500	E07000	MID	N1000	E07000
C	S4500	W03500	MID	N1000	E01700

Facsimile of Figure A8-1 to ICAO Annex 3.

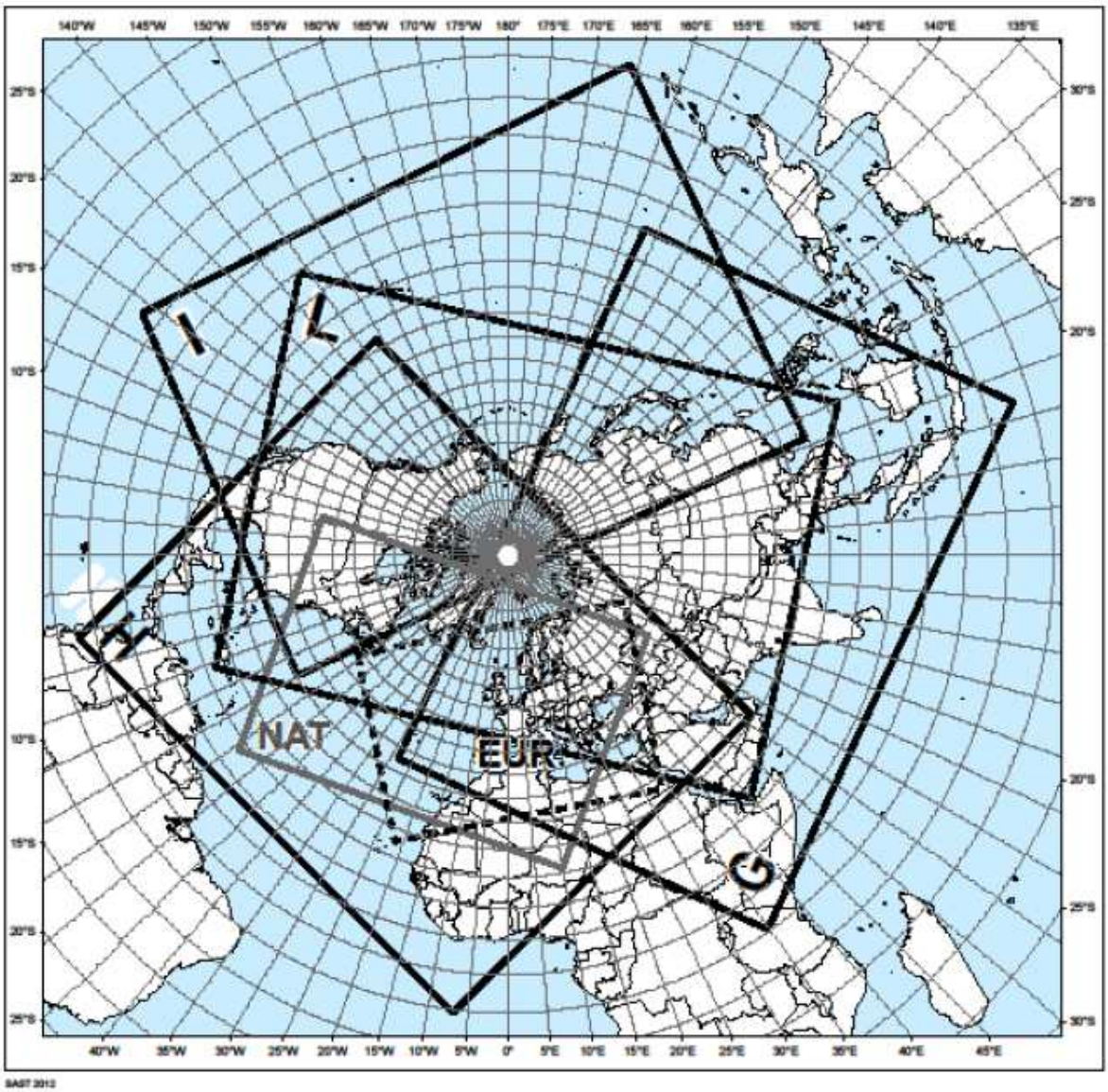


CHART	LATITUDE	LONGITUDE	CHART	LATITUDE	LONGITUDE
EUR	N4633	W05634	I	N1912	E11130
EUR	N5842	E06824	I	N3330	W06012
EUR	N2621	E03325	I	N0126	W12327
EUR	N2123	W02136	I	S0647	E16601
G	N3552	W02822	L	N1205	E11449
G	N1341	E15711	L	N1518	E04500
G	S0916	E10651	L	N2020	W06900
G	S0048	E03447	L	N1413	W14338
H	N3127	W14836	NAT	N4439	W10143
H	N2411	E05645	NAT	N5042	E06017
H	S0127	W00651	NAT	N1938	E00957
H	N0133	W07902	NAT	N1711	W05406

Facsimile of Figure A8-2 to ICAO Annex 3.

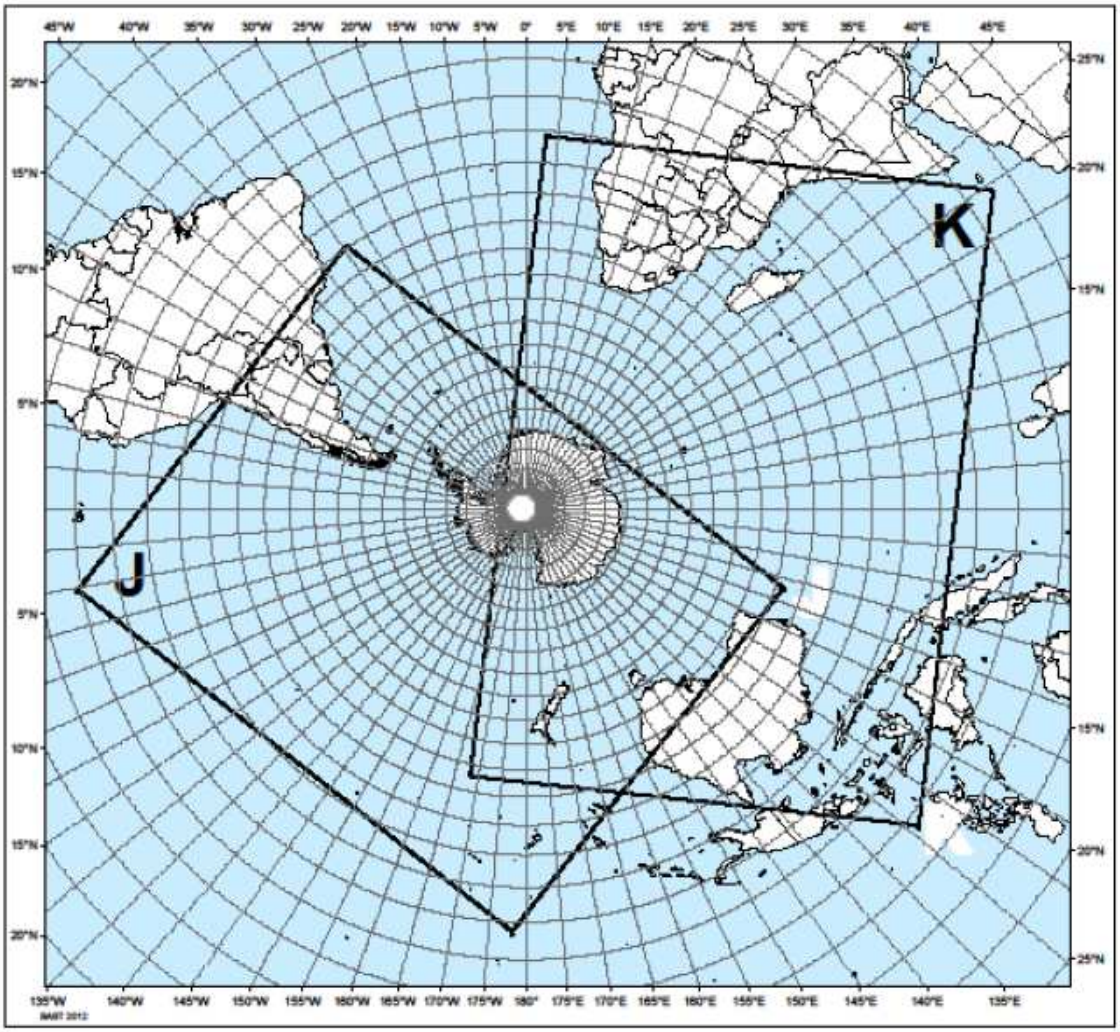


CHART	LATITUDE	LONGITUDE
J	S0318	W17812
J	N0037	W10032
J	S2000	W03400
J	S2806	E10717
K	N1255	E05549
K	N0642	E12905
K	S2744	W16841
K	S1105	E00317

Facsimile of Figure A8-3 to ICAO Annex 3.

APPENDIX B: Abbreviations

Abbreviation/Acronym	Meaning
WAFC	World Area Forecast Centre
WAFS	World Area Forecast System
ICAO	International Civil Aviation Organization
CB	Cumulonimbus cloud
CAT	Clear Air Turbulence
ISOL	Isolated. In the context of CB cloud in WAFC SIGWX forecasts: *maximum spatial coverage less than 50% of the area concerned*
OCNL	Occasional: In the context of CB cloud in WAFC SIGWX forecasts: *maximum spatial coverage between 50% and 75% of the area concerned*
EMBD	Embedded: In the context of CB cloud in WAFC SIGWX forecasts: *expected to be embedded within cloud layers and not readily recognised*
FRQ	Frequent: In the context of CB cloud in WAFC SIGWX forecasts: *maximum spatial coverage greater than 75% of the area concerned*
TC	Tropical Cyclone
SIGWX	Significant Weather (in the context of this document, WAFC SIGWX forecasts.
SWH	High Level WAFC SIGWX forecasts.
SWM	Medium Level WAFC SIGWX forecasts.
FL	Flight Level
FT	Feet
KT	Knot (nautical mile per hour)
RDOACT	Radioactive (used with CLD)
CLD	Cloud
GR	Graupel (hail)
TS	Thunderstorm
VA	Volcanic Ash
NOTAM	Notice to Airmen
ASHTAM	NOTAM series relating to volcanic ash.
SIGMET	Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather and other phenomena in the atmosphere that may affect the safety of aircraft operations.
BUFR	Binary Universal Form for the Representation of meteorological data, developed and maintained by the World Meteorological Organization (WMO)
PNG	Portable Graphic Network – an image format. In the context of WAFC SIGWX, these are a backup format to the BUFR data.
UTC	Universal Time Coordinated.
EURO	The European (and environs) domain of one of the Medium Level SIGWX forecasts.
MEA/MID	The Middle East (and environs) domain of one of the Medium Level SIGWX forecasts.
NAT	The North Atlantic (and environs) domain of one of the Medium

	Level SIGWX forecasts.
ASIA SOUTH	The South Asia (and environs) domain of one of the Medium Level SIGWX forecasts.

APPENDIX C: Symbols

Moderate turbulence

Severe turbulence

Moderate icing

Severe icing

location of volcanic eruptions that are producing ash clouds of significance to aircraft operations

Tropical cyclone (northern hemisphere)

Tropical cyclone (southern hemisphere)

location of a release of radioactive materials into the atmosphere of significance to aircraft operations

Location of widespread sandstorm/duststorm

Wind feathers/pennants (fleches):

A jet core of 75 knots (50+10+10+5)

A jet core of 105 knots (50+50+5)

A jet core of 125 knots (50+50+10+10+5)