



International Civil Aviation Organization

**FIFTEENTH MEETING OF THE
COMMUNICATIONS/NAVIGATION/SURVEILLANCE AND
METEOROLOGY SUB-GROUP (CNS/MET SG/15) OF APANPIRG**

Bangkok, Thailand, 25 – 29 July 2011

Agenda Item 8: Regional Implementation of the World Area Forecast System (WAWS)

UPDATE OF WAWS SERVICE REFERENCE DOCUMENT

(Presented by Chair, WAWS Implementation Task Force)

SUMMARY

This paper presents an update of the WAWS service reference document that was developed by the WAWS Implementation Task Force (WAWS/I TF) for distribution to States/Territories in ASIA/PAC Regions.

This paper relates to – **Strategic Objectives:**

- A: **Safety** – Enhance global civil aviation safety
- C: **Environmental Protection and Sustainable Development of Air Transport**

Global Plan Initiatives:

GPI-19 Meteorological Systems

1. Introduction

1.1 Following the Work Plan of the WAWS Implementation Task Force (WAWS I/TF), the Task Force developed a WAWS service reference document in October 2010 and distributed it to States/Territories in ASIA/PAC Regions. This document aims to provide an overview of WAWS, the role of the two WAFCs, the available communication mechanisms, datasets and summarizes the end-user equipment options available to User States.

2. Discussions

2.1 With the assistance of the two WAFCs, the document has recently been updated to reflect the latest developments in WAWS. The updated document will be reviewed by WAWS/I TF during CNS/MET SG/15, and will then be distributed to ASIA/PACIFIC States/Territories.

3. Action by the meeting

3.1 The meeting is invited to note the information provided in this paper.

**ICAO Asia Pacific Air Navigation Planning and
Implementation Regional Group (APANPIRG)**

World Area Forecast System (WAWS)

- Service Reference

THIS DOCUMENT IS AN ASIAPAC REGION MET SUB GROUP TASK FORCE DOCUMENT.
IT DOES NOT HAVE OFFICIAL STATUS UNDER WAWSOPSG/SADISOPSG OR ISCS/WIFS
GUIDANCE DOCUMENTATION FROM USA. IN THE CASE OF DIFFERENCES BETWEEN
DOCUMENTS, OFFICIAL WAWSOPSG/SADISOPSG OR ISCS/WIFS DOCUMENTATION
WILL TAKE PRECEDENCE. READERS ARE ADVISED TO REFER REGULARLY TO THE
WAWSOPSG AND SADISOPSG WEB SITES FOR THE LATEST INFORMATION

Version 1.[10](#)
Date Created: [26 October 2010](#)[8 July 2011](#)
Created by: ICAO APANPIRG WAWS/I TF

1 Introduction

1.1 Purpose

To provide a reference document on the World Area Forecast System (WAFS) for use by User States within the Asia and Pacific (ASIA/PAC) regions. This document provides an overview of WAFS, the role of the two World Area Forecast Centres (WAFCs), the available communication mechanisms, datasets and summarises the end-user equipment options available to User States.

1.2 Scope

This document is intended to collate general information on WAFS from many sources and provide a high-level overview of information. Rather than repeat details contained in other documents, this document will provide links to these documents.

1.3 References & Useful Links

APANPIRG WAFS/I TF: http://www.bangkok.icao.int/apanpirg_sg.html

ICAO : <http://www2.icao.int/en/anb/met-aim/met/>

ISCS : <http://www.weather.gov/iscs/>

ISCS User Guide from:

<http://www2.icao.int/en/anb/met-aim/met/wafsopsg/Guidance%20Material/ISCS%20User%20Guide.pdf>

SADIS : <http://www.metoffice.gov.uk/sadis/>

SADISOPSG : <http://www2.icao.int/en/anb/met-aim/met/sadisopsg/>

SADIS FTP and Secure SADIS FTP Guide from:

<http://www2.icao.int/en/anb/met-aim/met/sadisopsg/SADIS%20User%20Guide/Forms/OT.aspx>

<http://www2.icao.int/en/anb/met/sadisopsg/SADIS%20User%20Guide/Forms/OT.aspx>

SADIS User Guide from:

<http://www2.icao.int/en/anb/met-aim/met/sadisopsg/SADIS%20User%20Guide/Forms/OT.aspx>

<http://www2.icao.int/en/anb/met/sadisopsg/SADIS%20User%20Guide/Forms/OT.aspx>

WAFSOPSG : <http://www2.icao.int/en/anb/met-aim/met/wafsopsg/>

WIFS: <http://aviationweather.gov/wifs/>

1.4 Acronyms and Abbreviations

The following is a list of acronyms and abbreviations used within this document:

AFS	Aeronautical Fixed Service
AIREP	Air-report
ANSP	Air Navigation Service Provider
APANPIRG	Asia Pacific Air Navigation Planning and Implementation Regional Group
BUFR	Binary Universal Form for the Representation of meteorological data
CB	Cumulonimbus
CNS/MET SG	Communications, Navigation and Surveillance/Meteorology Sub-Group
FTP	File Transfer Protocol
GRIB	GRIdded Binary
GRIB1	GRIB Edition 1
GRIB2	GRIB Edition 2
HTTPS	Hypertext Transfer Protocol Secure
ICAO	International Civil Aviation Organization
ISCS	International Satellite Communications System
METAR	Meteorological Aviation Report / Aviation Routine Weather Report
MWO	Meteorological Watch Office
OPMET	Operational Meteorological Information

PC	Personal Computer
PNG	Portable Network Graphics
RANP	Regional Air Navigation Plan
SADIS	Satellite Distribution System for information relating to air navigation
SADISOPSG	Satellite Distribution System Operations Group
SIGMET	Significant Meteorological (Information)
SIGWX	Significant Weather
SPECI	Special Report / Aviation Selected Special Weather Report
SWH	High-level SIGWX
SWM	Medium-level SIGWX
TAF	(Terminal) Aerodrome Forecast
TCA	Tropical Cyclone Advisories
UK	United Kingdom
UKMO	UK Meteorological Office
USA	United States of America
US NWS	United States National Weather Service
VAA	Volcanic Ash Advisories
WAFC	World Area Forecast Centre
WAFS	World Area Forecast System
WAFS/I TF	WAFS Implementation Task Force
WAFSOPSG	World Area Forecast System Operations Group
WIFS	WAFS Internet File Service
WMO	World Meteorological Organization

2 WAFS Overview

The purpose of the World Area Forecast System (WAFS) is to provide the worldwide aviation community with operational meteorological forecasts and information about meteorological phenomena required for flight planning and safe, economic, and efficient air navigation. On behalf of the International Civil Aviation Organization (ICAO) and World Meteorological Organization, the WAFS comprises two Provider States, these being the United Kingdom Meteorological Office (UKMO) and the United States National Weather Service (US NWS). The WAFS Provider States each operate a World Area Forecast Centre (WAFC) known as WAFC London and WAFC Washington.

The WAFCs provide:

- global gridded forecasts of upper winds, upper-air temperatures and humidity, flight level and temperature of tropopause, and direction, speed and flight level of maximum wind; and
- global High-level SIGWX (SWH) products and Medium-level SIGWX (SWM) products for limited geographical areas.

The official distribution mechanism for WAFS data is via UK's SAtellite DIStribution (SADIS) system for information relating to air navigation and the USA's International Satellite Communication System (ISCS), both of which form part of the ICAO Aeronautical Fixed Service (AFS). Internet based distribution systems¹ also exist for the transmission of WAFS data. That operated by the UK is known as SADIS FTP, with a new service known as Secure SADIS FTP [currently planned to be available in parallel from November 2010](#). [The older SADIS FTP service will be ceased on 30 November 2012](#). The USA provides [FTP and HTTPS](#) based services, known as the ISCS FTP and WAFS Internet File Service (WIFS) [respectively](#).

In addition to the WAFS data, the above distribution mechanisms also forward OPMET data (TAF, METAR, SIGMET etc.) for purposes of flight planning only (i.e. not for time critical purposes). The WAFS satellite broadcasts have been operational since 1996.

¹ An enabling clause in Annex 3, Amendment 75, permits the use of the public internet for distribution of non-time critical data. WAFS data and OPMET data used for flight planning purposes only comes under this definition.

2.1 Charts

The two WAFCs provide global quality controlled High-level SIGWX (SWH) products covering FL250-630. The WAFC's also provide quality controlled Medium-level SIGWX (SWM) products, covering FL100-450², for limited geographic areas as defined in the regional air navigation agreements. At the time of writing these agreements specified that area's "ASIA SOUTH", "EUR" and "MID" will be provided by WAFC London and area "NAT" will be provided by WAFC Washington.

The WAFCs provide the SWH and SWM products as both coded data and charts, in BUFR³ and PNG formats, respectively. The PNG format is provided for back-up purposes and is only available for the areas defined in ICAO Annex 3 Figures A8-1, A8-2 and A8-3.

2.2 Data Sets

The WAFCs provide global gridded forecasts of upper wind and temperature data covering FL050-530, tropopause heights and temperature, maximum wind (height, speed, direction) and ~~upper air~~ humidity data covering FL050-180 in both GRIB⁴ Edition 1 (GRIB1) and Edition 2 (GRIB2). Parameters for cumulonimbus (CB), icing, and turbulence are currently only provided via SADIS FTP/Secure SADIS FTP and WIFS on a trial and evaluation basis (in GRIB2 format only) until endorsed by WAFSOPSG.

The aforementioned gridded products are produced four times daily, for T+06 to T+36 at 6 hour time steps, ~~and are available in the both GRIB⁵ Edition 1 (GRIB1) format and 3 hour time steps in and Edition 2 (GRIB2) formats~~. This data can be used in flight planning systems to optimise flights routes or to generate a range of charts, such ~~as~~ wind and temperature charts, cross sections, etc. See 2.2.1.

As described in Section 2.1, the two WAFCs provide SWH and SWM data in BUFR code. The data is generated every 6 hours and is available 17 hours before validity, unless WAFC back-up procedures are invoked, in which case the data is available 15 hours before validity. This data allows users to generate SIGWX charts for standard ICAO areas or user defined domains.

As noted in Section 2 above, the AFS/internet based distribution mechanisms include a range of global OPMET data. These datasets include alphanumeric messages such as METAR, SPECI, TAF, SIGMET, VAA, TCA, and special AIREPs.

Administrative messages as defined in Section 4.24.4 are also broadcast as OPMET.

2.2.1 Differences between GRIB1 and GRIB2

² This exceeds the Annex 3 requirement FL100-FL250

³ BUFR stands for Binary Universal Form for the Representation of meteorological data. Technical details are contained in the WMO Manual 306 Part B specification, which can be obtained via the WMO web site - <http://www.wmo.ch/pages/prog/www/WMOCodes/ManualCodesGuides.html>. BUFR provides efficient storage of meteorological features in a machine independent form, where all the information to describe the features are contained within the data.

⁴ GRIB stands for GRIdded BiNary. GRIB is a mathematically concise data format commonly used in meteorology to store gridded data. It is standardized by the WMO Commission for Basic Systems, known under number GRIB FM 92-IX. The details of GRIB1 and GRIB2 can be found at the following links, respectively: <http://www.wmo.int/pages/prog/www/WDM/Guides/Guide-binary-2.html> and <http://www.wmo.ch/pages/prog/www/DPS/FM92-GRIB2-11-2003.pdf>

⁵ GRIB stands for GRIdded BiNary. GRIB is a mathematically concise data format commonly used in meteorology to store gridded data. It is standardized by the WMO Commission for Basic Systems, known under number GRIB FM 92-IX. The details of GRIB1 and GRIB2 can be found at the following links, respectively: <http://www.wmo.int/pages/prog/www/WDM/Guides/Guide-binary-2.html> and <http://www.wmo.ch/pages/prog/www/DPS/FM92-GRIB2-11-2003.pdf>

Whilst there will obviously be differences at the technical ‘encoding’ level between GRIB1 and GRIB2; users may be interested to note the main differences between GRIB1 and GRIB2 are:

- a. GRIB2 is a regular grid with 1.25 X 1.25 degree (~140 km X 140 km at the equator) resolution. GRIB1 has the longitudinal points on the grid ‘thinned’ as the polar regions are approached.
- b. GRIB2 bulletins contain data covering the entire globe for each level and each parameter in each bulletin. GRIB1 has separate bulletins for each ‘octant’ of every level/parameter combination.
- c. GRIB2 data is compressed using the JPEG2000 standard. Appropriate JPEG2000 decompression libraries will be necessary.
- d. GRIB2 has a temporal resolution of 3 hours, from T+06 to T+36 inclusive. GRIB1 has a temporal resolution of 6 hours (T+06 to T+36 inclusive).
- e. GRIB2 has additional levels (FL270, FL320 and FL360) close to the normal cruise of level of Airliners. [FL410 will be added to the GRIB2 dataset in November 2013 and applicability of Amendment 76 to Annex 3.](#)
- f. The tropopause height in GRIB2 is capped at FL600, but in GRIB1 the cap is at FL530. As such, there may be differences between GRIB2 and GRIB1 tropopause heights and temperatures in the tropical regions. GRIB2 will be the more accurate representation.

Due to a combination of higher horizontal resolution in the polar regions in GRIB2, its 3 hour time step (twice that of GRIB1) and extra vertical levels, the GRIB2 data volume is nearly four times as much as the GRIB1 products. However the JPEG2000 data compression allows for a compression factor of approximately 2. Thus, the complete wind/temperature/tropopause dataset in GRIB2 format is approximately twice that of GRIB1. These figures exclude the CB, icing and turbulence parameters which are yet to be endorsed by WAFSOPSG.

2.3 Data Communication Options

The UK and USA provide point to multi-point data distribution services via satellite in real-time. These services are provided by the UKMO’s SADIS 2G satellite positioned at 00N 060E and US NWS’s ISCS-G2 satellites positioned at 00N 034.5W and 00N 180E. The coverage provided by these satellites services is shown in Figure 1.

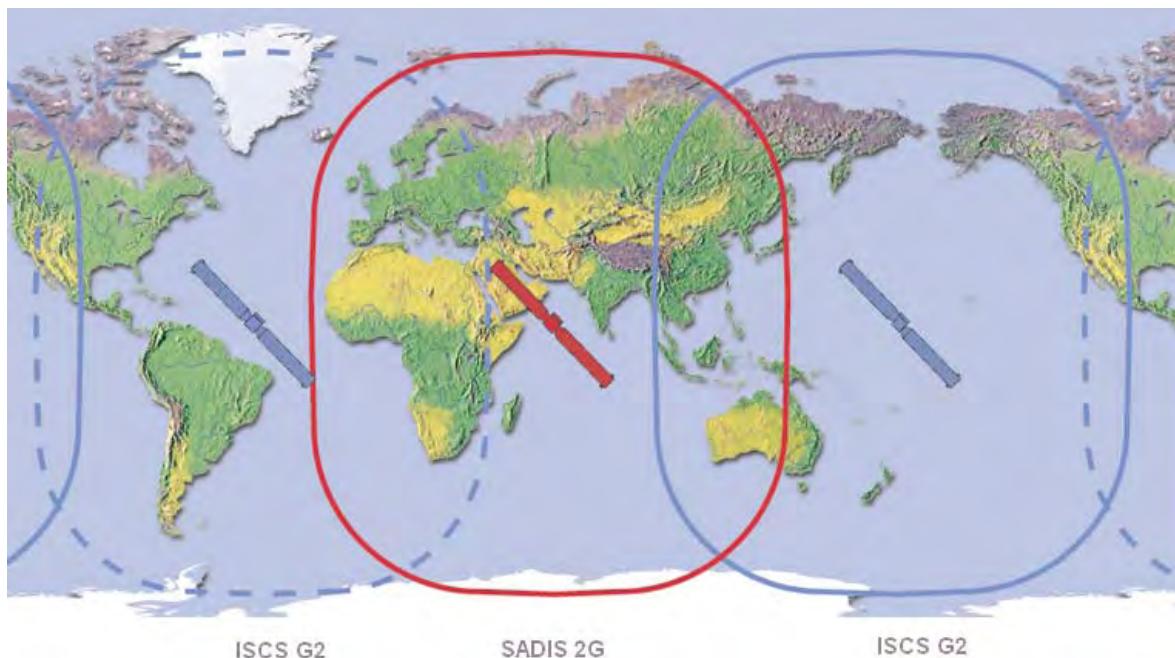


Figure 1: Schematic of ISCS-G2 and SADIS 2G satellite footprints. Reception signal strengths, particularly at the edges of the footprints, are not so simply or sharply defined. Consult SADIS and ISCS guidance documents for detailed information.

More recently, both WAFCs have offered backup internet-based services in addition to their satellite based system ~~via the FTP protocol, and in March 2010~~^{The} US NWS ~~commenced operation of their~~ provides a service known as WAWS Internet File Service (WIFS) which allows users to retrieve data via HTTPS⁶ protocol. The WIFS will replace the ISCS-G2 service and ISCS FTP service which is will ceaseing operation on 30 June 30 2012. On 18 November ~~18~~ 2010, amendment 75 to ICAO Annex 3 recognizeds the use of the Internet to access aviation weather data in support of flight planning. ~~At this time,The UKMO plans to commenecurrently provides access via SADIS FTP and a new~~ Secure SADIS FTP service ~~as a backup, or as an alternative to, the SADIS satellite service or as a backup to the satellite service.~~ The ~~existingolder~~ SADIS FTP service will remain in service in parallel with the ~~s~~Secure SADIS FTP service for at least 12 monthsuntil 30 November 2012, when it (SADIS FTP) will be withdrawn. The following Gantt chart shows the indicative availability of ~~the various~~ WAWS communication distribution services provided by UK and USA.

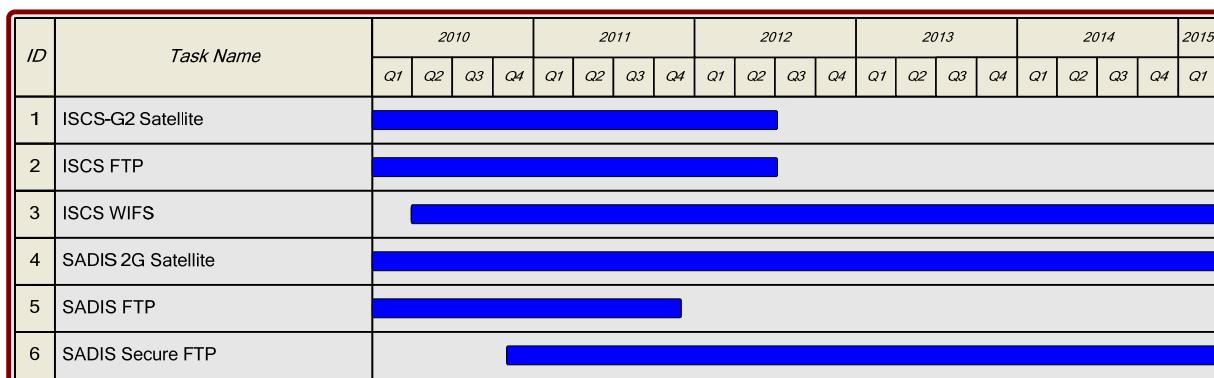


Figure 2. Timeline showing the indicative availability of WAWS services up to the year 2015

2.4 WAWS End-User system components

User States wishing to implement utilize WAWS data require the following components:

1. Visualisation software
2. PC/server on which to run the visualisation software
3. Communications with the:
 - o Satellite based SADIS 2G or ISCS-G2; and/or
 - o Internet based SADIS FTP, Secure SADIS FTP or WIFS).

2.4.1 Visualisation Software

There are a number of companies which offer commercial-off-the-shelf software capable of visualising the WAWS/OPMET datasets and generating graphical charts. Software is available for both Windows and Linux operating systems. The UK Met Office (as SADIS Provider) maintains a list of the companies offering WAWS capable visualisation software compatible with its systems. The details can be found at:

http://www.metoffice.gov.uk/sadis/about/manufacturers_full.html

The UK Met Office has performed an evaluation of these software systems, the results of which can be found at:

<http://www.metoffice.gov.uk/sadis/software/>

Some WAWS users have elected to implement there own bespoke software. Alternatively many flight planning systems support the visualisation of WAWS data and flight plan optimisation based on WAWS data, however these systems are outside the scope of this document.

⁶ The primary open source product for access using the HTTPS protocol is the "GNU Wget package" (GNU is a recursive acronym for "GNU's Not Unix" and is pronounced "guh-NEW").

2.4.2 PC/Server

All systems require a PC or server on which to run the visualisation software. For redundancy, User States may elect to install the visualisation software on multiple PCs/servers or under platform virtualisation such as VMware.

2.4.3 Data Communications with a WAFC

It is essential that all users of ISCS G2 are aware that this satellite based delivery mechanism for WAFS data will not be available after 30 June 2012.

User States need to determine whether they will access WAFS data via satellite (after 30 June 2012 and withdrawal of ISCS G2 this will only be possible if the user is under the SADIS 2G satellite footprint) and/or internet based communications. Typically internet based communications are already available to a User State, although the reliability and availability may need to be reviewed, whereas satellite based communications require dedicated hardware. Satellite based communications require a satellite data reception system comprising the following sub-systems:

- satellite antenna (normally 1.8 or 2.4 metre diameter)
- low noise block
- digital receiver
- router
- cabling including coaxial, power, communications (RS-232/Ethernet/USB)

The typical cost – subject to confirmation by suppliers - for a single reception system, with 2.4m dish, is approximately USD15,000⁷ (EUR12,000). This price excludes shipping, installation and spares for ‘quick return to service’. For redundancy purposes, some User States elect to install multiple satellite reception systems or alternatively use internet based communication systems as a backup.

Further details on suppliers of this satellite data reception system can be found at:

<http://www.metoffice.gov.uk/sadis/hardware/suppliers/>

2.4.4 Procurement Guidelines for satellite reception

Whilst the ISCS satellite service will cease operation on June 30 2012, the SADIS 2G service will continue to operate until at least 2015. User States wishing to implement this service can find procurement guidelines for SADIS 2G equipment at:

<http://www.metoffice.gov.uk/sadis/procure.html>.

User's should note the important guidance at the foot of the following link:

<http://www.metoffice.gov.uk/sadis/about/manufacturers.html>.

3 System Operation

The WAFCs is used by a variety of users groups around the world including airlines, Air Navigation Service Providers (ANSPs) and Meteorological Watch Offices (MWOs). This section is intended to provide an overview of the WAFCs from the generation of datasets by the WAFC to typical end-users.

The two WAFCs run global meteorological models which run four times daily. The WAFCs gridded (GRIB1/GRIB2) parameters are direct outputs from these models, whereas as the SIGWX products are manually generated by forecasters. The forecasters generate these SIGWX charts-datasets by individually drawing each features based on an analysis of satellite imagery, meteorological models and a range of other forms of guidance. The generated SIGWX products are in accordance with the Standards and Recommended Practices of ICAO Annex 3.

⁷ All costs indicated in this document are indicative only and may vary from time to time.

The SIGWX products are available in both BUFR and PNG format. It is anticipated that Users will generate charts for their region from the BUFR data and that the PNG charts are made available as a backup. The SIGWX products are available_produced every 6 hours, and_are valid for 00Z, 06Z, 12Z or 18Z and are available 17 hours before validity under normal conditions, 15 hours under backup conditions. The SIGWX charts are valid for to be used for operational within a period starting 3 hours before, until 3 hours after validity time.

Unlike the SIGWX products which are generated for a single validity time, the WAFCs global gridded datasets are generated for a range of time steps between T+06 and T+36 hours. Within this time range, the GRIB1 data is available at 6 hourly steps whereas the GRIB2 data is available in 3 hourly steps, i.e.

- GRIB1 data available for time steps +6, +12, +18... to +36
- GRIB2 data available for time steps +6, +9, +12, +15, +18... to +36

It is intended that for anything other than basic situational awareness (e.g. Wind and Temperature charts), the GRIB data should be interpolated between time steps. This is particularly so with regard to use of winds in flight planning software.

OPMET messages are disseminated as soon as the messages are received by the ISCS and SADIS Provider States.

Once the data sets are available, the WAFCs:

- Transmit (push) the data to users via satellite distribution push communications (SADIS 2G and ISCS G2) the data to users; and
- Internet/FTP service requires users to pull the data.
- Place the data on their internet (SADIS FTP, Secure SADIS FTP, WIFS) file servers allowing users to retrieve (pull) the products at the user's convenience.

User States wanting to utilise the WAFS data are required to either install or operate a satellite data reception system or have a permanent and reliable internet connection as defined in Section 2.4.3. In addition, User States will also need to operate visualisation software as defined in Section 2.4.1.

Under normal operating conditions a User State ingests data from their primary WAFC (Section 4.1). A User State may also contact the alternative WAFC provider in order to obtain an account for backup/contingency purposes (Section 3.2). The visualisation software ingests the WAFS data and generates products:

- At predefined times;
- Upon the arrival of new datasets; and/or
- As required by the operator.

Depending on the intended user, the Most WAFS visualisation software can be configured to generate a range of different products. Commonly generated products include:

- High-level SIGWX charts for any region of the globe from the BUFR data;
- Mid-level products for limited geographical regions from the BUFR data; and
- Wind and Temperature charts from GRIB data.

In addition, some visualisation software is also capable of providing generating a range of other products. These products can also be grouped together to form a flight packages for user defined routes and may contain:

- OPMET data (METAR/SPECI, TAF, SIGMET, AIRMET, TCA, VCA, etc)
- SIGWX charts
- Wind and Temperature charts
- Cross sections charts
- Route/Flight forecasts in text format

The visualisation software can typically be configured to disseminate the aforementioned charts and data sets to Users via a range of mechanisms including email, web servers, FTP servers, etc and TCP

[communication protocols](#). End users of these charts include pilots, flight planners, air traffic controllers, meteorologists, etc. Airlines and ANSPs also often load the [WAFS](#) GRIB data into flight planning systems to optimise routes for efficiency and safety.

3.1 Errors or Omissions in WAFS products

Should a user detect any errors or omissions in the WAFC products they are encouraged to contact the WAFC directly using the following 24-hour contact details:

WAFC London service desk contact details:

email: servicedesk@metoffice.gov.uk

telephone: +44 (0) 1392-88 66 66

[fax: +44 \(0\) 1392 88 44 12](tel:+44(0)1392884412)

WAFC Washington [operational forecast service](#) desk contact details:

[Email: \[toc.nwstg@noaa.gov\]\(mailto:toc.nwstg@noaa.gov\)](mailto:toc.nwstg@noaa.gov)

telephone: [+1 301 713 0902](tel:+13017130902) [+00 \(1\) 816 584 7220](tel:+18165847220)

Should the error or omission relate to a SIGWX product the WAFCs will typically issue a correction message as described in Section [4.2.14.4.1](#).

3.2 Backup Communications

The two WAFCs provide global forecasts of SWH charts and a range of gridded fields as defined in Section 2. Having global forecasts available from the two WAFCs provides a backup should an outage occur. The WAFS architecture supports the following:

- Loss of satellite based communication mechanism:
 - The WAFCs each [offer provide a FTP/HTTPSi](#)nternet based services [and these can be used](#) as a backup [source of data to that delivered over to](#)their [primary satellite based services SADIS 2G, ISCS G2 services respectively](#). It is incumbent on users to request access details from the primary WAFC.
- Complete loss of data from SADIS or ISCS/WIFS provider.
 - In the extremely unlikely event that either the SADIS or the ISCS/WIFS provider were to be completely unavailable, those users who have pre-arranged alternative accounts can make use of the alternate provider's internet based service to obtain data. It is incumbent on users to request and obtain access details for the alternate provider. Moreover, the WAFCs do not arrange backup/contingency accounts on behalf of users. Users also need to note that the data and data structures available from the two WAFCs are not identical mirrors of each other and Users are responsible for ensuring that their systems are able to decode both EGRR and KWBC/KKCI GRIB⁴ [and](#) BUFR data.

4 Implementation Factors

4.1 Selection of primary WAFC

WAFS service should be obtained as per direction from the Regional Air Navigation Plans (RANPs). Since the ASIA/PAC regions have coverage by both the ISCS-G2 and SADIS 2G satellites the ASIA/PAC RANP nominates both services as an option. Given this, satellite selection should be determined on best position underneath a particular satellite's footprint. Where satellite footprints overlap with equal strength then the choice is the user's.

[Access to the Internet based services has recently been ratified through several ICAO groups, and following expected updates of the ASIA/PAC Air Navigation Plan will more explicitly specify where a particular user State should obtain its service.](#)

Following the selection of the primary WAFC, the visualisation software needs to be configured to generate products from that WAFC. WAFC London transmits all its products with a source address of “EGRR”. WAFC Washington however transmits its data from 2 source addresses (“KWBC” GRIB; “KKCI” BUFR/PNG).

4.2 Satellite or Internet based primary communications

~~User States need to determine whether they use satellite or internet based communications as the primary communication mechanism. The following is a brief list of pro's and con's for each option. This list is not exhaustive and each User State should undertake their own review and optionally a risk analysis.~~

4.2.1 Satellite Pro's

- ~~Purpose built independent system which is not shared or accessible by public unrestricted users.~~
- ~~Internet communications can typically also be used as a cost effective backup solution.~~
- ~~Highly available service.~~

4.2.2 Satellite Con's

- ~~Reliant on dedicated hardware (hardware costs ~USD15K, plus shipping, installation, etc).~~
- ~~ISCS satellite service is ceasing in June 2012. SADIS is guaranteed until 2015, however the life of the satellite service beyond this time is unknown.~~

4.2.3 Internet Pro's

- ~~No dedicated hardware and thus low setup costs.~~
- ~~Existing highly available communications normally available.~~
- ~~If an outage occurs due to natural disaster or similar, the internet is one of the first services to be restored.~~
- ~~Typically, User States already have staff proficient in diagnosing issues with internet connectivity/service.~~

4.2.4 Internet Con's

- ~~Internet service can be susceptible to internet attacks such as Denial of Service.~~
- ~~Shared with other users and large downloads may degrade service.~~
- ~~Reliant upon international (fibre) links.~~

4.3 Backup Communications

~~As detailed in Section 3.2, the SADIS/ISCS Provider States provide internet based services as backup/contingency to their own satellite based communications. Additionally, users can apply for backup/contingency accounts for the internet based services of the alternate provider.~~

~~User States wishing to take advantage of this capability are responsible for:~~

- ~~Organising access details and accounts with both the primary and alternate WAFC; and~~
- ~~Configuring their visualisation software to work with the data from the two WAFCs.~~

4.44.2 Administration Messages

The SADIS Provider and ISCS Provider notify User States of changes to services and documentation via Administration Messages. These Administration Messages are structured text messages which are provided to User States via each of the communication mechanisms (i.e. satellite, FTP, WIFS).

The SADIS administration messages include:

Header ⁸	Description
NOUK10 EGRR	Generally used to advise on model or product difficulties, engineering outages, and product changes. This is the preferred bulletin header for general messages
NOUK11 EGRR	Other advice messages.
NOUK12 EGRR	Provides a text message directing users how to decode GRIB values. It is mainly used by Workstation Suppliers.
NOUK13 EGRR	SADIS User Guide Updates (ICAO can only authorise these messages).
NOUK31 EGGY	NATS advisory messages
NOBX99 EBBR	BMG METNOs describing changes to bulletins promulgated in the EUR Region
PLUK30 EGRR PLUK31 EGRR PLUK32 EGRR PLUK33 EGRR PLUK34 EGRR	The PL series have been reserved for any graphical ADMIN messages but users would be alerted and directed from a NOUK10 EGRR message

For further details refer to section 4.2 of SADIS Gateway Operations Handbook, from

<http://www2.icao.int/en/anb/met-aim/met/sadisopsg/SADIS%20User%20Guide/Forms/OT.aspx>

The ISCS/WIFS administration messages include:

Header	Description
NOXX10 KWBC	ISCS administration messages until June 2012
NOXX10 KKCI	WIFS administration messages

~~At the time of writing, the ISCS Administration Messages were not separated from other general Administration Messages. The Header of these Administration Messages takes the form:~~

NOUK CCCC**

where,

****** are two numbers (e.g. 41)

CCCC is the four character source address (e.g. KKCI)

4.4.14.2.1 Correction Messages

The two WAFCs have also implemented Correction Messages to advise users of errors or omissions in SIGWX forecasts (PNG or BUFR). It is intended that the content of such messages shall be brought to the attention of users of the WAWS SIGWX forecast at the pre-flight planning stage. Guidance regarding these bulletins is available on the WAWSOPSG website at URL:

<http://www2.icao.int/en/anb/met-aim/met/wawsopsg/Pages/GuidanceMaterial.aspx>.

These messages are transmitted with the following headers:

WAFC London	FXUK65 EGRR
WAFC Washington	FXUS65 KKCI

⁸ The message header takes the form TTAAii CCCC. For further details, see:

http://www.wmo.int/pages/prog/www/ois/Operational_Information/Publications/WMO_386/AHLSymbols/TableDefinitions.html

5 Further Information

5.1 WAFC General Contact Details

User States wanting to access the system should contact the relevant WAFC.

5.1.1 WAFC Washington

~~NWS/Aviation Weather Center
Attention: Mr Matt Strahan
International Branch Chief,
7220 NW 101st Terrace
Kansas City, Missouri
USA 64153-2371
E-mail addressed to: matt.strahan@noaa.gov
Fax number: +00 (1) 816-584-7203~~

NWS/Aviation Weather Center
Attention: Mr Michael Pat Murphy
Warning Coordination Meteorologist
7220 NW 101st Terrace
Kansas City, Missouri
USA 64153-2371
E-mail addressed to: Michael.Pat.Murphy@noaa.gov
Fax number: +00 (1) 816-880-0650/584-7239

5.1.2 WAFC London

The Met. Office
Attention: Mr. Nigel Gait
International Aviation Manager
Fitzroy Road
Exeter
Devon EX1 3PB
United Kingdom
E-mail addressed to: nigel.gait@metoffice.gov.uk
Fax number: +44 (0)1392-885-681

5.2 Technical Groups

There are a number of technical groups involved with the development and implementation of WAFS. These include:

APANPIRG WAFS/I TF:

http://www.bangkok.icao.int/apanpirg_sg.html

SADISOPSG:

<http://www2.icao.int/en/anb/met-aim/met/sadisopsg/Pages/default.aspx>

WAFSOPSG:

<http://www2.icao.int/en/anb/met-aim/met/wafsopsg/Pages/default.aspx>

6 Significant Changes to WAFS

Date Effective	Description
1 Mar 2010	GRIB 2 data available via SADIS FTP, including trial forecasts of CB, icing & turbulence parameters
May 2010	WIFS operational
18 Nov 2010	Secure SADIS FTP service due to commence operation, SADIS FTP expected to operate for at least 12 months beyond this point
18 Nov 2010	GRIB2 over SADIS 2G and ISCS commences
30 Mar 2012	Current ISCS users should have transitioned to WIFS
1 Jul 2012	Cessation of the ISCS satellite service
<u>1 Jul 2012</u>	<u>Cessation of the ISCS FTP service</u>
<u>5 Jul 2012</u>	<u>Re-prioritisation of GRIB2 over GRIB1</u>
<u>30 Nov 2012</u>	<u>SADIS FTP will be ceased. Secure SADIS FTP will be the sole Internet based service provided by the UK.</u>
<u>Nov 2013</u>	<u>Planned cessation of WAFS Upper Air Forecasts in GRIB1 form. GRIB2 will be the sole format provided.</u>