



International Civil Aviation Organization

CAR/SAM Regional Planning and Implementation Group (GREPECAS)

**Eighth Meeting of the GREPECAS Aeronautical Meteorology Subgroup
(AERMETS/8)**

Santiago, Chile, 9 to 13 October 2006

AERMETS/8 – IP/03

12/09/06

Agenda Item 2: WAFS Implementation in the CAR/SAM Regions

Draft User Guide for the International Satellite Communication System

(Presented by the United States)

SUMMARY

Attached to this information paper is a copy of the Draft User Guide that is under development by the Washington World Area Forecast Center.

1. Introduction

1.1 At the World Area Forecast System Operations Groups (WAFSOSG)/2 meeting it was agreed that the Washington World Area Forecast Centre (WAFC) would provide a User Guide for the International Satellite Communication System (ISCS) modelled after the Satellite Distribution System (SADIS) User Guide. The development of the User Guide was done in response to CAR/SAM Regional Planning and Implementation Group (GREPECAS) Conclusion 12/55 which noted a need for a User Guide for the CAR/SAM Region.

1.2 This paper presents a draft of the User Guide that was discussed at the WAFSOPSG/3 meeting recently held in Paris, France 26-29 September 2006.

2. Discussion

2.1 For several years users of SADIS had available to them a User Guide that describe the functionality of the operations and identified the data and products that were distributed by the satellite broadcast. Over this same time period the SAIDS User Guide at the direction of the SADISOPSG has been updated and revised to reflect current operating conditions.

2.2 This same capability was lacking for users under the broadcast of the ISCS 1/2 area of responsibility. Thus, the Federal Aviation Administration (FAA) in cooperation with the National Weather Service (NWS) undertook a task to develop a User Guide that would provide similar information as in the SADIS User Guide.

2.3 A draft of the ISCS User Guide was presented at the WAFSOPSG/3 meeting and is attached as Appendix A to this paper. While the draft is not completed it is being provided at this meeting for information purposes to keep States in CAR/SAM advised of progress in developing the guide.

2.4 The User Guide consists of five chapters, five appendices, and four Annexes. Chapter 1 provides a short summary of the WAFS program how the system is managed and authorization to access ISCS. Chapter 2 describes the data provided over the broadcast that being OPMET data, grid point data, forecasts, and BUFR coded data. Also provided in Chapter 2 is how to obtain access via the public Internet for backup. Then Chapter 3 describes the basic requirements for data processing and refers users to the United Kingdom MET Office to obtain a list potential suppliers. Chapter 4 identifies points of contact in NOAA for ISCS and how to obtain assistance should the user encounter problems with their operations. Chapter 5 is a glossary of terms and acronyms.

2.5 The appendices attached to the User Guide provide a graphic of the ISCS Footprint, components of ISCS, how to obtain access via FTP, guidelines to obtained authorization to the WAFS, and guidelines on data processing.

2.6 Annexes 2 and 3 to the User Guide are still under development and are being evaluated for content. There are four Annexes planned for inclusion in the User Guide and they are as follows:

Annex	Title of Annex
Annex 1	OPMET information required from aerodromes to be included on the ISCS broadcast
Annex 2	OPMET information on the ISCS broadcast - listed in terms of aerodromes /location indicators and States
Annex 3	OPMET information on the ISCS broadcast - listed in terms of bulletin numbers and location indicators of aerodromes contained in each bulletin
Annex 4	WAFS forecasts disseminated on ISCS

4. **Action**

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

APPENDIX A

**International Satellite Communication System
(ISCS)**

June 2006

(Prepared by NWS/FAA)

International Civil Aviation Organization

DRAFT

The designations and the presentation of material in this publication do not imply the expression of any opinion whatsoever of the part of ICAO concerning the legal status of any country, territory, city or area of its authorities, or concerning the delimitation of its frontiers or boundaries.

Table of Contents

Chapter 1. Introduction to the International Satellite Communication System (ISCS)

Chapter 2. Products and data broadcast on ISCS

Chapter 3. Recommended Basic Requirements for Data Processing Systems

Chapter 4. User Support

Chapter 5. Glossary

Appendices

Appendix A	ISCS Footprint
Appendix B	Components of ISCS
Appendix C	FTP Access
Appendix D	Guidelines for Authorized Access to the World Area Forecast System (WAFS) Satellite Broadcast
Appendix E	Data Processing Systems

Annex	Title of Annex
Annex 1	OPMET information required from aerodromes to be included on the ISCS broadcast
Annex 2	OPMET information on the ISCS broadcast - listed in terms of aerodromes /location indicators and States
Annex 3	OPMET information on the ISCS broadcast - listed in terms of bulletin numbers and location indicators of aerodromes contained in each bulletin
Annex 4	WAFS forecasts disseminated on ISCS

Chapter 1

Introduction to the International Satellite Communication System

1.1 Introduction

1.1.1. The World Area Forecast System (WAFS) was established at the International Civil Aviation Organization (ICAO) Communications/Meteorology (COM/MET) Divisional Meeting (1982) held conjointly with the seventh session of the WMO Commission for Aeronautical Meteorology (CAeM) in Montreal. The objective of the system is to supply meteorological authorities and other users with forecasts of en-route meteorological conditions in digital form. This objective is achieved through a comprehensive, integrated worldwide, and, as far as is practicable, uniform system and in a cost-effective manner, taking advantage of evolving technologies.

The meteorological information provided by the Washington World Area Forecast Center (WAFc) as distributed by the International Satellite Communication System (ISCS) complies with the Standards and Recommended Practices (SARPS) of Annex 3, Meteorological Service for International Air Navigation, as defined in Chapter 3 of Part I (Core SARPs) and in Appendix 2, Technical Specifications Related to World Area Forecast System and Meteorological Offices. The information includes:

- a) upper wind;
- b) upper-air temperature;
- c) upper-air humidity;
- d) direction, speed and height of maximum wind;
- e) tropopause height and temperature; and
- f) significant weather phenomena.

To facilitate computerized processing this information is provided in standardized digital formats. Information in a) through e) is provided in the gridded binary (GRIB) code (WMO FM 92-IX Ext. GRIB). Information in f) is provided in the Binary Universal Format for Representation of meteorological data (BUFR) code (WMO FM 94-XII Ext. BUFR).

1.1.2 The foregoing products are provided globally by the two WAFcS, London and Washington by satellite broadcast as part of the ICAO Aeronautical Fixed Service (AFS). WAFS products consist of aeronautical meteorological information of an operational nature. There is therefore an obligation for ICAO to ensure that all ICAO Contracting States have access to all the WAFS data they may need through at least one component of the AFS.

1.1.3 The worldwide satellite communications are provided using four INTELSAT satellites. The United States provide three INTELSAT services for the distribution of WAFc Washington products over the Americas, Pacific and Eastern Asia, using an INTELSAT satellites based over the Atlantic, Pacific, and eastern Indian Oceans. The services provided by the United States are known as the International Satellite Communications System (ISCS).

1.1.4 The area outside of the Washington WAFc coverage is provided by the London WAFc by way of the Satellite Distribution System (SADIS). This ensures that all States are able to receive WAFS products using satellite communications from either WAFc, depending on their location. The "footprint" of the ISCS is shown in Appendix A.

1.1.5 ISCS delivers WAFS forecasts in digital format, as well as alphanumeric OPMET information required for pre-flight planning. Details about the data and products disseminated on ISCS are given in Chapter 2 of this guide.

1.2 Description of the system

1.2.1 ISCS support for WAFS is in response to ICAO and WMO requirements. ISCS and SADIS make up the worldwide WAFS program providing vital meteorological support for flight planning and air traffic management throughout the world. The purpose of ISCS/SADIS 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.

1.2.2 ISCS provides a point to multi-point service on a 24-hour basis via satellite (see Appendix B). ISCS uplinks are situated at the three Gateways in Andover, Maine; Yacolt, Washington; and Fuchsstadt, Germany. WAFS data is provided from Washington WAFS Center in the United States and are uplinked from the hubs at Andover, ME to the INTELSAT satellite 903 located over the Atlantic Ocean and Yacolt, Washington for utilization of the INTELSAT 701, and Fuchsstadt, Germany for utilization of the INTELSAT 906 over the Pacific Ocean.

1.2.3 The data is delivered to the end user using Transmission Control Protocol/Internet Protocol (TCP/IP). A computer processing system (workstation or mini-computer) must be connected to the communications port of the network interface device. This computer system is selectable by the user, but the interface of the selected computer must be prepared to utilize Hughes Network Systems= Program Director (PD) Receiver software to enable reception of IP multicast data stream. The system can be a stand alone workstation as the third component of the ISCS. This component receives the data stream and stores the data for retrieval and use. Authorized users of the WAFS may select any workstation from available commercial vendors who have met the functional requirements for an ISCS (WAFS) workstation. A list of vendors with WAFS ready computer systems can be obtained at <http://www.met-office.gov.uk/sadis/about/manufacturers.html>.

1.2.4 In addition to the satellite service, approved ISCS users can access all of WAFS data using FTP over the public Internet (see Appendix C).

1.3 Management of ISCS

1.3.1 The Federal Aviation Administration (FAA), as the U.S. Meteorological Authority, identifies the requirements for the products and services for the Washington WAFS and ensures the operation of ISCS. The National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) is the provider of the WAFS products, and has responsibility for the management and operation of the ISCS. The FAA has an Interagency Agreement with NOAA which describes the administrative functionality and roles and responsibilities of the FAA and NOAA/NWS.

1.4 Authorized access to ISCS

1.4.1 It is incumbent upon user States to arrange access to the satellite broadcasts for the reception of WAFS digital products and OPMET data, and to arrange for their national distribution, in line with the provisions of Annex 3, Section 2.1. In order for the authorities in the individual States to retain control over the national distribution it is necessary to identify those users who are authorized to receive the ISCS broadcast directly. Authorized users are defined in the Air Navigation Plans, Volume II, Facilities and Services Implementation Document.

1.4.2 Access to the ISCS broadcast will be based upon advice by the meteorological authority of the respective State as defined in Annex 3, Chapter 1, and Chapter 2, paragraph 2.1.4 and will be communicated to ICAO for inclusion in the ANP/FASID. The U.S. NWS is authorized by the FAA to manage the authorization of users to ISCS. States and the location of the WAFS Workstations under the ISCS area of responsibility are provided in Appendix D.

1.5.1 The United States bears all costs associated with ISCS broadcast from collection of data to the modem which connects the receiver to the workstation. Access to the ISCS broadcast is free based on the user's purchase of a VSAT antenna, downlink, and registration with the NWS/WMO-ICAO representative.

Chapter 2

Products and Data Broadcast in ISCS

2.1 Overview of products and data broadcast on ISCS

2.1.1 Information provided on the WAFS broadcasts is defined in ICAO Annex 3, Meteorological Service for International Air Navigation, Chapter 3. This information is divided into four formats:

- a. Grid point information in gridded binary (GRIB) format;
- b. Significant Weather (SIGWX) information in T4 format;
- c. SIGWX information in BUFR format; and
- d. OPMET information in character-oriented format.

2.1.2 The required areas, flight levels, and forecast times are established by Regional Air Navigation agreements, and listed in the applicable regional ICAO Air Navigation Plan.

2.2 Grid Point Data

2.2.1 Grid point data is prepared by WAFS Washington and coded in the WAFS thinned GRIB format (See the Manual on Codes, WMO Pub. No. 306, Volumes I.1 and I.2.). Users receiving this data must have a data processing system which can read, decode, and manipulate data for the user's specific purpose.

2.2.2 WAFS products prepared in GRIB format are transmitted as a series of bulletins. Each bulletin contains a grid point field of one parameter at a single level, as a continuous bit stream sequence of bytes within a communications envelope. Part I - Technical description of the document titled "Gridded Binary (GRIB Code) Data on a "Thinned" Grid, from WAFS London and Washington," describes the precise details of the data format.

2.2.3 WAFS thinned GRIB are on a global horizontal grid 1.25° latitude x 1.25° longitude (approximately 140 kilometers). The globe is divided into eight segments, four each in the Northern and Southern Hemispheres. Each segment is 90° in length, starting either side of the 30° W meridian, covering the Equator to each Pole. Decoding software available from WAFS Washington enables the information to be interpolated and presented on a regular latitude/longitude grid.

2.2.4 Gridded forecasts are prepared four times daily, valid at 6, 12, 18, 24, 30 and 36 hours after synoptic data time (0000, 0600, 1200, and 1800 UTC). Forecasts are made available for transmission as soon as technically feasible, but no later than six (6) hours after the standard time of observation.

2.2.5 Grid point forecasts prepared by WAFS Washington are shown in Table 1.

Table 1: ISCS Gridded Products

	AMSL	Surface	1000	850	700	600	500	400	300	275	250	225	200	150	100	070	Trop	Max Wnd
upper U-component wind			x	x	x		x	x	x		x		x	x	x	x		
upper V-component wind			x	x	x		x	x	x		x		x	x	x	x		
upper temperature			x	x	x		x	x	x		x		x	x	x	x		
upper relative humidity			x	x	x		x	x	x									
altitude of upper levels			x	x	x		x	x	x		x		x	x	x	x		
tropopause altitude																	x	
tropopause temperature																	x	
trop U-component																	x	
trop V-component																	x	
U-component max wind																		x
V-component max wind																		x
altitude of max wind																		x
temperature at max wind																		x
surface temperature		x																
surface U-component wind		x																
surface V-component wind		x																
surface pressure		x																
surface relative humidity	x																	
mean sea level pressure	x																	
Total precipitation		x																
Convective precipitation		x																
Total grids = 66																		

2.3 Significant Weather T4 Charts

2.3.1 SIGWX forecasts supplied in T4 facsimile form are issued four (4) times daily, and are valid at 0000, 0600, 1200, and 1800 UTC for the areas of coverage shown in Appendix A. The transmission of each forecast is completed as soon as technically feasible but at least 12 hours before its valid time. The SIGWX forecasts include, as appropriate to flight:

- a. thunderstorms
- b. tropical cyclones
- c. moderate or severe turbulence (in cloud or clear air)
- d. moderate or severe icing
- e. widespread sandstorm/dust storm
- f. for FL100 to FL250, clouds associated with a. to e.
- g. above FL250, cumulonimbus cloud associated with a. to f.
- h. surface position of well-defined convergence zones
- i. surface positions, speed and direction of movement of frontal systems when associated with significant enroute weather
- j. tropopause heights
- k. jetstreams
- l. information on volcanic eruption locations producing ash clouds of significance to aircraft operations, including those producing only steam. This is depicted with a volcanic eruption symbol at the volcano's location, and at the side of the chart, the volcanic eruption symbol, the name of the volcano, latitude/longitude, the date and time of first eruption, if known, and a reminder users should check the latest Significant Meteorological Advisories (SIGMET) and Notices to Airmen (NOTAM) or Notices to Airmen for Volcanic Ash (ASHTAM) issued for the area concerned
- m. information on location of an accidental release of radioactive materials into the atmosphere, of significance to aircraft operations, comprising the radioactivity symbol at the accident's site, and at the side of the chart, the radioactivity symbol, latitude/longitude of the site of the accident, date and time of the accident and a reminder users should check the latest NOTAM for the area concerned

2.3.2 The dissemination of SIGWX T4 information is expected to cease after 30 November 2006.

2.4 Significant Weather BUFR Files

2.4.1 SIGWX forecasts are issued using BUFR code form follow the specifications included in WMO Publication No. 306, Manual on Codes, Volume I.2, Part B – Binary Codes. Forecasts of SIGWX prepared by WAFC Washington are issued four times daily, valid at 0000, 0600, 1200, and 1800 UTC. The transmission of each forecast will be completed as soon as technically feasible but at least 12 hours before its valid time. Forecasts of SIGWX include all the items listed in paragraph 2.3.1 above, and include global information between FL250 and FL630 (SWH), and limited geographical areas listed in the applicable regional ICAO Air Navigation Plan between FL100 and FL250 (SWM).

2.4.2 BUFR is a standard binary format approved by the WMO for efficient storage of meteorological features. To produce a BUFR file, two elements are needed: a raw data file and a set of tables containing descriptors. When raw data is encoded, each data value is attached to a descriptor defining what the data represents. The decoding process reads the BUFR file, looks up the descriptor in the relevant table, and writes out the information in the proper format. Binary BUFR files contain a set of tables with descriptors. Descriptors must be decoded from a set of common tables on the local machine in order to understand what the values represent. To this end, BUFR messages are very small and machine independent. They can be understood and decoded by any BUFR decoder having the latest tables available.

2.4.3 SIGWX data in BUFR format is independent of the background or projection. Only the information describing the feature is encoded. For example, a CLOUD area is a list of points with the height of bases and tops, and cloud type and amount attributes attached. There are no rules on how the cloud area should be drawn, or how the attributes are displayed. On SIGWX charts this is shown as a box, sometimes with an arrow to the area, but this information is determined by the graphical display program.

2.4.4 BUFR does not provide information on how to visually represent data. However, ICAO Annex 3 includes guidance on how meteorological features should be depicted on charts. SIGWX BUFR messages prepared by AWC use the following WMO headers:

Elements in BUFR Message	WMO HEADER
SWH Jetstreams	JUWE96 KKCI
SWH Clear Air Turbulence	JUCE00 KKCI
SWH Cumulonimbus	JUBE99 KKCI
SWH Tropopause height	JUTE97 KKCI
SWH Surface Fronts	JUFE00 KKCI
SWH/SWM Tropical Storms, Sandstorms and Volcanoes	JUVE00 KKCI
SWM Tropopause height	JUOE00 KKCI
SWM Jetstreams	JUTE00 KKCI
SWM Surface Fronts	JUJE00 KKCI
SWM cloud, in-cloud icing and turbulence	JUNE00 KKCI
SWM Clear Air Turbulence	JUME00 KKCI

2.5 **Operational Meteorological (OPMET) Information in Character-Oriented Format.**

2.5.1 OPMET information includes Routine Aviation Weather Reports (METAR), Special Routine Aviation Weather Reports (SPECI), Terminal Aerodrome Forecasts (TAF), Significant Meteorological Information (SIGMET) and special Air-reports (AIREPs). Volcanic Ash Advisory (VAA) and Tropical Cyclone Advisory (TCA) messages will also be included on the broadcast.

2.6 **Backup**

2.6.1 In case of interruption of WAFC operations, its functions will be carried out by the London WAFC. This includes any or all of the WAFS services as needed. WAFC London and WAFC Washington have studied a number of potential service interruption and outage scenarios, and agreed upon the appropriate responses to each interruption in service. Approved ISCS users can access the SADIS FTP as follows:

<http://www.icao.int/ANB/SADISOPSG/status%20of%20implementation.pdf>

Any user not authorized to access the ISCS broadcast will need to receive authority from their State Meteorological Authority before access is provided.

2.6.1 Customer Login Process

2.6.1.1 Individual customer accounts will be established on the server. These will be accessed via a unique set of login information: a username, and a password. The Met Office will provide this information to each user on an individual basis when requested.

2.6.1.1 Workstation software needs to be constructed in such a way as to automate the login process. The software needs to be able to store the customer's login details and send these directly to the server when required. FTP sessions need to be established by the user. The service does not provide a "push" facility, i.e. the user has to collect ("pull") data by initiating FTP sessions rather than expected rather to be sent automatically.

General login information for the service:

IP Address: 151.170.240.63
Server name: sadis.metoffice.gov.uk
Domain name: metoffice.gov.uk
FTP address: ftp sadis
Access via web browser:
ftp://[username]:[password]@sadis.metoffice.gov.uk

Chapter 3

Recommended Basic Requirements for Data Processing Systems

3.1 General requirements

3.1.1 To receive ISCS, users need a Prodelin Series 1251 satellite antenna and a Comtech satellite modem. Users are then free to choose their own processing and display systems to connect to the VSAT according to their own individual requirements.

3.1.2 Users should investigate whether or not their own message switch and/or computer system is ISCS compatible. Users are also advised to check that any display system which they may consider purchasing is capable of generating products which comply with the formats and specifications laid down in Annex 3, including the generation of products from GRIB- and BUFR coded bulletins. It is recommended that users consult with a number of different suppliers prior to being committed to expenditure.

3.1.3 Users should check specific system configurations with individual suppliers.

3.1.4 A set of recommended basic requirements for VSAT data processing systems is given in Appendix E.

3.1.5 Data processing systems for processing these data must ensure the integrity of the information and be compatible with the ISCS delivery of data. This data will be presented to the end system as TCP/IP. For flight safety reasons it is essential that any data outside of their validity period are not retained on the system and displayed for operational use. However, the system should ensure that data received via ISCS are stored and displayed for a user on request during their validity period, or until they are amended by a subsequent updated version.

3.1.6 The data stored on the system should be made available to a user by visual reference on a screen display, and printed for permanent reference, e.g. as flight documentation. All products either displayed or printed should include a clear reference to the date and time of access and the validity times of the data. Systems should be programmed to avoid data from a previous day being incorrectly used. It should be noted that there is an obligation for States to retain flight documentation for at least 30 days, in case of an inquiry (Annex 3, 9.4.6). This storage requirement should be considered by users when making their choice of end-user system

3.1.7 A number of the display packages enable users to manipulate the information presented to the workstation in BUFR format. This may be a useful feature for users who wish to use their workstation for the production of national products. However it is important that users appreciate that any modification to the meteorological content of information transmitted via ISCS invalidates that information as being a WAFS product. In such a case the product becomes a national product. It is imperative that such a change is clearly reflected in the legend that would be assigned to the product.

3.2 Sources of information regarding potential suppliers of equipment to process/display products and data broadcast on ISCS

3.2.1 A list in alphabetical order of potential suppliers is available on request from:

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

Current contact information is available at <http://www.weather.gov/iscs/>

4.1 Technical support by WAFC Washington

End users of ISCS equipment may obtain technical support directly from WAFC Washington. The staff will assist in any way possible to resolve problems experienced by users if the fault lies within ISCS. They may of course find that the fault lies within the user's own receiving equipment downstream of the VSAT.

4.2 24-hour helpline/faults desk

ISCS/NWS 24-hour Network Operations Technical Control Center

Tel.: + 00 (1) 301-713-0902

Fax: + 00 (1) 301-587-1773

E-mail: toc.nwstg@noaa.gov

Problems with VSAT or Satellite modem:

Visit <http://www.weather.gov/iscs/phonelist.htm> for a phone listing by country.

or

Tel.: +00 (1) 919-677-5948

General contact facilities during routine office hours East Coast Time

Address:

US Dept of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
1325 East West Highway
Silver Spring, MD 20910

Program Leader

Patrick Gillis NWS/ISCS +00(1) 301-713-1743 x 104 patrick.gillis@noaa.gov

Satellite Systems Program Manager

Robert Gillespie NWS +00(1) 301-713-9478 x 140 robert.gillespie@noaa.gov

Chief, International Activities Office

Robert O. Masters +00(1) 301-713-0645 x 101 robert.masters@noaa.gov

Program Analyst, International Activities Office

Jennifer S. Lewis +00(1) 301-7130645 x 109 jennifer.lewis@noaa.gov

NWS International Aviation Weather Services Program Manager

Michael Mercer +00(1) 301-713-1726 x 153 michael.mercer@noaa.gov

4.4 System development contact facilities

4.4.1 Sample data for each of the products available via ISCS can be provided by WAFC Washington for individual system development and trials. Requests to access the test database should be directed to the WAFC ISCS Data and Products Manager.

4.4.2 WAFC Washington can also provide advice and guidance on GRIB and BUFR encoded data and applications.

4.5 Information on ISCS

4.5.1 The purpose of this ISCS User Guide is to give an overview of the system and provide helpful information to potential users. It is intended to complement the technical manuals which will accompany the individual VSAT and workstation equipment. The ISCS User Guide is also available on the NWS website at:

http://www.weather.gov/iscs/user_guide

4.6 Assistance to implementation

4.6.1 Assistance on installation is provided by Verizon/MCI.

4.7 How To Register Your Site

4.7.1 In order for your site to be aware of and be considered for any possible changes to ISCS, please send the contact information for your site to the ISCS Program Manager. The contact information should include the following:

1. Primary and Secondary Point of Contact for your site
2. E-mail address, Telephone and FAX numbers of point of contact
3. E-mail address, Telephone and FAX numbers for Operations Center of your site
4. Days and Hours of operation for your site
5. Postal and street address for your site
6. Your INTERNET web page address should your site/organization have one

4.8 ISCS back-up procedures

4.8.1 In the unlikely event of a failure of ISCS broadcast, the Internet is used as a back-up to ISCS. All the authorized ISCS users can access all of the operational WAFS data using FTP over the Internet. Users wishing to access this backup service should contact WAFC Washington to initiate account setup.

- A15 -

Appendix A

ISCS Footprint

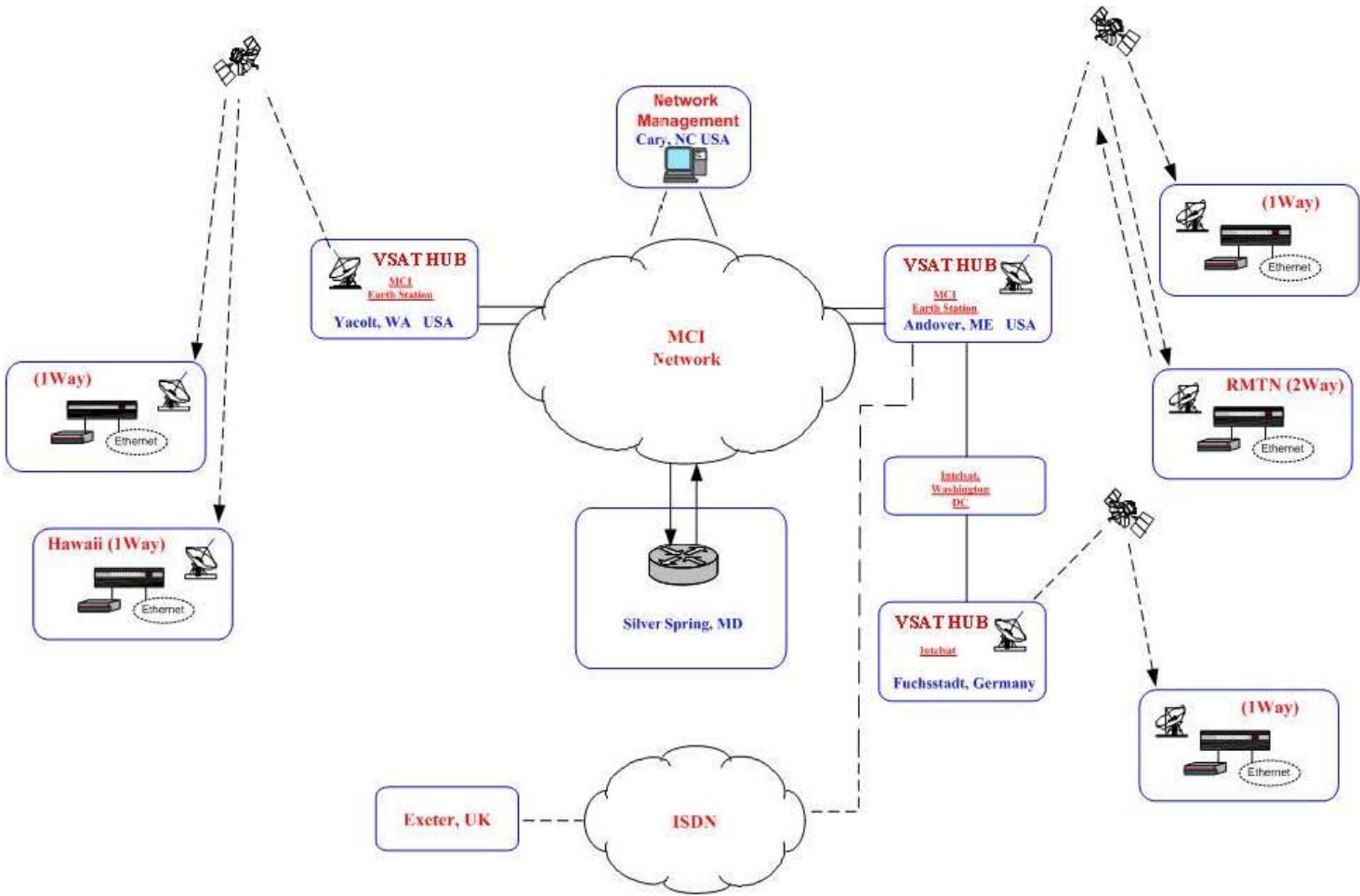
See attached file "footprint"

DRAFT

Appendix B

Components of ISCS

International Satellite Communications System (ISCS)



- A17 -

Appendix C

FTP Access

Please see attached file “FTP Access”

DRAFT

Appendix D

Guidelines for Authorized Access to the World Area
Forecast System (WAFS) Satellite Broadcast

Note — Noted by the ICAO Council on 5 July 1995 (145/24)

1. General

1.1 The satellite broadcast constitutes a sub-system of the ICAO aeronautical fixed service (AFS) providing an international point-to-multipoint telecommunication service via satellite for the dissemination of aeronautical information to ICAO Contracting States.

1.2 The aeronautical information disseminated by the satellite broadcast includes primarily operational meteorological (OPMET) information consisting of the WAFS upper wind and temperature and significant weather forecasts in binary and facsimile formats, and alphanumeric messages.

1.3 Through the use of the satellite broadcast, Contracting States may wish to meet their obligation under Article 28 of the Convention on International Civil Aviation regarding the supply to users of meteorological information for the provision of meteorological service for international air navigation.

2. Authorized access to the satellite broadcast

2.1 It is the prerogative of each Contracting State to determine the distribution of the OPMET information to users, in the State concerned, as well as means, links and information flow to be used for this purpose. In view of this, it is for each Contracting State to determine the users in the State concerned to be provided with the authorized access to the satellite broadcast.

2.2 Where the meteorological service for international air navigation is provided by or through arrangements made by the Meteorological Authority in compliance with the standard contained in 2.1.4 of Annex 3 - *Meteorological Service for International Air Navigation* to the Convention on International Civil Aviation, the Meteorological Authorities, World Area Forecast Centers, Regional Area Forecast Centers and aerodrome and other meteorological offices should fully enjoy the benefits of the satellite broadcast to receive the OPMET information broadcast. Furthermore, it is at the discretion of each Contracting State to determine, on advice from its Meteorological Authority, whether any of the following users will be provided with authorized access to the satellite broadcast: operators; air traffic services units; search and rescue services units; aeronautical information services units; volcanic ash and tropical cyclone advisory centers; and other aeronautical users.

2.3 Each Contracting State will notify ICAO and, for the purpose of efficiency, also the provider State for the satellite broadcast concerned, regarding the users in that State it has authorized to access the satellite broadcast.

Note.- Where the satellite broadcast also comprises a sub-system of the World Meteorological Organization Global Telecommunication System (WMO GTS), in accordance with the action by Council on Recommendation 4.2/5 - Relationship of satellite communication system to the WMO's GTS, of the communications/Meteorology Divisional Meeting (1982), the WMO Member State concerned determines the users authorized to receive basic synoptic data and analyses via the satellite broadcast and notifies ICAO through WMO, accordingly.

Appendix E

Data Processing Systems

1. Recommended basic requirements for data processing systems

The system should :

- a. interface with IP protocols (UDP multicast and FTP);
- b. have ample capacity to receive the data required by the user (facsimile charts, GRIB coded data, alphanumeric information);
- c. have sufficient speed to display and process data in near real time;
- d. NOT be capable of displaying or printing time expired data or charts;
- e. be user friendly for documentation in an ATC/FBU environment;
- f. be PASSWORD protected for ATC/FBU;
- g. ensure that products are displayed in ICAO Annex 3 compliant formats; and
- h. ensure that if any modifications to the meteorological content of transmitted information takes place it is with the clear understanding that the product ceases to be a WAFS product, and this is automatically reflected in any associated chart legends.

2. Specific requirements for digital grid point (GRIB) data and digitally coded SIGWX data

The system should:

- a. display wind and temperature information generated from the GRIB data, and SIGWX information from the BUFR data on a map background in the appropriate ICAO Annex 3 format;
- b. select the map area for a selected route;
- c. be able to zoom in on a selected area;
- d. display all the grid point data along a route;
- e. print the screen display;
- f. display valid data with the correct date and time group at all times;
- g. sure that the standard ICAO areas are available on the system as map area defaults;
- h. able to produce wind and temperature charts from GRIB data, and SIGWX charts from BUFR that are largely identical to the equivalent T4/BUFR products;
- i. be able to produce charts that span the international date line, and cover all of the standard ICAO areas; and
- j. have the capability to automatically generate ICAO Annex 3 compliant charts from the GRIB and BUFR code forms.

3. Specific requirements for coded digital (T4) facsimile charts and BUFR charts

The system should:

- a. display WAFS upper-air and SIGWX chart;
- b. display charts with the correct orientation and map projection;
- c. be able to zoom into part of a chart if required with a valid date and time displayed at all times; and
- d. print whole charts on A4 paper.

4. Specific requirements for OPMET information in alphanumeric format

The system should:

- a. display all OPMET information in alphanumeric format (METARs - SA, TAFs - FC, FT and SIGMETs - WS, WV, WC and special AIREPs – UA, tropical cyclone and volcanic ash advisories — FK, FV, and GAMETs – Fas and AIRMETs - WAs).

- b. display only valid OPMET information by FIR, bulletin, country or route;
- c. include an option to select all data;
- d. be able to build a user's own route list which can be saved for future use;
- e. display SIGMETs at all times and in particular when linked by requests for TAF and METAR information by FIR, country or selected route; and
- f. print out OPMET information.

5. General information and advice when implementing a data processing system

- a. establish how the hardware will be supported in your country;
- b. determine hardware reliability and the mean time between failures and what parts are likely to fail;
- c. determine if the supplier holds spares and how many other systems have been sold in your country;
- d. identify the cost of spares and turn-round time in getting new spares;
- e. does the hardware carry sufficient extended warranty. Is it worth the extra cost?
- f. does the supplier provide a 'hot-line' for customer support, what is its availability, is it in your own language?
- g. identify the cost of additional copies of the application software and operating software;
- h. prepare information on the required layout of where the VSAT and the data processor are to be installed;
- i. determine whether or not remote systems are required and the cost of terrestrial circuits;
- j. identify, as much as possible, the volume of data and the type of products that are required to be processed - through WAFC Washington - and ensure that your system will be able to cope and meet future requirements cheaply and effectively;
- k. identify the cost of software upgrades and enhancements that will be required when the WAFS product suite changes; and
- l. review the ICAO hardware and software procurement guidelines available from the SADIS website at www.metoffice.gov.uk/sadis/news/software_procure_guide.html.

Annexes

Annex	Title of Annex
Annex 1	OPMET information required from aerodromes to be included on the ISCS broadcast
Annex 2	OPMET information on the ISCS broadcast - listed in terms of aerodromes /location indicators and States
Annex 3	OPMET information on the ISCS broadcast - listed in terms of bulletin numbers and location indicators of aerodromes contained in each bulletin
Annex 4	WAFS forecasts disseminated on ISCS

DRAFT

OPMET information required from aerodromes to be included on the ISCS

Currently Under Development

DRAFT

OPMET information on the ISCS broadcast - listed in terms of aerodromes /location indicators and States

Currently Under Development

DRAFT

OPMET information on the ISCS broadcast - listed in terms of bulletin numbers and location indicators of aerodromes contained in each bulletin

Currently Under Development

DRAFT

- A25 -

Annex 4

WAFS forecasts disseminated on ISCS

Currently Under Development

DRAFT

— END —

DRAFT