SECURE AVIATION DATA INFORMATION SERVICE (SADIS) USER GUIDE

Part 2 – Technical

To be read in conjunction with Part 1 – General and Administrative

Note, this Technical Section will be subject to more frequent updates than Part 1 – General and Administrative

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Prepared by the ICAO Meteorological Panel Meteorological Operations Working Group (WG MOG)

Contents:

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS				CORRIGENDA		
No.	Date	Pages affected		No.	Date	Pages affected
	7/7/2016	Original issue				
2.0		Minor editorials. Reference to trial 'low level area forecasts in graphical format'. Generic email address 'sadismanager@metoffice.gov.uk introduced.				
2.1	24/4/2018	Addition of Space Weather OPMET data (from Nov 2018), and minor adjustments to formatting.				
2.2	11/04/2019	Update to bandwidth description and low level area forecast graphics section. Addition of tropical cyclone directory, and updating of hyperlinks. Page numbering and index updated				
2.3	05/11/2020	Addition of IWXXM format OPMET information and 0.25 degree gridded hazard data (from Nov 2020). Update to IP addresses used by SADIS, and update to contact phone numbers				
2.3a	01/12/2020	Update to IWXXM format OPMET instructions (6.8.1, 6.9.1 and 6.10.1)				
2.4	20/04/2021	Addition of missing IWXXM information and removal of redundant appendix				

In the event of any operational issues relating to the SADIS FTP service, then please contact the 24/7 Service Desk, details below:

By phone from the UK	Tel: 0370 900 0100
By phone from outside the UK	Tel: +44 330 135 4444
By Email	servicedesk@metoffice.gov.uk

Please also copy the SADIS Manager (SADISmanager@metoffice.gov.uk) in to any emails.

1. INTRODUCTION

1.1. The Secure Aviation Data Information Service (SADIS) FTP[1] provides WAFS and OPMET data to users making use of Digital Signing and Certification processes. Users obtaining WAFS and OPMET data via the SADIS FTP can be secure in the knowledge that the data has been provided by the SADIS Provider, and that it has not been tampered with or otherwise corrupted *en route* to the users' Workstation (or in-house software if appropriate).

1.2. The SADIS FTP is a 'pull' or 'collect' service, in that the user must gain access to the servers by using username and password, and then requesting ('pulling') the necessary data from the system. This allows flexibility in that the user only needs to download the data that they need, and also allows re-polls should data not be immediately available.

1.3. It is important to note that the SADIS FTP uses a normal 'FTP' connection, and not 'SFTP' or 'FTPS' connection protocols. Although a normal FTP connection is used, users should verify and confirm the authenticity of the data received from the SADIS Provider's servers by interrogating the corresponding digital signatures that will be made available for each file, and the Digital Certificate that is available on the server.

2. USER ACCESS

2.1. Access to SADIS FTP is dependent upon the direction given in the Regional Air Navigation Plans (RANPs), and subsequent authorisation from the Meteorological Authority (as specified in ICAO Annex 3 – *Meteorological Service for International Aviation*[2], chapter 2.1.4). Access to the SADIS FTP will be granted for backup/contingency purposes only for those users who are directed by RANPs to take their WAFS data from WIFS. Appendix A of the SADIS User Guide Part 1 – *General and Administrative* gives detailed guidance on the process.

2.2. Generally, users' access the SADIS FTP via a third party 'Workstation' specifically designed and capable of processing WAFS and OPMET data delivered via the service. A list of third party vendors that provide SADIS FTP capable workstations is available from https://www.metoffice.gov.uk/services/transport/aviation/regulated/sadis/software/suppliers. Potential Workstation suppliers should be contacted by users to determine the compatibility of their workstations with the SADIS FTP, particularly with upgrades to existing systems. Advice for Workstation Providers on the implementation of the SADIS FTP compatible processes is given in Appendix A of this document.

2.3. It may be that a user, or their organisation, wishes to develop bespoke software to download and extract WAFS and OPMET data via the SADIS FTP. This is of course permitted, but the general principles as given in Appendix A still hold and should be followed.

2.4. Regardless of whether the user employs third party workstations or bespoke software, they must register with the SADIS Provider in order to obtain a SADIS FTP account, and be provided with a username and password. To register for the SADIS FTP, an application must be made to the SADIS Manager.

[1] Following the withdrawal of the satellite component of the SADIS service, the original definition of the acronym became a misnomer. Accordingly, with effect 1 August 2016, 'SADIS' was re-defined to mean 'Secure Aviation Data Information Service'. As a consequence, and since 'Secure' is part of the updated acronym, 'Secure SADIS FTP' will become simply 'SADIS FTP', effective 1 August 2016.

[2] 'ICAO Annex 3' hereafter

2.5. The contact details for registering for the SADIS FTP are:

SADIS Manager
Met Office
Fitzroy Road, Exeter, Devon
EX1 3PB, United Kingdom

Tel: +44(0) 330 135 1370

E-mail: SADISmanager@metoffice.gov.uk

3. GENERAL SERVICE INFORMATION

3.1. The SADIS FTP is a real-time data library. The service does not, and is not intended to visualise or process data. Visualisation/processing of products/data extracted from the service will require additional software (GRIB decoders, BUFR decoders etc). A list of known commercial suppliers of such software is available from the SADIS Website (https://www.metoffice.gov.uk/services/transport/aviation/regulated/sadis/software/suppliers).

3.2. Data formats on the SADIS FTP are of the following types, namely

- Alphanumeric format: METAR, SPECI, TAF, SIGMET, AIRMET, GAMET, Special AIREP, Volcanic Ash Advisory, Tropical Cyclone Advisory, Space Weather Advisory.
- IWXXM[3] format: METAR, SPECI, TAF, SIGMET, AIRMET, Volcanic Ash Advisory, Tropical Cyclone Advisory, Space Weather Advisory.
- BUFR[4] encoded high level SIGWX information
- GRIB2 (GRIB[5] edition 2) encoded wind, temperature, geopotential height, humidity, turbulence, icing and cumulonimbus information;
- PNG[6] format: WAFS SIGWX charts, Volcanic Ash Advisory graphics, tropical cyclone advisory graphics, low level area forecasts

3.3. Users should note that activity on SADIS FTP is monitored and records of logins and downloaded data are retained. Inappropriate access activity or actions that may cause disruption to the service or to other users may result in accounts being suspended or cancelled. In order to protect the system and other users, under such circumstances such action may be taken without notice.

3.4. In November 2019 SADIS was migrated to use cloud computing infrastructure., which permits data to be downloaded at up to 3Gbps. The communications links over the internet between the user and the cloud hosted SADIS servers is outside of the control of the SADIS Provider.

3.5. For security reasons, only FTP *read* permission is granted.

[3] ICAO Information Exchange Model
[4] Binary Universal Form for the Representation of meteorological data, BUFR; FM 94 BUFR
[5] GRIB – Gridded Binary, WMO code FM 92 -IX Ext
[6] PNG – Portable Network Graphics

4. USER LOGIN PROCESS

4.1. Individual customer accounts will be established on the server. These are accessed via unique login credentials: a username and a password. The SADIS Provider will provide this information to each user on an individual basis when requested and after necessary checks to confirm that access to SADIS data is authorised.

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

> *Important Note – Multiple log-in requests should be avoided. It is only necessary to log in once to establish a connection for subsequent multiple downloads. Clearly, if a connection is lost then the software should re-establish the connection and log-in again. There should be no need to send a log-in request when a connection is already established prior to requesting a download. Multiple attempts to log-in may, at worst, be detected as an attempted denial of service attack on the service; and since there is a set limit of concurrent users with the same credentials may well actually degrade the end user's experience of the service.*

4.3. General login information for the service:

Host name	sadisftp.metoffice.gov.uk
Domain name	metoffice.gov.uk
Access via web browser	ftp://[username]:[password]@sadisftp.metoffice.gov.uk

4.4. SADIS is set up to use four different IP addresses – two of which will be in use at any one time. Therefore it is advised that "DNS Lookup" is used for sadisftp.metoffice.gov.uk, or that the following four IP addresses are permitted by the end user's firewall

IP Addresses	3.10.146.140
	3.10.184.136
	3.8.255.138
	35.177.24.136.

The Workstation supplier's instruction manual should be consulted for the precise method of connection to and logging in to the SADIS FTP.

5. EXPLANATION OF DIRECTORY STRUCTURE AND FILENAME FORMATS

5.1. The directory structure requires special mention in order to explain the methodology in the provision of the Digital Signatures. Within each folder a Digital Signature corresponding to each data file is provided. This Digital Signature file has the identical name of its equivalent data file except that it is appended with '.SIG'.

For example, in the directory: /SIGWX_PNG/SWH_PNG/AREA_B/ the files below might be indicated.

```
10/25/2010 06:50AM         68,020 PGSE05_EGRR_0000.PNG
10/25/2010 06:50AM            128 PGSE05_EGRR_0000.PNG.SIG
10/25/2010 12:50PM         66,006 PGSE05_EGRR_0600.PNG
10/25/2010 12:50PM            128 PGSE05_EGRR_0600.PNG.SIG
10/25/2010 06:45PM         69,680 PGSE05_EGRR_1200.PNG
10/25/2010 06:45PM            128 PGSE05_EGRR_1200.PNG.SIG
```

Each of the above files that does not have the .SIG suffix is a source data-file, whereas the corresponding Digital Signature has an identical name, appended with .SIG.

5.2. So, to verify the SIGWX PNG file for area 'B' valid at 0600 UTC (issued by WAFC London) the system should extract PGSE05_EGRR_0600.PNG from path /SIGWX_PNG/SWH_PNG/AREA_B. This process simply extracts the raw data. The verification is performed by the user's system also extracting the second file PGCE05_EGRR_0600.PNG.SIG, from the same folder and processing the two files. The second file is the Digital Signature. The Digital Signature file should be verified against the data file to ensure integrity and originator. This is expected to be done transparently to the user by the Workstation software as explained in Appendix A. Appendix C indicates how such verification can be performed on data downloaded during an Internet browser ftp session, but it is emphasised that *the service is not intended* for use via Internet browser ftp sessions.

5.3. It is the responsibility of those users who develop bespoke software to access the SADIS FTP to implement equivalent routines to confirm the integrity and authenticity of the data.

5.4. In addition to the functional aspects of the folder and filename structure, the following conventions are used:

- All folder names and filenames are in upper case.
- Spaces are not used in folder names or filenames, but are replaced by the underscore ('_') character if it is felt that a separator to enhance human readability is necessary.
- All Digital Signature filenames are appended '.SIG', but otherwise have identical names to their corresponding data files.

5.5. The separation of the incoming data into a range of folders allows different strategies to be employed by Workstation providers in order to access data (or re-poll) data in a number of different ways. Strategies can be developed that whilst enabling real-time updates of data on the SADIS FTP also allow alternative paths to extract data that might have been missed due to temporary local loss of data connection. For instance, if a number of OPMET_LAST_5MINS files

have been missed due to a local failure of power or internet connection, the system can be designed to interrogate the `OPMET_SET_OF_5MIN_FILES`, `OPMET_LAST_HOUR` or `ALL` folders/files as necessary to quickly populate the database for possible missing data. Similarly, it may be more efficient after a connection failure to only attempt to download the most recent set of BUFR or GRIB2 data as opposed to all historical files.

5.6. All files with the exception of IWXXM format data on the SADIS FTP follow the WMO FTP 00 standard.

All concatenated files follow this format:

```
^C Message Length
Bulletin Number
Bulletin Header
Actual Data
```

Explicitly this means that, *with the exception of the very first line in a concatenated file*, the first line of each concatenation begins with a ^C character.

The example below contains the very first three concatenated files from an OPMET file. (Note, blue text is explanatory and not actually part of the data)

```
0000053600^A^M^M [There is no ^C character, but the digits give the message length]
387^M^M [This is the bulletin number]
SAFR41 LFPW 181300^M^M [This is the standard WMO bulletin header (AHL)]
LFBG 181300Z 17004KT CAVOK 08/02 Q1024=^M^M
LFBI 181300Z 20005KT 9999 SCT040 BKN050 07/04 Q1023 NOSIG=^M^M
LFBL 181300Z 13003KT 9999 SCT016 BKN043 05/02 Q1023 NOSIG=^M^M
LFKC 181300Z 33006KT 9999 FEW036 12/03 Q1020 NOSIG=^M^M
LFKF 181300Z 25013KT 230V300 9999 SCT037 13/04 Q1020 NOSIG=^M^M
LFLB 181300Z 35002KT 8000 FEW026 04/M02 Q1024 NOSIG=^M^M
LFLD 181300Z 23005KT 3500 BR BKN004 05/05 Q1023=^M^M
LFLV 181300Z 17005KT 130V210 9999 OVC026 05/00 Q1023=^M^M
LFTH 181300Z 12004KT 080V170 9999 FEW030 13/05 Q1020 NOSIG=^M^M
^C0000029700^A^M^M [^C character, followed by the message length]
388^M^M [This is the bulletin number]
SABN31 OBBI 181300^M^M [This is the standard WMO bulletin header (AHL)]
OBBI 181300Z 33022KT 9999 FEW025 17/10 Q1020 NOSIG= ^M^M
OEDF 181300Z 32016KT CAVOK 17/M04 Q1020 NOSIG= ^M^M
OEDR 181300Z 30012KT CAVOK 16/05 Q1019 NOSIG=^M^M
OTBD 181300Z 32014KT 260V360 9999 FEW025 18/09 Q1019 NOSIG=^M^M
OKBK 181300Z 32014KT CAVOK 17/00 Q1022 NOSIG=^M^M
^C0000013500^A^M^M [^C character, followed by the message length]
389^M^M [This is the bulletin number]
SACN31 CWAO 181300^M^M [This is the standard WMO bulletin header (AHL)]
METAR CYJT 181300Z 07005KT 15SM -SHSN SCT025 BKN038 M06/M08 A2976 RMK^M^M
SC4SC3 VSBY LWR N-NE SLP078=^M^M
[etc.]
```

All non-concatenated files (BUFR, advisories, GAMETs, AIRMETs) follow the same format but do not contain the ^C character at the start of the file.

6. DETAIL OF THE SADIS FTP DIRECTORY STRUCTURE

6.1. AIRMET

6.1.1. This directory contains any published traditional alphanumeric code (TAC) format AIRMETs.

6.1.2. Within this directory there are 4 data files:

```
AIRMETS_00_TO_06
AIRMETS_06_TO_12
AIRMETS_12_TO_18
AIRMETS_18_TO_00
```

and the corresponding signature files.

6.1.3. AIRMET bulletins with bulletin time between:

0000UTC and 0559UTC are written to file `AIRMETs_00_TO_06`
0600UTC and 1159UTC are written to file `AIRMETs_06_TO_12`
1200UTC and 1759UTC are written to file `AIRMETs_12_TO_18`
1800UTC and 2359UTC are written to file `AIRMETs_18_TO_00`

6.1.4. Deletion/Overwrite Policy: All files are kept for 23 hours and then deleted in preparation for the next rolling update:

6.2. ALL

6.2.1. This directory contains a rolling 36 hour archive of TAC format data files batched at 5 minute intervals, with a filename format: `DDHHMM.DAT`; For example:

```
251630.DAT
251635.DAT
251640.DAT
...
```

and the corresponding signature files.

NOTE: Once each of these files is made available on the server, they will never change. As such, it is inefficient to continually download the same data files.

6.2.2. Each data file contains a concatenation of the last 5 minutes worth of data. For example, the file `251635.DAT` will contain all of the data *received* in the 5-minute period 1630 UTC to 1635 UTC.

6.2.3. Note, in the rare event that no data is received over the 5 minute period for which a `DDHHMM.DAT` data file would be expected to be created, no file will be generated. i.e., in the event of no data to batch, the expected behaviour is that no file will be generated (as opposed to generating a file with no data). Systems can be designed to alert for such occasions, but an isolated event of a missing `DDHHMM.DAT` file is not considered an indication of a problem with the service. Occasions of 2 or more consecutive periods where no `DDHHMM.DAT` files have been generated may be considered as indicative of upstream data delivery problems.

6.2.4. Deletion/Overwrite Policy: Files are deleted after 36 hours.

6.3. **ASHTAMS_AND_VA_NOTAMS**

6.3.1. This directory contains ASHTAM and Volcanic Ash NOTAMS, with filenames of the form `NWXX01_EGRR_DDHHMM`, for example:

```
NWXX01_EGRR_251050
NWXX01_EGRR_251126
...
```

and the corresponding signature files.

6.3.2. Deletion/Overwrite Policy: These files are deleted after 48 hours.

6.4. **BUFR**

6.4.1. All files contained within directory BUFR are in binary.

6.4.2. The BUFR directory contains sub-directories EGRR and KKCI identifying the source of the BUFR files - i.e. from WAFC London (EGRR) or WAFC Washington (KKCI). For example:

```
EGRR/
        H_CAT
        H_EMBEDDED_CB
        H_FRONTS
        H_JETS
        H_TROP
        M_CAT
        M_CLOUD
        M_FRONTS
        M_JETS
        M_TROP
        OTHER_PARAMETERS
KKCI/
        H_CAT
        H_EMBEDDED_CB
        H_FRONTS
        H_JETS
        H_TROP
        M_CAT
        M_CLOUD
        M_FRONTS
        M_JETS
        M_TROP
        OTHER_PARAMETERS
```

6.4.3. Each of the subfolders above will contain BUFR files, with filename format `J/////_EGRR_DDHHMM` (in the `EGRR` higher level directory) or `J/////_KKCI_DDHHMM` (in the `KKCI` higher level directory). The precise references to the `J/////` parts of the filename and their meaning are given in see Appendix B to SUG Part 1.

An example of the files, in the `/BUFR/EGRR/CAT` sub-folder is given below:

```
JUCE00_EGRR_251200
JUCE00_EGRR_251800
...
```

and the corresponding signature files.

6.4.4. Corrections to WAFS SIGWX BUFR files

6.4.4.1. In the event that WAFC London or WAFC Washington issue corrected SIGWX forecasts, then ALL SIGWX BUFR files (and SIGWX PNG files – see 6.24.3) for the affected dataset will be re-issued with an appropriate correction indicator in the BBB section of the WMO AHL.

6.4.4.2. As such, the filenames reflecting the corrected data will be similarly appended, for example:

`JUCE00_EGRR_251200_CCA`

and the corresponding signature file.

`CCA` refers to the first correction in accordance with WMO AHL bulletin procedures. If subsequent corrections are necessary, then `CCB`, `CCC` etc will be used.

6.4.4.3. The original (and erroneous) files for the affected dataset will be deleted.

6.4.5. See Appendix B to SUG Part 1for BUFR filenames and availability.

6.4.6. Deletion/Overwrite Policy: Deleted after 36 hours.

6.5. GAMET

6.5.1. This directory contains TAC format GAMETs.

6.5.2. Within this directory there are 4 files

```
GAMETS_00_TO_06
GAMETS_06_TO_12
GAMETS_12_TO_18
GAMETS_18_TO_00
```

and the corresponding signature files.

6.5.3. GAMET bulletins with bulletin time between :

0000UTC and 0559UTC are written to file `GAMETs_00_to_06`
0060UTC and 1159UTC are written to file `GAMETs_06_to_12`
1200UTC and 1759UTC are written to file `GAMETs_12_to_18`
1800UTC and 2359UTC are written to file `GAMETs_18_to_00`

6.5.4. Deletion/Overwrite Policy: All files are kept for 23 hours and then deleted.

6.6. GRIB2

6.6.1. WAFS Upper Air Data in GRIB2 format is made available from this directory.

6.6.2. There is a subfolder `COMPRESSED` to identify that WAFS Upper Air Data in GRIB2 form is compressed (using JPEG2000). Two lower tier folders `EGRR` and `KWBC` are used to identify GRIB2 data from WAFC London (EGRR) and WAFC Washington (KWBC). Sub-folders at the next level separate the individual time steps into data for `T+06`, `T+09`, `T+12`, `T+15`, `T+18`, `T+21`, `T+24`, `T+27`, `T+30`, `T+33` and `T+36` for the standard GRIB2 parameters. For example:

```
COMPRESSED/EGRR/
                T+06
                T+09
                T+12
                T+15
                T+18
                T+21
                T+24
                T+27
                T+30
                T+33
                T+36
```

6.6.3. Each of the subfolders above will contain a GRIB2 file, with filename format '`T+HH_HHMM`'. For example, in `/GRIB2/EGRR/T+21`:

```
T+21_0000
T+21_1800
...
```

and the corresponding signature files.

6.6.4. Each file is a concatenation of all individual GRIB2 bulletins that are valid for each GRIB2 time step. For example, file `T+21_1800` will contain all WAFS GRIB2 files (for all standard parameters) which were produced from the 1800 UTC model run and are valid for T+21.

6.6.5. CB, ICE, CAT data is available at 1.25 degree resolution in the following sub-folders, namely: Clear Air Turbulence (`CAT`), cumulonimbus cloud (`CB`), and icing potential (`ICE`). Within each of these folders, a lower tier distinguishes between data for the time steps `T+06`, `T+09`, `T+12`, `T+15`, `T+18`, `T+21`, `T+24`, `T+27`, `T+30`, `T+33` and `T+36`. It should be noted that these data sets will be retired in November 2022 due to them being superseded by their higher resolution equivalents described in 6.6.6. The in-cloud turbulence field (`INCLDTURB`) was retired in late March 2021 so that sub-folder is empty

6.6.6. In November 2020 new 0.25 degree resolution data sets were added to SADIS FTP in the following sub-folders, namely: cumulonimbus (`CB_0.25`), icing severity (`ICE_0.25`), and turbulence severity (`TURB_0.25`). It should be noted that icing severity and turbulence severity uses new algorithms developed by the WAFCs. Information on these new data sets can be found on an information sheet located here: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/services/transport/aviation/wafs/wafs-hazard-data-sets-dec19.pdf

6.6.7. Corrections to WAFS GRIB2 files

6.6.7.1. In the event that WAFC London or WAFC Washington issue corrected GRIB2 forecasts, then ALL GRIB2 files for the affected dataset will be re-issued with an appropriate correction indicator in the BBB section of the WMO AHL.

6.6.7.2. As such, the filenames reflecting the corrected data will be similarly appended, for example:

`T+21_0000_CCA`

and the corresponding signature file.

6.6.7.3. The original (and erroneous) files for the affected dataset will be deleted.

6.6.8. For more detail on the filenames, and the availability of GRIB2 data files, see Appendix B to SUG Part 1.

6.6.9. WAFC Washington GRIB2 data is provided – in a similar fashion to that described in 6.6.2 to 6.6.8 inclusive - within the `KWBC` sub-folder that can also be found in the `COMPRESSED` folder. Also see Appendix B.

6.6.10. CB, ICE, CAT and TURB sub folders. Data for Clear Air Turbulence (`CAT`), cumulonimbus cloud (`CB`), icing (`ICE`) at 1.25 degree resolution, and cumulonimbus (`CB_0.25`), icing severity (`ICE_0.25`) and turbulence severity (`TURB_0.25`) at 0.25 degree resolution is made available in the same manner as described for WAFC London data in section 6.6.5 and 6.6.6 above.

6.6.11. There may be the occasional need to re-poll for data. GRIB2 data is made available as it is received. Rarely, if there are delays in the delivery of GRIB2 data, not all bulletins will be available initially. If users identify an incomplete dataset, the initial action should be to re-poll after a minimum period of 5 minutes. If users repeatedly download incomplete datasets (more than 3 re-polls over 20 minutes), they should contact the Service Desk.

6.6.12. A similar process to that described in 6.6.7 above will be followed with regard to WAFC Washington corrections.

6.6.13. Deletion/Overwrite Policy: Files are deleted after 15 hours.

6.7. IWXXM/IWXXM_HOURLY_FILES

6.7.1. The 24 files that are contained within this directory have the name format `IWXXM_HOURLY_DATA_HH00`. Each file is created on the hour by copying the current `IWXXM_LAST_HOUR` file to the `IWXXM_HOURLY_FILES` directory and renaming appropriately. As they are constituted from the `IWXXM_LAST_HOUR` file, the bulletins contained within it are by *reception* time, not nominal bulletin time. For example;

```
IWXXM_HOURLY_DATA_1500
IWXXM _HOURLY_DATA_1600
IWXXM _HOURLY_DATA_1700
IWXXM _HOURLY_DATA_1800
...
```

and the corresponding signature files.

6.7.2. Deletion/Overwrite Policy: Deleted after 36 hours.

6.8. IWXXM/IWXXM_LAST_1_MINUTE

6.8.1. This file is populated and updated every minute. The file is a tar archive file compressed as gzip (with extension .tar.gz) and can be unpacked using common tar commands. It will contain all IWXXM[7] format OPMET bulletins received in the last minute (strictly, those bulletins with T_1T_2 of the WMO AHL set to LA, LC, LK, LP, LS, LT, LU, LV, LW, LY, and LN). This is the file that needs to be regularly downloaded if a user wishes to have access to the very latest IWXXM format OPMET data at one minute intervals.

IWXXM_LAST_1_MINUTE

and the corresponding signature file.

6.8.2. To unzip and decompress the IWXXM files the Linux command: tar -xvzf <filename> can be used. It is important to provide the command options in that order, otherwise it won't detect the file to unzip.

6.8.3. *'If no new IWXXM data is received no file will be presented. Users should not assume there is a problem with the service if an updated file is not available, and on occasion it is possible for there to be no new data presented for 5 or more consecutive minutes.*

6.8.4. Deletion/Overwrite Policy: Continuously overwritten.

6.9. IWXXM/IWXXM_LAST_5_MINS

6.9.1. This file is populated and updated every 5 minutes. The file is a tar archive file compressed as gzip (with extension .tar.gz) and can be unpacked using common tar commands. It will contain all IWXXM_LAST_1_MINUTE files that were published in the last 5 minutes. This is the file that needs to be regularly downloaded if a user wishes to have access to IWXXM format OPMET data at 5 minute intervals.

6.9.2. In order to access the individual IWXXM OPMET files, each individual IWXXM_LAST_1_MINUTE gzip file contained within the IWXXM_LAST_5_MINS file will need to be unzipped.

IWXXM_LAST_5_MINS

and the corresponding signature file.

6.9.3. To unzip and decompress the IWXXM files the Linux command: tar -xvzf <filename> can be used. It is important to provide the command options in that order, otherwise it won't detect the file to unzip. The command will need to be run recursively in order to extract the sub directories within the file.

6.9.4. *If no new IWXXM data is received no file will be presented. Users should not assume there is a problem with the service if – on occasion – an updated file is not available.*

6.9.5. Deletion/Overwrite Policy: Continuously overwritten.

[7] *Guidance on the implementation of IWXXM is provided in the* Manual on the ICAO Meteorological Information Exchange Model (IWXXM) *(Doc 10003)*

6.10. IWXXM/IWXXM_LAST_HOUR

6.10.1. The file `IWXXM_LAST_HOUR` file is updated every 5 minutes and is a tar archive file compressed as gzip (with extension .tar.gz) and can be unpacked using common tar commands. It contains all `IWXXM_LAST_5_MINS` zip files produced since the turn of the hour.

6.10.2. In order to access the individual IWXXM OPMET files, each individual `IWXXM_LAST_5_MINS` gzip file and subsequent `IWXXM_LAST_1_MINUTE` files will need to be unzipped.

6.10.3. To unzip and decompress the IWXXM files the Linux command: tar -xvzf <filename> can be used. It is important to provide the command options in that order, otherwise it won't detect the file to unzip. The command will need to be run recursively in order to extract the sub directories within the file.

6.10.4. The file is accessible to the user in its interim state throughout the hour. At 1 minute past each hour, the file is moved and appropriately renamed to the `IWXXM_ _HOURLY_FILES` directory to enable the next hour's file to start being generated.

`IWXXM_LAST_HOUR`

and the corresponding signature file.

6.10.5. Deletion/Overwrite Policy: Moved and renamed at 1 minute past each hour to enable the next hour's file to be generated.

6.11. IWXXM_SET_OF_5MIN_FILES

6.11.1. This folder contains 60 minutes worth of `IWXXM_LAST_5_MINS` files which have been renamed to take the form `IWXXM_HHMM`

6.11.2. An example of the typical content of the folder is indicated below:

```
IWXXM_1235
IWXXM_1240
IWXXM_1245
```

6.11.3. Deletion/Overwrite Policy: Deleted after 60 minutes.

6.12. NUCLEAR_EMERGENCY_MESSAGES

6.12.1. This folder contains any issued nuclear emergency messages and take the form `NNXX01_EGRR_DDHHMM`

```
NNXX01_EGRR_150432
...
```

and the corresponding signature file(s).

6.12.2. Deletion/Overwrite Policy: Deleted after 36 hours.

6.13. **OPMET**

6.13.1. OPMET data is stored on the SADIS FTP Service in a variety of different ways. The `OPMET` directory is one such way and contains a list of 24 files of name format `HHZ`, which contain TAC format OPMET data based on nominal hour as indicated in the WMO bulletin header. For example, file named `00Z` will contain a concatenation of all OPMET bulletins where the 'hour' part of the WMO header equals '00'. It is important to note that it is the bulletin header that will define whether this file is added to and not the time of receipt of the file, and as such it may be that bulletins are appended to this file sometime after the nominal time indicated in the WMO bulletin header. For example;

```
06Z
07Z
08Z
09Z
...
```

and the corresponding signature files.

6.13.2. Deletion/Overwrite Policy: Files in this directory are deleted after 23 hours.

6.14. **OPMET_DAILY_HOURLY_FILES**

6.14.1. The 36 files that are contained within this directory have the name format `OPMET_HOURLY_DATA_HH00`. Each file is created on the hour by copying the current `OPMET_LAST_HOUR` file to the `OPMET_DAILY_HOURLY_FILES` directory and renaming appropriately. As they are constituted from the `OPMET_LAST_HOUR` file, the bulletins contained within it are by *reception* time, not nominal bulletin time. For example;

```
OPMET_HOURLY_DATA_1500
OPMET_HOURLY_DATA_1600
OPMET_HOURLY_DATA_1700
OPMET_HOURLY_DATA_1800
...
```

and the corresponding signature files.

6.14.2. Deletion/Overwrite Policy: Deleted after 23 hours.

6.15. **OPMET_LAST_5MINS**

6.15.1. This file is populated and updated every 5 minutes. It contains a concatenation of the last 5 minutes of TAC format OPMET bulletins (strictly, those bulletins with T_1T_2 of the WMO AHL set to `SA`, `SP`, `WS`, `WC`, `WV`, `WA`, `FT`, `FC`, `FA`, `FK`, `FV`, `NO`, `UA` and `FN`). This is the file that needs to be regularly downloaded if a user wishes to have access to alphanumeric OPMET data at 5 minute intervals. It is also possible for users to access alphanumeric OPMET data at 1 minute intervals. See 6.17.

```
OPMET_LAST_5MINS
```

and the corresponding signature file.

6.15.2. Deletion/Overwrite Policy: Continuously overwritten.

6.16. OPMET_LAST_HOUR

6.16.1. The file OPMET_LAST_HOUR file is updated every 5 minutes by appending all TAC format OPMET bulletins (strictly, those bulletins with T_1T_2 of the WMO AHL set to SA, SP, WS, WC, WV, WA, FT, FC, FA, FK, FV, NO, UA and FN). The file is accessible to the user in its interim state throughout the hour. At 1 minute past each hour, the file is moved and appropriately renamed to the OPMET_DAILY_HOURLY_FILES directory to enable the next hour's file to start being generated.

OPMET_LAST_HOUR

and the corresponding signature file.

6.16.2. Deletion/Overwrite Policy: Moved and renamed at 1 minute past each hour to enable the next hour's file to be generated.

6.17. OPMET_LAST_MINUTE

6.17.1. This file is populated and updated every minute. It contains a concatenation of the last minute of TAC format OPMET bulletins (strictly, those bulletins with T_1T_2 of the WMO AHL set to SA, SP, WS, WC, WV, WA, FT, FC, FA, FK, FV, NO, UA and FN). This is the file that needs to be regularly downloaded if a user wishes to have access to the very latest alphanumeric OPMET data at one minute intervals.

OPMET_LAST_MINUTE

and the corresponding signature file.

6.17.2. Deletion/Overwrite Policy: Continuously overwritten.

6.18. OPMET_SET_OF_1MIN_FILES

6.18.1. This directory contains files of name format OPMET_HHMM (strictly, those TAC format bulletins with T_1T_2 of the WMO AHL set to SA, SP, WS, WC, WV, WA, FT, FC, FA, FK, FV, NO, UA and FN). These files are created every minute if data has been received in the preceding minute.

6.18.2. *If no alphanumeric data has been received no file will be presented. Users should not assume there is a problem with the service if – on occasion – particular files are not available. On rare occasions it is possible for there to be no new data (and therefore no files) presented for several consecutive minutes.*

6.18.3. Each file (when presented) will contain data for one minute of OPMET data. This behaviour is different to the OPMET_SET_OF_5MIN_FILES described in section 6.19 The folder will contain 60 minutes worth of 1 minute files.

6.18.4. An example of the typical content of the folder is indicated below:

```
OPMET_1252
OPMET_1253
OPMET_1254
OPMET_1255
OPMET_1256
OPMET_1257
OPMET_1258
OPMET_1259
OPMET_1300
OPMET_1301
OPMET_1302
...

OPMET_1347
OPMET_1348
OPMET_1349
OPMET_1350
OPMET_1351
```

and the corresponding signature files

6.18.4.1. Deletion/Overwrite Policy: Deleted after 60 minutes.

6.19. **OPMET_SET_OF_5MIN_FILES**

6.19.1. This directory contains files of name format `OPMET_HHMM` (strictly, those TAC format bulletins with T_1T_2 of the WMO AHL set to `SA`, `SP`, `WS`, `WC`, `WV`, `WA`, `FT`, `FC`, `FA`, `FK`, `FV`, `NO`, `UA` and `FN`). These files are created every hour. Note, the behaviour of the files within this folder is different to that of `OPMET_SET_OF_1MIN_FILES` described in section 6.18.

6.19.2. In the array below the numbers in quotes correspond to the file extensions for the set of 5-min files that are updated at the times stated. New data (from file OPMET_last_5mins) gets appended to the relevant files every five minutes.

@ 5 mins past each hour: ("05","10","15","20","25","30","35","40","45","50","55");
@ 10 mins past each hour: ("10","15","20","25","30","35","40","45","50","55");
@ 15 mins past each hour: ("15","20","25","30","35","40","45","50","55");
@ 20 mins past each hour: ("20","25","30","35","40","45","50","55");
@ 25 mins past each hour: ("25","30","35","40","45","50","55");
@ 30 mins past each hour: ("30","35","40","45","50","55");
@ 35 mins past each hour: ("35","40","45","50","55");
@ 40 mins past each hour: ("40","45","50","55");
@ 45 mins past each hour: ("45","50","55");
@ 50 mins past each hour: ("50","55");
@ 55 mins past each hour: ("55");

6.19.3. Thus, if a user logs on at 37 minutes past the hour (say 1537 UTC) if they download file `OPMET_1535` they will obtain a file which contains all of the OPMET which has been *received* by the server from 00 minutes past the hour (1500 UTC) to 35 minutes past the hour (1535 UTC).

6.19.4. The example below shows OPMET_HHMM files in the OPMET_SET_OF_5_MINUTE_FILES folder. In brackets the filesize in bytes is indicated showing how the filesize increases as data is added to the files over time in accordance with the above.

OPMET_1305	(86,546)
OPMET_1310	(211,690)
OPMET_1315	(258,470)
OPMET_1320	(272,099)
OPMET_1325	(287,048)
OPMET_1330	(321,561)
OPMET_1335	(340,750)
OPMET_1340	(367,933)
OPMET_1345	(402,176)
OPMET_1350	(410,236)
OPMET_1355	(426,698)
...	

and the corresponding signature files.

6.19.5. Deletion/Overwrite Policy: At most, there will be two hours worth of files in this directory.

6.20. **PUBLIC_KEYS**

6.20.1. This folder is 'hidden', but can be accessed by explicitly stating the folder path. There are two subfolders:

```
CURRENT
PREVIOUS
```

6.20.2. The CURRENT folder contains the current Digital Certificate that is used to verify all of the source data files by using the corresponding data files' Digital Signature file. For example;

```
SADISFTP004.CER
```

6.20.3. It is planned that each certificate filename will be of the form SADISFTPnnn.CER where nnn will be an incrementing number.

6.20.4. Deletion/Overwrite Policy: The certificates will be updated to a schedule that will not be published. Workstation suppliers should implement appropriate software routines to;

a) regularly determine if a certificate has been updated, and/or

b) initiate a process to check for updated certificates in the event of a signature verification failure. i.e. in the event of a signature verification failure, it is feasible that a certificate has been updated. The first action should be to check for a new certificate and then re-verify. Subsequent failures may indicate corruption or tampering with the data and the user should be alerted to the failure.

6.20.5. The PREVIOUS folder will contain the previously valid Digital Certificate that was used to verify all of the source data files by using the corresponding data files' Digital Signature file. For example;

```
SADISFTP001.CER
```

6.20.6. Because there will be a period of up to 48 hours where older files with signatures based on a recently replaced certificate will remain on the system whilst newer signature files based on the new certificate will be being created it will be necessary for Workstations to be able to access both certificates.

6.20.7. As such, Workstation providers will need to implement appropriate routines to check files using Digital Signatures based on either of the certificates in the `CURRENT` or `PREVIOUS` folders.

6.20.8. Workstation providers should build in capability to ensure their systems can deal with Certificates from a number of Certificate Authorities (Verisign, Comodo etc).

6.20.9. Deletion/Overwrite Policy: Will be deleted to an unpublished policy of the SADIS Provider.

6.21. SADIS_ADMINISTRATIVE_MESSAGES

6.21.1. SADIS administrative messages have standard WMO Abbreviated Header Lines (AHLs) of `NOUK10 EGRR ddhhmm`, `NOUK11 EGRR ddhhmm`, and `NOUK13 EGRR ddhhmm`. Any recent messages are stored as individual files in the `SADIS_ADMINISTRATIVE_MESSAGES` directory, i.e.,

```
NOUK10_EGRR_150700
...
```

and the corresponding signature file(s).

6.21.2. SADIS Gateway administrative messages will also be made available in this folder. WMO AHLs of `NOUK31_EGGY_ddhhmm`, `NOUK32_EGGY_ddhhmm` and `NOUK34_EGGY_ddhhmm` are provided in this folder, i.e.,

```
NOUK32_EGGY_150700
...
```

and the corresponding signature file(s).

6.21.3. Deletion/Overwrite Policy: Deleted after 36 hours.

6.22. SIGMETS

6.22.1. SIGMET files contain one TAC format bulletin per file.

```
WSBW20_VGZR_131100
WSBW20_VGZR_131800
WSCN32_CWEG_141419
WSCZ31_LKPW_130237
WSDL31_EDZF_130525
...
```

and the corresponding signature files.

6.22.2. Deletion/Overwrite Policy: Files are deleted when over 36 hours old.

6.23. SIGWX_CORRECTION_MESSAGES

6.23.1. `FXUK65 EGRR` and `FXUS65 KKCI`: These bulletins are simple, generally short, text files. These text correction bulletins will be issued by each WAFC if an error is identified in high- or medium-level SIGWX forecasts in the BUFR-code or PNG-chart forms. For example;

`FXUK65 EGRR ddhhmm` (for WAFC London correction bulletins)
`FXUS65 KKCI ddhhmm` (for WAFC Washington correction bulletins)

6.23.2. `FXUK66 EGRR` and `FXUS66 KKCI`: These products are precisely formatted messages that are intended to act as triggers to SADIS Workstations to initiate download of corrections for either WAFS SIGWX or WAFS GRIB2 data. For example;

`FXUK66 EGRR ddhhmm` (for WAFC London correction bulletins)
`FXUS66 KKCI ddhhmm` (for WAFC Washington correction bulletins)

6.23.3. Deletion/Overwrite Policy: Deleted after 36 hours.

6.24. SIGWX_PNG

6.24.1. PNG formatted WAFS SIGWX charts are available from this directory, and included in two sub-directories: `SWH_PNG` and `SWM_PNG`. Copies of all high level (SWH) and medium level (SWM) charts produced by WAFC London and WAFC Washington are included.

```
SWH_PNG/
              AREA_A
              AREA_B
              AREA_B1
              AREA_C
              AREA_D
              AREA_E
              AREA_F
              AREA_G
              AREA_H
              AREA_I
              AREA_J
              AREA_K
              AREA_M
SWM_PNG/
              AREA_ASIA_SOUTH
              AREA_EURO
              AREA_MID
              AREA_NAT
```

6.24.2. Each of the subfolders above will contain a SIGWX PNG formatted file, with filename format `PG////_CCCC_HHMM.PNG`. For example, in `/SWH_PNG/AREA_A`:

```
PGEE05_KKCI_0000.PNG
PGEE05_KKCI_0600.PNG
PGEE05_KKCI_1200.PNG
...
```

and the corresponding signature files.

6.24.3. Corrections to WAFS SIGWX PNG files

6.24.3.1. In the event that WAFC London or WAFC Washington issue corrected SIGWX forecasts, then ALL SIGWX PNG files (and SIGWX BUFR files see 6.4.4) for the affected dataset will be re-issued with an appropriate correction indicator in the BBB section of the WMO AHL.

6.24.3.2. As such, the filenames reflecting the corrected data will be similarly appended, for example:

```
PGEE05_KKCI_1200_CCA.PNG
```

and the corresponding signature files.

6.24.3.3. The original (and erroneous) files for the affected dataset will be deleted.

6.24.4. For full filename details, and time of availability see Appendix E.

6.24.5. Deletion/Overwrite Policy: These files overwrite previous, or are deleted after 24 hours.

6.25. SPACE_WEATHER_ADVISORIES

6.25.1. Space Weather Advisories contain one TAC format bulletin per file.

6.25.2. Single bulletins, with a filename based on the WMO Bulletin Header will be stored within the directory for example;

```
FNXX01_KWBC_YYGGgg
FNXX01_EFKL_YYGGgg
FNXX02_EFKR_YYGGgg
```

and the corresponding signature files.

6.25.3. Deletion/Overwrite Policy: Files will be deleted on a rolling basis when over 36 hours.

6.26. SPECIAL_AIREP

6.26.1. Special AIREP bulletins with WMO bulletin header format `UA/// CCCC` are placed as single files within this directory.

```
UAUK60_EGRR_150420
...
```

and the corresponding signature file(s).

6.26.2. Deletion/Overwrite Policy: Files are deleted on a rolling basis when over 36 hours old.

6.27. SUPP_VOLC_ASH_CONC_DATA

6.27.1. There are two sub-folders within this directory, `CSV` and `PNG`. The contents of these sub-folders will be simple alphanumeric text files within the CSV folder, and PNG graphics files within the PNG folder. There remains much ongoing work relating to defining the content and filename structure of files delivered to these folders, and it must be emphasised they are not standard, globally endorsed ICAO products[8]. The folder was added by special agreement at SADISOPSG/15. More information and updates to this document will be made as and when the structure of information sent to this folder is ratified.

6.27.2. Note, the CSV and PNG sub-folders will only be populated with data from London VAAC during eruptions of volcanoes within London VAACs area of responsibility.

6.27.3. Deletion/Overwrite Policy: Files placed in this directory are deleted on a rolling basis when over 16 hours old.

6.28. TROPICAL_CYCLONE_ADVISORIES

6.28.1. Single TAC format bulletins, with a filename based on the WMO Bulletin Header are stored within the directory, for example;

```
FKPS20_NFFN_140400
FKPS20_NFFN_150400
...
```

and the corresponding signature files.

6.29. TROPICAL_CYCLONE_ADVISORY_GRAPHICS

6.29.1. Within this directory is a further sub-directory named `PNG_FORMAT`. This sub-directory contains tropical cyclone advisory graphic files in PNG format.

6.29.2. Files placed in the `PNG_FORMAT` directory are of the form;

```
PZXD01_FMEE_0000.PNG
PZXD02_FMEE_0000.PNG
...
```

and the corresponding signature files

Note: Not all Tropical Cyclone Advisory Centres currently issue graphical versions of their Tropical Cyclone Advisory messages.

6.29.3. Deletion/Overwrite Policy: Deleted on a rolling basis when over 36 hours old.

[8] Provision of data of this type was made at the EUR/NAT Regional level in the form of the Volcanic Ash Contingency Plan EUR/NAT, though at time of launch of Secure SADIS FTP work was ongoing to finalise certain aspects of the data.

6.30. TROPICAL_CYCLONE_SIGMETS

6.30.1. Single TAC format bulletins, with a filename based on the WMO Bulletin Header are stored within the directory, for example;

```
WCSS20_VHHH_281315
WCID21_WIII_140600
WCIY31_LIIB_140845
...
```

and the corresponding signature files.

6.30.2. Deletion/Overwrite Policy: These files are deleted when over 36 hours old.

6.31. VOLCANIC_ASH_ADVISORY_GRAPHICS

6.31.1. Within this directory is a further sub-directory named `PNG_FORMAT`. This sub-directory contains volcanic ash advisory graphic files in PNG format.

6.31.2. Files placed in the `PNG_FORMAT` directory are of the form;

```
PFXD05_ADRM_0000.PNG
PFXD06_ADRM_1300.PNG
PFXD06_ADRM_1900.PNG
...
```

and the corresponding signature files.

6.31.3. Deletion/Overwrite Policy: and are deleted on a rolling basis when over 36 hours old.

6.32. VOLCANIC_ASH_ADVISORY_STATEMENTS

6.32.1. Single TAC format bulletins, with a filename based on the WMO Bulletin Header are stored within the directory, for example;

```
FVAU01_ADRM_140702
FVAU02_ADRM_141246
FVFE01_RJTD_132250
...
```

and the corresponding signature files.

6.32.2. Deletion/Overwrite Policy: Files are deleted on a rolling basis when over 36 hours.

6.33. VOLCANIC_ASH_SIGMETS

6.33.1. Single TAC format bulletins, with a filename based on the WMO Bulletin Header are stored within the directory, for example;

```
WVHO31_MHTG_132144
WVID21_WIII_140600
WVIY31_LIIB_140845
...
```

and the corresponding signature files.

6.33.2. Deletion/Overwrite Policy: These files are deleted when over 36 hours old.

6.34. LOW_LEVEL_AREA_FCST_GRAPHICS

6.34.1. This is a trial folder (trial due to continue until 2024) for provision of low-level area forecasts in graphical format. The

6.34.2. Within this directory is a further sub-directory named `PNG_FORMAT`. This sub-directory contains all available low level area forecast charts in PNG format.

6.34.3. Files placed in the `PNG_FORMAT` directory are of the form;

```
QGAE15_GMMC_162147.PNG
QGDC40_EDZW_161900.PNG
QGXD70_EINN_160900.PNG
...
```

and the corresponding signature files.

6.34.4. Deletion/Overwrite Policy: and are deleted on a rolling basis when over 36 hours old.

7. ACCESS TO THE SADIS FTP, AND BACKUP/CONTINGENCY ACCOUNTS WITH THE USA ADMINISTERED WAFS INTERNET FILE SERVICE (WIFS).

7.1. Access to the **SADIS FTP** is determined by the Regional Air Navigation Plans. Users who wish to make use of the **SADIS FTP** as a contingency/backup alternative to WIFS must a) first have an account authorised and enabled on the WIFS service; and then b) apply to the SADIS Manager (8.1) for a backup account. Those **SADIS FTP** users who wish to arrange a WIFS account as a contingency/backup to the **SADIS FTP** must a) first have an account authorised and enabled on the **SADIS FTP**; and then b) apply for a WIFS account via the WIFS Registration web pages. The detailed process to follow is given in Appendix A of the SADIS User Guide Part 1.

8. CONTACT DETAILS AND SOURCES OF FURTHER INFORMATION.

8.1. The contact details for registering for the **SADIS FTP** are:

SADIS Manager
Met Office
Fitzroy Road
Exeter
Devon
EX1 3PB
United Kingdom

Tel: +44(0) 330 135 1370
E-mail: sadismanager@metoffice.gov.uk

(Note: the above contact details should not be used for reporting faults, see 8.2 below.)

8.2. In the event of issues with data on the **SADIS FTP**, the first action should be to confirm that local systems (power, internet connections, ISP, local software etc) are not to blame for the faults. Also check any SADIS Administration Messages (`NOUK10`) that may have been issued to alert users of known problems. If, after investigating such aspects it is believed there is a problem with the **SADIS FTP** itself, then the point of contact should be the SADIS Provider's Help Desk number:

By phone from the UK: Tel: 0370 900 0100

By phone from outside the UK: Tel: +44 1392 885680

By Email: servicedesk@metoffice.gov.uk

Dedicated support staff are available on the above numbers 24/7, and can best deal with any potential issues relating to the **SADIS FTP**.

8.3. A description of the SADIS service with many helpful links (including details of Workstation vendors and evaluations of workstation software) is available from: https://www.metoffice.gov.uk/aviation/sadis.

8.4. The **SADIS FTP** is overseen by Working Groups as established by the ICAO Meteorological Panel (METP). Currently, the working groups are: Meteorological Operations Group (WG-MOG); Meteorological Information Exchange (WG-MIE); Meteorological Requirements and Integration (WG-MRI); and the Meteorological Information and Service Development (WG-MISD). The provision of SADIS features in all four Working Groups, though for day to day operational aspects the WG-MOG will take a lead. The other Working Groups are more forward, strategic looking though there will be some overlap. The following link contains details of meetings and references relevant to the service:

http://www.icao.int/airnavigation/METP/Pages/default.aspx

9. POOR INTERNET CONNECTIVITY ISSUES.

9.1. Data can be downloaded from SADIS FTP at up to 3Gb/sec, and it is recommended that broadband connections, of minimum 512 Kbit/sec and ideally 4098 Kbit/sec are established with Internet Service Providers (ISPs) to connect to SADIS FTP. It is further recommended that, wherever practicable, consideration be given to establishing connectivity via two separate ISPs for resilience and redundancy.

9.2. It should be noted that the SADIS Provider is *not* responsible for the local user connections, and therefore can only offer third-party assistance when all other solutions have failed – i.e. monitoring access attempts by IP addresses to the **SADIS FTP** server.

9.3. If a user is experiencing connectivity problems to the **SADIS FTP**, it is most often related to bandwidth availability on the local connection from the user terminal. The first point of contact in resolving connectivity issues should be with the user's local Internet Service Provider.

— — — — — — — —

APPENDIX A: GUIDANCE TO WORKSTATION VENDORS FOR COMPATIBILITY WITH THE SADIS FTP, AND THE IMPLEMENTATION OF DIGITAL SIGNATURE VERIFICATION.

ICAO Doc 9855 *(Guidelines on the Use of the Public Internet for Aeronautical Applications)* discusses the use of the public internet for the provision of Aeronautical data. The WAFS and OPMET data supplied via **SADIS FTP** is provided for planning purposes only, and as such the use of the public internet for such use was mandated in Amendment 75 to Annex 3 – *Meteorological Service for International Air Navigation*, effective 18 November 2010.

Nonetheless, Doc 9855 still requires that such data is provided to a suitably high standard of confidence in terms of the integrity and source of the data used. In order that all users can be secure in the knowledge that the data they download from the **SADIS FTP** has been provided by the SADIS Provider, and has not been tampered with or otherwise modified (deliberately or accidentally), all data has an associated 'Digital Signature' which can be used to confirm that the relevant data file has not been changed. A Digital Certificate is used to process the Digital Signature using appropriate software tools (OpenSSL for example) and perform appropriate cross checks with the data and with Certificate Authorities (or further Digital Certificates from Certificate Authorities).

Workstation Providers who provide systems that are **SADIS FTP** compliant should include within their software solution:

- Clear indication to the user that a downloaded file has been verified as being intact (not modified/corrupt), and that it originated from the SADIS Provider (UK Met Office). This could be done passively by indicating on screen in a 'status bar' or equivalent. For printed documents a statement confirming that the information has been verified would be appropriate and encouraged.
- Once data has been received by the system, the system's own software is likely to further process data to populate the system's databases. From this point on the data will be manipulated such that the SADIS Provider's Digital Certification can no longer be used. However, a database 'flag' that indicates the contents of the record/field have been sourced from data files that have had their integrity/source verified would be one method of retaining an audit trail of data verification and allow a process by which users could be informed (on-screen or on printed documents) that the data presented has been verified as originating from the SADIS Provider and that there was no corruption/tampering between the SADIS Provider's FTP servers and the receipt of the data into the Workstation.
- An automatic ability to re-poll data (both the file and the corresponding Digital Signature an appropriate number of times before alerting the user to potential issues with the data. This process should also implement a procedure to check for updated Digital Certificates (see 6.20) as will be issued from time to time during the life of this service.
- The capability for the user to be informed of files that fail verification (after a suitable number of re-polls), but to be allowed to choose to continue to work with the data – at the user's discretion. Such actions should be logged.
- The capability for the user to easily obtain a simple log/list of the files that have been detected as corrupt, tampered with, or otherwise modified. This should be implemented in such a way so as to allow the user to be able to provide that information to the SADIS Provider's Help Desk and/or the Workstation Vendor's Help Desk in order to allow efficient resolution of any issues.

It should be the default behaviour that all files are verified for integrity and for originating source. Any user action to disable or turn of the verification processes should be both indicated on-screen and on printed data; and a log maintained on the system to record such actions[9] and of the suspect files concerned.

It should be made possible for users to work with data which cannot be verified. This allows for a 'fall back' option in the event of Digital Signing/Digital Certification issues. However, any acceptance of data that fails the integrity tests should be logged by the system[9]. In the event that the SADIS Provider is aware of Digital Signature/Digital Certification issues, then an appropriate administration message (NOUK10) will be transmitted.

The SADIS Provider has implemented Digital Certification/Digital Signing as a methodology of to allow an end user to have absolute confidence that data has come from the SADIS Provider and has not been modified in anyway[10]. However, there is a responsibility on Workstation providers to implement appropriate processes to fully exploit the security methods used by the SADIS Provider. As such, all evaluations on SADIS Workstations in relation to the processing of **SADIS FTP** data will place great emphasis on the Workstation vendor demonstrating that the necessary protections have been implemented in a robust fashion within Workstation software/hardware systems.

Workstation vendors, and any user developing bespoke software solutions should consult very closely sections 4, and 6.20 of this document.

Verification logs relating to integrity/source of the **SADIS FTP** - including logs of users acknowledging and choosing to work with data that has not passed the integrity/verification checks, or turning such checks off should be retained for 30 days, or longer if directed by local State practices.

— — — — — — — —

[9] This may be implemented by recording in an appropriate field of the system's database; or by maintaining separate logs, or both. Workstation vendors are free to develop/implement/demonstrate alternative methodologies.

[10] The SADIS Provider is not responsible for data received from other sources, and re-transmitted. For example, whilst the UK Met Office, as SADIS Provider, originates WAFC London GRIB1 and WAFC London GRIB2 data (and therefore is responsible for all stages of production/transmission of the data), it is not responsible for TAFs/METARs/SIGMETs originating from other States. However, the SADIS Provider digitally signs these files in order to allow it to be subsequently proven that the data as re-transmitted via SADIS FTP has not subsequently been corrupted or tampered with over the internet and into the user's workstation.

APPENDIX B: SADIS FTP FOLDER STRUCTURE

The **SADIS FTP** Folder structure is indicated below.

Note 1: items identified **IN THIS TEXT STYLE** are files in the root directory and are not directories/folders. Their corresponding .SIG files are not indicated.
Note 2: items identified *IN THIS TEXT STYLE* are hidden folders.

Folder/Subfolders	See Section
AIRMET	6.1
ALL	6.2
ASHTAMS_AND_VA_NOTAMS	6.3
BUFR	6.4
EGRR	6.4.2,6.4.3,6.4.5
H_EMBEDDED_CB	
H_FRONTS	
H_JETS	
H_TROP	
M_CAT	
M_CLOUD	
M_FRONTS	
M_JETS	
M_TROP	
OTHER_PARAMETERS	
KKCI	6.4.2,6.4.3,6.4.5
H_EMBEDDED_CB	
H_FRONTS	
H_JETS	
H_TROP	
M_CAT	
M_CLOUD	
M_FRONTS	
M_JETS	
M_TROP	
OTHER_PARAMETERS	
DOCUMENTATION	
GAMET	6.5
GRIB2	6.6
COMPRESSED	6.6.2
EGRR	6.6.3,6.6.4,6.6.8
T+06	
T+09	
T+12	
T+15	
T+18	
T+21	
T+24	
T+27	
T+30	
T+33	
T+36	
CAT	
T+06	
T+09	
T+12	
T+15	
T+18	
T+21	
T+24	
T+27	
T+30	
T+33	
T+36	
CB	
T+06	
T+09	
T+12	
T+15	
T+18	
T+21	
T+24	

```
                T+27
                T+30
                T+33
                T+36
        CB_0.25                                 6.6.6
                T+06
                T+09
                T+12
                T+15
                T+18
                T+21
                T+24
                T+27
                T+30
                T+33
                T+36
        ICE
                T+06
                T+09
                T+12
                T+15
                T+18
                T+21
                T+24
                T+27
                T+30
                T+33
                T+36
        ICE_0.25                                6.6.6
                T+06
                T+09
                T+12
                T+15
                T+18
                T+21
                T+24
                T+27
                T+30
                T+33
                T+36
        TURB_0.25                               6.6.6
                T+06
                T+09
                T+12
                T+15
                T+18
                T+21
                T+24
                T+27
                T+30
                T+33
                T+36
KWBC                                            6.6.9
        T+06
        T+09
        T+12
        T+15
        T+18
        T+21
        T+24
        T+27
        T+30
        T+33
        T+36
        CAT
                T+06
                T+09
                T+12
                T+15
                T+18
                T+21
                T+24
                T+27
                T+30
                T+33
                T+36
        CB
```

```
                        T+06
                        T+09
                        T+12
                        T+15
                        T+18
                        T+21
                        T+24
                        T+27
                        T+30
                        T+33
                        T+36
                CB_0.25                                 6.6.9
                        T+06
                        T+09
                        T+12
                        T+15
                        T+18
                        T+21
                        T+24
                        T+27
                        T+30
                        T+33
                        T+36
                ICE
                        T+06
                        T+09
                        T+12
                        T+15
                        T+18
                        T+21
                        T+24
                        T+27
                        T+30
                        T+33
                        T+36
                ICE_0.25                                6.6.9
                        T+06
                        T+09
                        T+12
                        T+15
                        T+18
                        T+21
                        T+24
                        T+27
                        T+30
                        T+33
                        T+36
                TURB_0.25                               6.6.9
                        T+06
                        T+09
                        T+12
                        T+15
                        T+18
                        T+21
                        T+24
                        T+27
                        T+30
                        T+33
                        T+36
IWXXM
        IWXXM_HOURLY_FILES                                      6.7
        IWXXM_LAST_1_MINUTE                                     6.8
        IWXXM_LAST_5_MINS                                       6.9
        IWXXM_LAST_HOUR                                         0
        IWXXM_SET_OF_5_MIN_FILES                                6.11
LOW_LEVEL_AREA_FCST_GRAPHICS                            Trial folder
        PNG_FORMAT                                      and subfolder 6.34
NUCLEAR_EMERGENCY_MESSAGES                              6.12
OPMET                                                   6.12.2
OPMET_DAILY_HOURLY_FILES                                6.14
OPMET_LAST_5MINS                                        6.15
OPMET_LAST_MINUTE                                       6.17
OPMET_SET_OF_1MIN_FILES                                 6.18
OPMET_LAST_HOUR                                         6.16
OPMET_SET_OF_5MIN_FILES                                 6.19
```

PUBLIC_KEYS	6.20,6.20.1
CURRENT	6.20.2
PREVIOUS	6.20.5
SADIS_ADMINISTRATIVE_MESSAGES	6.21
SIGMETS	6.22
SIGWX_CORRECTION_MESSAGES	6.23
SIGWX_PNG	6.24
SWH_PNG	6.24.2,6.24.4
AREA_A	
AREA_B	
AREA_B1	
AREA_C	
AREA_D	
AREA_E	
AREA_F	
AREA_G	
AREA_H	
AREA_I	
AREA_J	
AREA_K	
AREA_M	
SWM_PNG	6.24.2,6.24.4
AREA_ASIA_SOUTH	
AREA_EURO	
AREA_MID	
AREA_NAT	
SPACE_WEATHER_ADVISORIES	6.25
SPECIAL_AIREP	6.26
SUPP_VOLC_ASH_CONC_DATA	6.27
CSV	
PNG	
TROPICAL_CYCLONE_ADVISORIES	6.28
TROPICAL_CYCLONE_ADVISORY_GRAPHICS	6.29
PNG_FORMAT	
TROPICAL_CYCLONE_SIGMET	6.30
VOLCANIC_ASH_ADVISORY_GRAPHICS	6.31
PNG_FORMAT	
VOLCANIC_ASH_ADVISORY_STATEMENTS	6.32
VOLCANIC_ASH_SIGMETS	6.33

APPENDIX C: TUTORIAL EXPLAINING HOW TO VERIFY INTEGRITY OF DATA DOWNLOADED FROM AN INTERNET BROWSER FTP SESSION.

*Note 1: It is important to realise that **SADIS FTP** is not designed or intended to be used via Internet browser ftp sessions. It is designed to be accessed programmatically via appropriately designed software. However, this tutorial indicates how it is possible to verify integrity of the data manually from an ftp session through a browser.*

Note 2: It is also important to realise that implementing appropriate verifying processes for either Internet browser FTP sessions or fully automated 'programmatic' procedures that are transparent to users requires some knowledge and skills of Internet security protocols. This document cannot be a fully instructional reference on what is quite a complex subject.

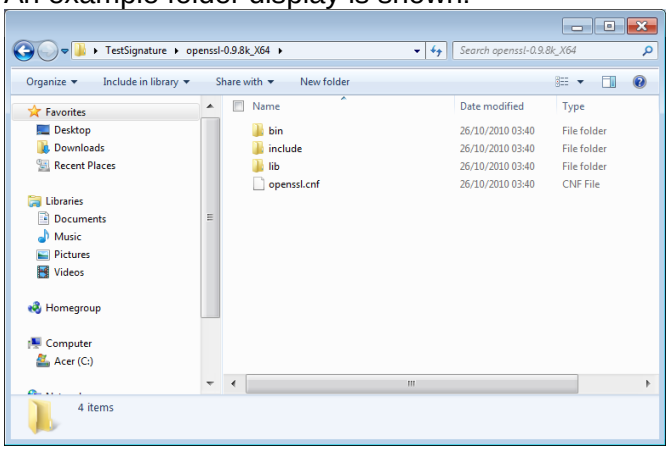
Note 3: From 2016, the SADIS FTP enhanced the certification levels used for Digital Signatures in line with industry developments. Please monitor further notices from the SADIS Manager for additional updates.

Initial actions:

Important Note: Before attempting any of these actions, ensure that your PC has been appropriately backed up. It is strongly recommended that only experienced users attempt the following. No responsibility or liability for subsequent issues will be accepted.

1) Download and install OpenSSL.

An example folder display is shown:



2) For convenience, add the path to the OpenSSL software. This can be done in Windows 7 via:

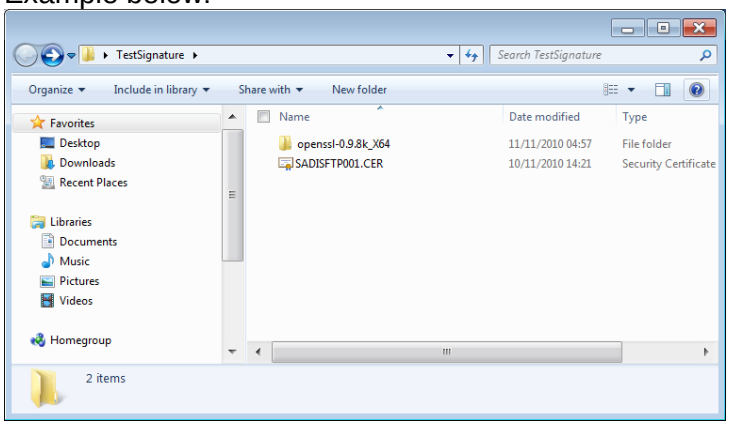
Control Panel
System and Security
System
Advanced System Settings (System Properties)
Environment Variables
System Variables (scroll down to 'path')

Add path in dialogue (*note, take care not to change or delete any existing path information*).

To verify data:

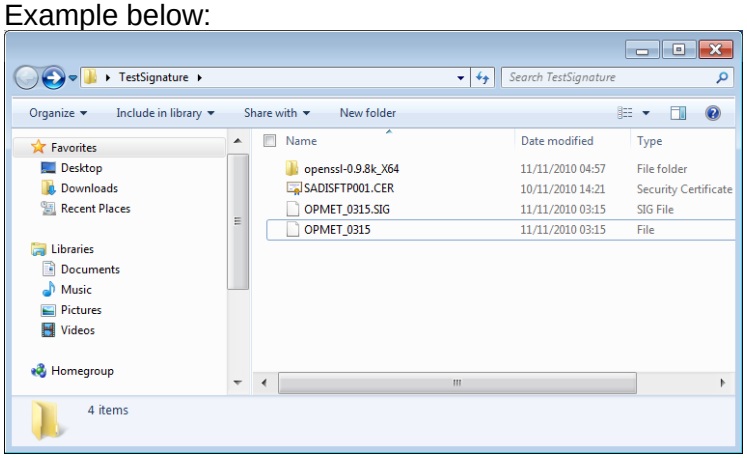
1) Copy signature from hidden folder ftp://sadisftp.metoffice.gov.uk/PUBLIC_KEYS/CURRENT/ in to an appropriate folder.

Example below:



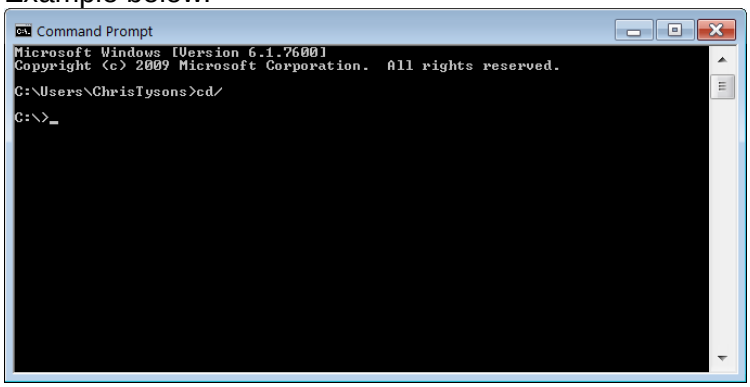
2) Copy the data file you want to download and its signature from **SADIS FTP** to an appropriate folder (in this case using the same folder for simplicity).

Example below:



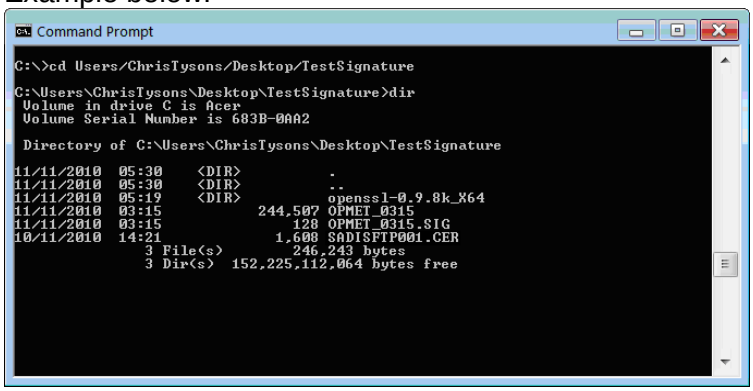
3) Open a Command Prompt (usually available via ‘All Programs; Accessories in Windows).

Example below:



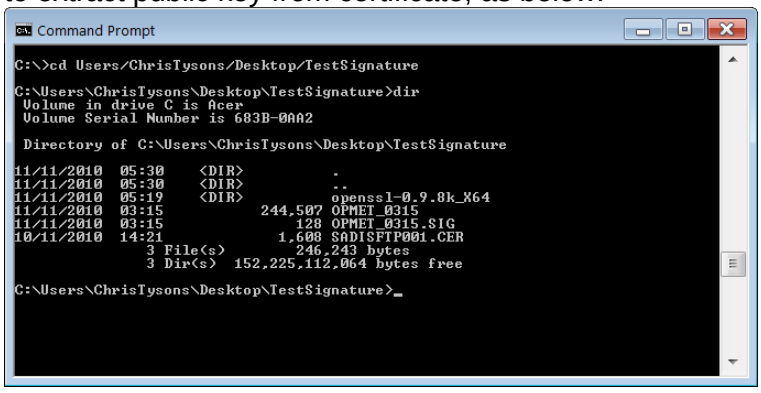
4) Navigate to directory, as below (dir command has been used to display contents).

Example below:

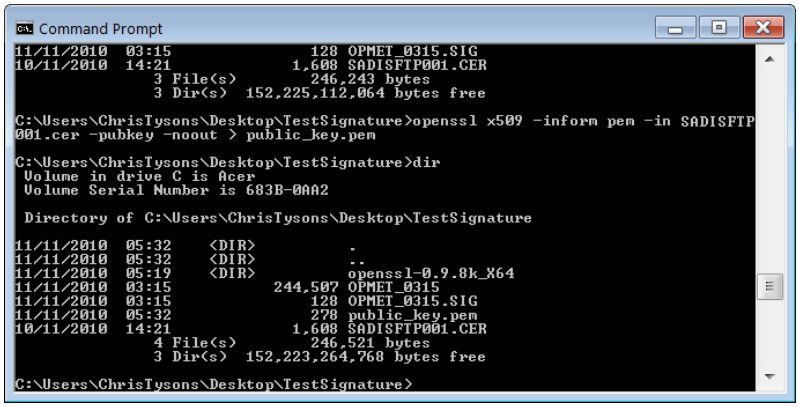


Use command:
`openssl x509 -inform pem -in sadisftp001.cer -pubkey -noout > public_key.pem`

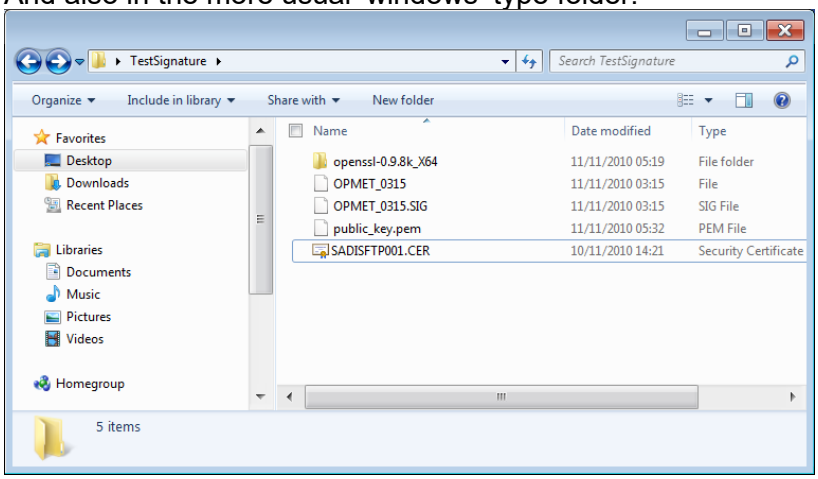
to extract public key from certificate, as below:



The public key is identified as `public_key.pem`, in the screenshot below (this need only be done once*):



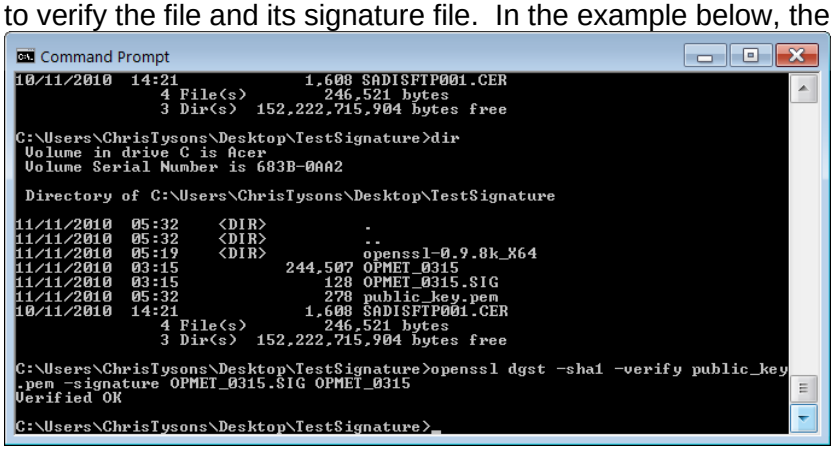
And also in the more usual 'windows' type folder:



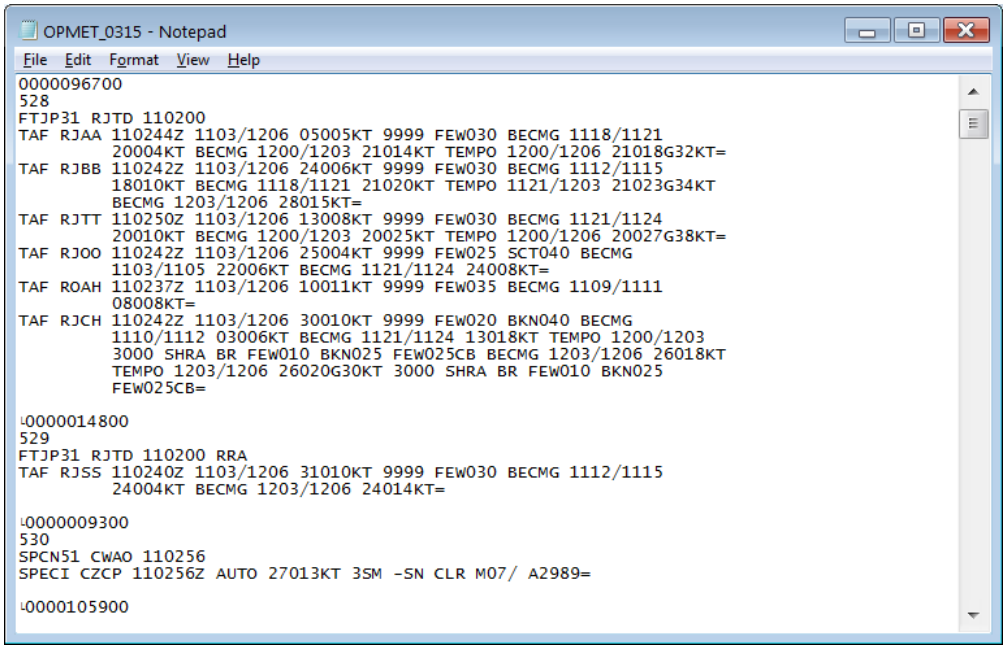
In the Command Line, use:

```
openssl dgst -sha1 -verify public_key.pem -signature OPMET_0315.SIG OPMET_0315
```

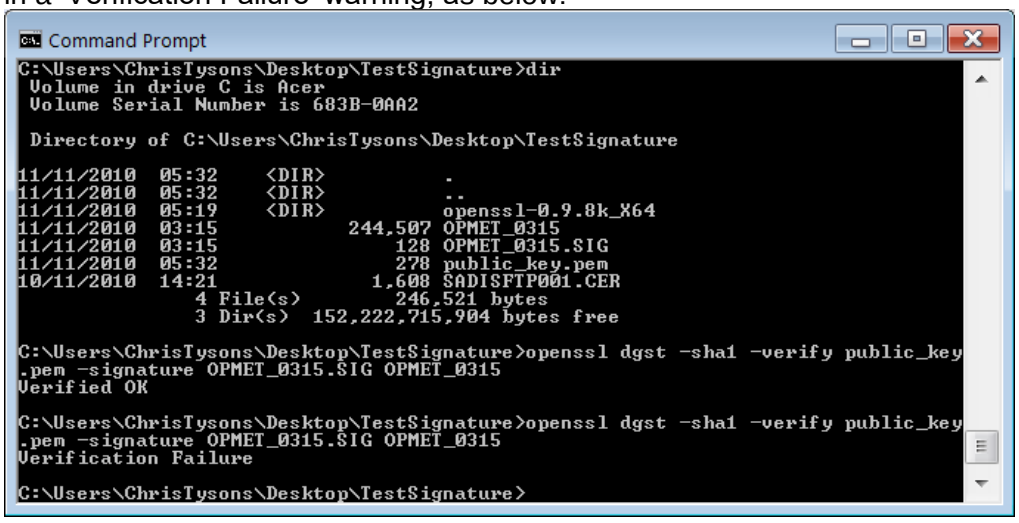
to verify the file and its signature file. In the example below, the file has 'Verified OK'.



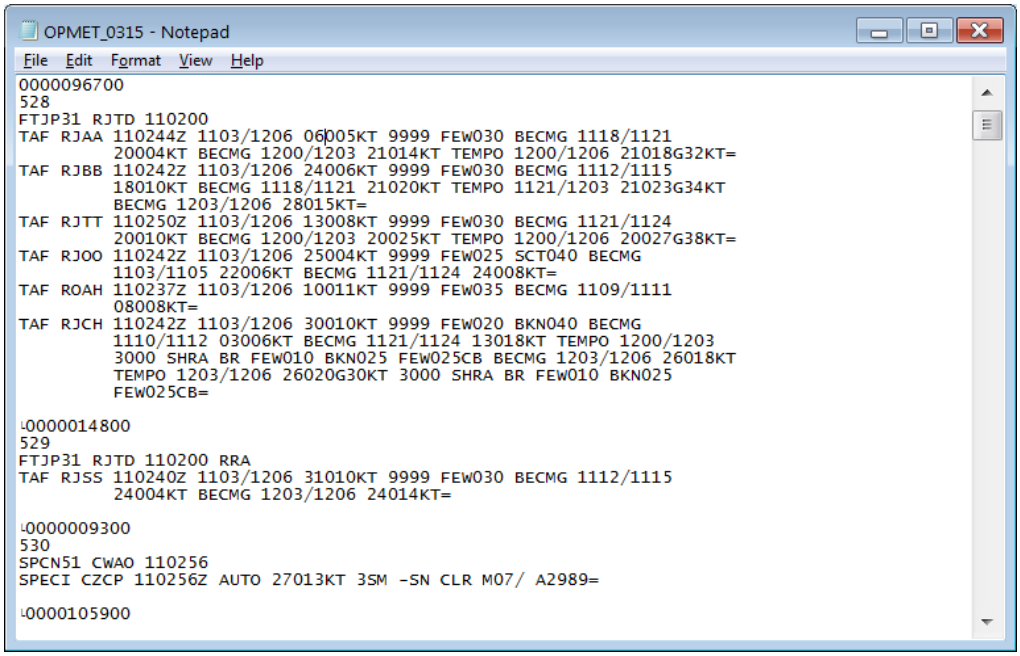
The data just verified in this manner is shown to be correct and uncorrupted or tampered with since leaving the SADIS Provider's systems and during its transmission over the internet. See below for a partial image of the data verified.



If the contents of the file are changed and saved, then any subsequent attempts to verify will result in a 'Verification Failure' warning, as below:



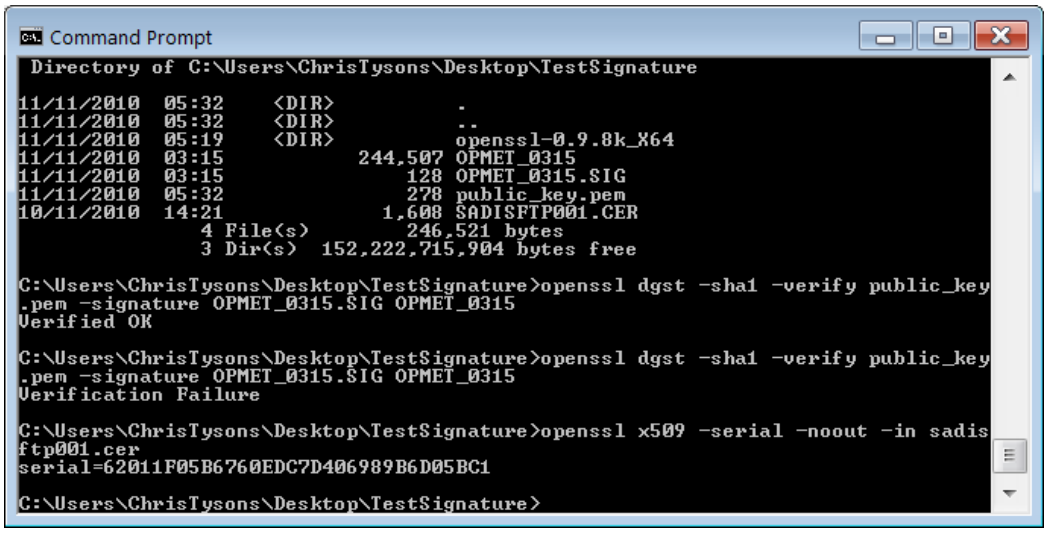
The changed text is indicated below. The wind had been changed from 05005KT to 06005KT for TAF RJAA. This 'tampering' is detected, and warned by the failure notification.



Additional commands.

The Serial Number of the Certificate can be obtained via the command:
`openssl x509 -serial -noout -in sadisftp001.cer`

As below:



It is possible to extract information from the certificate using the x509 option of OpenSSL. For example, the following command will show all available certificate information.
`openssl x509 -text -in SADISFTP001.CER`

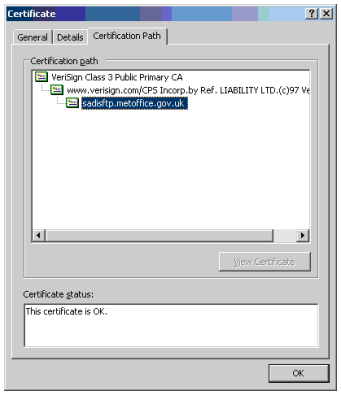
Of particular note is the OCSP field within the certificate text:

`OCSP - URI:http://ocsp.verisign.com`

This is the Online Certificate Status Protocol URI than can be used to check – online – the revocation status of a particular certificate.

Verifying Public Key Certificates

Verifying the public key certificate can be carried out with the OpenSSL 'verify' command; this will verify it against the list of trusted CA certificates. Note that a chained certificate (where the digital certificate is actually signed by an intermediate CA certificate, which is in turn signed by the root key), will require that the appropriate CA certificate be added to the bundle of trusted CA certificates (or passed as parameters to the OpenSSL command). A quick way of identifying a certificate chain within, for example, Windows, is simply to double-click it.



Here, we can see that the certificate was signed by an intermediate CA key, which was itself signed by the root CA key.

The intermediate (and root, if required) CA certificates can be exported, or downloaded from the issuer. Depending on installation, CA certificates can either be kept locally and passed explicitly to the verification command, or added to the bundle of trusted CA certificates – again, depending on installation.

The basic command to verify a certificate is:

```
openssl verify SADISFTP001.CER
```

The response should be:

```
SADISFTP001.CER: OK
```

The command above is assuming that OpenSSL has the necessary CA certificates within its CA bundle; if not, the chain can be explicitly passed using the `-CAfile` or `-CApath` as appropriate.

Online Certificate Status Protocol

It is possible to use OpenSSL to connect to the issuing certificate authority's OCSP server in order to carry out a check against certificate revocation lists held by the CA.

Let us assume that we have a `x509` public key certificate called `SADISFTP001.CER`, an intermediate CA certificate called `CAinter.cer`, the CA root certificate called `CAroot.cer`, and a file called `chain.cer`, which contains a concatenation of `CAroot.cer` and `CAinter.cer`.

We can now execute this command:

```
openssl ocsp -issuer CAinter.cer -cert SADISFTP001.CER -url
http://ocsp.verisign.com -text -CAfile chain.cer
```

Upon execution, openssl will connect to the specified OCSP server and return a response of the certificate status – one of 'good', unknown and revoked.

```
OCSP Request Data:
    Version: 1 (0x0)
    Requestor List:
        Certificate ID:
          Hash Algorithm: sha1
…
Response verify OK
SADISFTP001.CER: good
        This Update: Nov 10 04:37:54 2010 GMT
        Next Update: Nov 14 04:37:54 2010 GMT
```

It is worth noting the `CAfile` option. The response from the OCSP server is, itself, signed; the `CAfile` option specifies the CA certificates that are needed to validate the response. Some vendors do not include the certificate in the response, and it has to be manually specified by the `VAfile` option. Workstation suppliers should ensure they build in appropriate algorithms to process and verify signatures from a range of Certificate Authorities.

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APPENDIX D: DESCRIPTION OF WAFS GRIB2 CUMULONIMBUS CLOUD, ICING, TURBULENCE UPPER AIR FORECAST DATA

For more information regarding these forecast parameters, users can find links to the following documents on the METP WG-MOG webpages. Accessed via URL https://www.icao.int/airnavigation/METP/Pages/Public-Documents.aspx within the MOG-WAFS Reference Document section.

WAFS_HazardGridUserGuide
A document giving information regarding the parameters - theoretical range of data, missing data values. Information is also provided explaining how the data can be used.

New_WAFS_0.25_degree_hazard_data_sets
A document giving information on the three new data sets that were added to SADIS in November 2020.

Nov 2020 NEW WAFS Hazard data training material
This document gives more in-depth information on the new turbulence and icing data sets being provided at 0.25 degree resolution

WAFS GRIB2 Specification (V5.3)
A document that provides detail on the flight level, time-step and parameters produced, and their WMO AHL identifications

Training module regarding gridded forecasts for CB, icing and turbulence
An internet based training module with English language voice over. In addition, there are static PDF versions of the training module with the text translated into Chinese, French, Russian, Spanish and Arabic.

WAFC London WAFS Upper Air Forecast GRIB2 Dataset Guide (V1.5)
A document giving a basic introduction the WAFS Upper Air Forecasts in GRIB2 format

Representing WAFS SIGWX Data in BUFR - V4 3
Guidance describing how WAFS SIGWX BUFR data should be interpreted and visualised.

WAFS Change Imp Notice
Document describing planned changes by the WAFCs

APPENDIX E: METHODOLOGY USED FOR CORRECTING WAFS SIGWX AND WAFS GRIB2 DATA.

1.0 Introduction

This document describes how the WAFCs will send corrected Significant Weather Forecasts (SIGWX) and GRIB2 Forecasts. Please note that the WAFCs will not update or amend previously issued forecasts because new weather information becomes available. The WAFCs will only issue corrections to address errors, such as missing information or corruption.

2.0 General Methodology

2.1 When a BUFR, PNG or GRIB2 file needs to be corrected, it will have 'CCA' added to its WMO AHL. For example, if the original 'JUCE00 EGRR 191800' bulletin requires correction, then 'JUCE00 EGRR 191800 CCA' would be issued. If further corrections are necessary, the 2nd correction will have 'CCB' added to its WMO AHL, and the third correction will have 'CCC', and so on. For simplicity and brevity, only 'CCA' will be referenced subsequently in this document.

2.2 On the SADIS FTP, all of the associated files will also have the 'CCA' indicator added to their filename as well. For example, if the Jets BUFR file needs to be corrected, the Jets BUFR file and all the other BUFR and PNG files, such as the Cloud and Trop files, will be renamed with 'CCA' appended to their filenames.

2.4 The SADIS FTP will replace all the associated files with the re-distributed files, appending 'CCA' to the filenames. The original files will be deleted.

2.5 A strictly formatted administrative message (FXUK66 EGRR for WAFC London, FXUS66 KKCI for WAFC Washington) will be sent to notify users of the correction. The format and proposed WMO headers of this administrative message can be found in Section 1 of this Appendix. Note, these administrative messages are in addition to the FXUK65 EGRR and FXUS KKCI messages.

2.6 Corrected PNG charts will have the 'CCA' added to the bulletin ID, found in the top left corner of the PNG chart.

2.7 User created visualizations of BUFR and GRIB2 forecasts should note that the underlying data was corrected in an appropriate manner.

2.8 Examples of corrected BUFR and GRIB2 files can be found in Annex C and D of this Appendix.

2.9 WAFC London can supply complete sample files for original and corrected WAFC London SIGWX forecasts. Please contact SADISmanager@metoffice.gov.uk

Section 1: Example filename convention relating to corrected data

The tables below provide examples of filenames of corrected products for both WIFS and the SADIS FTP. Note that the corrected files will be in the same directories as the original files, and the original files will be deleted.

SADIS FTP

Product type	**Example Original Filename**	**Example Corrected Filename**
PNG	PGCE05_EGRR_0000.PNG	PGCE05_EGRR_0000_CCA.PNG
BUFR	JUCE00_EGRR_191800	JUCE00_EGRR_191800_CCA
GRIB2	T+06_0000	T+06_0000_CCA
Signature	JUCE00_EGRR_191800.SIG	JUCE00_EGRR_191800_CCA.SIG

WIFS

Product	**Original Filename**	**Corrected Filename**
PNG	20140127_0600_PGAE05_KKCI.png	20140127_0600_PGAE05_KKCI_CCA.png
BUFR	20140127_0600_JUBE99_KKCI.bufr	20140127_0600_JUBE99_KKCI_CCA.bufr
GRIB2	20140127_1800f18.grib2	20140127_1800f18_CCA.grib2

Section 2: Format of FXUK66 EGRR and FXUS66 KKCI messages

Example of the format of the Administrative Message used to notify users of corrections to SIGWX or GRIB2 products. Note that WAFC London will use the WMO header FXUK66 EGRR, and WAFC Washington will use the WMO Header FXUS66 KKCI. Users should use this message as a trigger to update their software with new files.

```
FXUK66 EGRR 200343

RETRANSMITTED WAFC LONDON DATA:

DATA TYPE: WAFC LONDON SIGWX BUFR AND PNG

ORIGINAL WMO AHL: PG//// EGRR 191800

                  JU//// EGRR 191800

RETRANSMITTED WMO AHL: PG//// EGRR 191800 CCA

                       JU//// EGRR 191800 CCA

WHERE PG//// REPRESENTS ALL WAFC LONDON SIGWX PNG FILES

AND JU//// REPRESENTS ALL WAFC LONDON SIGWX BUFR FILES

ALL WAFC LONDON SIGWX BUFR AND PNG FILES INDICATED ABOVE ARE

NOW BEING RE-TRANSMITTED.

ISSUED BY WAFC LONDON=
```

Section 3: Example corrected BUFR file content.

Example of the first few lines of a corrected BUFR file, if it were dumped to text by software such as Microsoft Notepad.

```
0000179500
958
JUCE00 EGRR 191800 CCA
BUFR À————————————————————    J      @   o
```

Section 4: Example corrected GRIB2 file content.

Example of a corrected GRIB2 file if it were dumped to text by software such as Microsoft Notepad.

```
0002938400
639
YUXC85 EGRR 210000 CCA
GRIB          r¥     J Ý
```

Section 5: The SADIS FTP policy.

Re-issuance of WAFC London corrected SIGWX.

On the SADIS FTP, SIGWX BUFR files are located in the 'BUFR' directory, under which there are two subfolders:

```
11/08/2010 12:00AM      Directory EGRR
09/01/2010 12:00AM      Directory KKCI
```

Within each of EGRR and KKCI, lie 'parameter' subfolders

```
10/21/2013 12:50PM      Directory H_CAT
10/21/2013 12:50PM      Directory H_EMBEDDED_CB
10/21/2013 12:50PM      Directory H_FRONTS
10/21/2013 12:50PM      Directory H_JETS
10/21/2013 12:50PM      Directory H_TROP
10/21/2013 12:50PM      Directory M_CAT
10/21/2013 12:50PM      Directory M_CLOUD
10/21/2013 12:50PM      Directory M_FRONTS
10/21/2013 12:50PM      Directory M_JETS
10/21/2013 12:50PM      Directory M_TROP
10/21/2013 12:50PM      Directory OTHER_PARAMETERS
```

SIGWX BUFR, files are presented thus within their 'parameter' folder:

```
10/20/2013 12:50AM           1,805 JUCE00_EGRR_191800
10/20/2013 12:50AM             256 JUCE00_EGRR_191800.SIG
10/20/2013 06:50AM           1,911 JUCE00_EGRR_200000
10/20/2013 06:50AM             256 JUCE00_EGRR_200000.SIG
10/20/2013 12:50PM           1,455 JUCE00_EGRR_200600
10/20/2013 12:50PM             256 JUCE00_EGRR_200600.SIG
10/20/2013 06:50PM           1,429 JUCE00_EGRR_201200
10/20/2013 06:50PM             256 JUCE00_EGRR_201200.SIG
10/21/2013 12:50AM           2,295 JUCE00_EGRR_201800
10/21/2013 12:50AM             256 JUCE00_EGRR_201800.SIG
10/21/2013 06:50AM           2,431 JUCE00_EGRR_210000
10/21/2013 06:50AM             256 JUCE00_EGRR_210000.SIG
10/21/2013 12:50PM           1,761 JUCE00_EGRR_210600
10/21/2013 12:50PM             256 JUCE00_EGRR_210600.SIG
```

Consider, the High Level CAT parameter (H_CAT):

```
10/20/2013 12:50AM           1,805 JUCE00_EGRR_191800
```

This is how the original data is represented as 'text' (for example in notepad), WMO AHL bulletin ID is highlighted.

```
0000179500
958
JUCE00 EGRR 191800
BUFR à————————————————————     J       @
————————————————————
```

This is how the corrected version of the file would be indicated

```
0000179500
958
JUCE00 EGRR 191800 CCA
BUFR à————————————————————     J       @
```

Since the policy is that when a correction is issued for WAFS SIGWX forecasts, **all** SIGWX BUFR parameters originally issued by that WAFC will be re-issued (including those parameters that do not have an error). Similar actions will take place for all SIGWX BUFR files issued by that WAFC corrected from the original 191800 data time in this example.

i.e. the following files would be issued:

JUWE96_EGRR_191800_CCA	(BUFR high level jetstreams)
JUCE00_EGRR_191800_CCA	(BUFR high level CAT)
JUBE99_EGRR_191800_CCA	(BUFR high level cloud)
JUTE97_EGRR_191800_CCA	(BUFR high level TROP)
JUFE00_EGRR_191800_CCA	(BUFR high level fronts)
JUVE00_EGRR_191800_CCA	(BUFR high level TRS, Volcano, Radiation)
JUOE00_EGRR_191800_CCA	(BUFR medium level TROP)
JUTE00_EGRR_191800_CCA	(BUFR medium level jetstreams)
JUJE00_EGRR_191800_CCA	(BUFR medium level fronts)
JUNE00_EGRR_191800_CCA	(BUFR medium level cloud)
JUME00_EGRR_191800_CCA	(BUFR medium level CAT)

The PNGs would also be reissued.
They are presented thus on the SADIS FTP:

In the 'SIGWX_PNG' folder there are two subfolders

```
09/01/2010 12:00AM      Directory SWH_PNG
09/01/2010 12:00AM      Directory SWM_PNG
```

In SWH_PNG:

```
10/21/2013 12:55PM      Directory AREA_A
10/21/2013 12:50PM      Directory AREA_B
10/21/2013 12:55PM      Directory AREA_B1
10/21/2013 12:50PM      Directory AREA_C
10/21/2013 12:50PM      Directory AREA_D
10/21/2013 12:50PM      Directory AREA_E
10/21/2013 12:55PM      Directory AREA_F
10/21/2013 12:50PM      Directory AREA_G
10/21/2013 12:55PM      Directory AREA_H
10/21/2013 12:55PM      Directory AREA_I
10/21/2013 12:55PM      Directory AREA_J
10/21/2013 12:50PM      Directory AREA_K
10/21/2013 12:55PM      Directory AREA_M
```

In SWM_PNG

```
10/21/2013 12:50PM      Directory AREA_ASIA_SOUTH
10/21/2013 12:50PM      Directory AREA_EURO
10/21/2013 12:50PM      Directory AREA_MID
10/21/2013 12:55PM      Directory AREA_NAT
```

As an example (from AREA E)

```
10/21/2013 06:50AM         89,817 PGCE05_EGRR_0000.PNG
10/21/2013 06:50AM            256 PGCE05_EGRR_0000.PNG.SIG
10/21/2013 12:50PM         88,168 PGCE05_EGRR_0600.PNG
10/21/2013 12:50PM            256 PGCE05_EGRR_0600.PNG.SIG
10/20/2013 06:50PM         87,399 PGCE05_EGRR_1200.PNG
10/20/2013 06:50PM            256 PGCE05_EGRR_1200.PNG.SIG
10/21/2013 12:50AM         90,284 PGCE05_EGRR_1800.PNG
10/21/2013 12:50AM            256 PGCE05_EGRR_1800.PNG.SIG
```

Corrected SIGWX PNGs would be replaced with the following:

```
10/21/2013 06:50AM         89,817 PGCE05_EGRR_1800 CCA.PNG
10/21/2013 06:50AM            256 PGCE05_EGRR_1800 CCA.PNG.SIG
```

All other SIGWX PNGs would be similarly re-issued with the following filenames on the SADIS FTP.

PGSE05_EGRR_191800_CCA	(PNG ICAO High Level SIGWX Area B)
PGRE05_EGRR_191800_CCA	(PNG ICAO High Level SIGWX Area C)
PGZE05_EGRR_191800_CCA	(PNG ICAO High Level SIGWX Area D)
PGGE05_EGRR_191800_CCA	(PNG ICAO High Level SIGWX Area E)
PGCE05_EGRR_191800_CCA	(PNG ICAO High Level SIGWX Area G)
PGAE05_EGRR_191800_CCA	(PNG ICAO High Level SIGWX Area H)
PGKE05_EGRR_191800_CCA	(PNG ICAO High Level SIGWX Area M)
PGDE14_EGRR_191800_CCA	(PNG ICAO Medium Level SIGWX Area EURO)
PGCE14_EGRR_191800_CCA	(PNG ICAO Medium Level SIGWX Area MID)
PGZE14_EGRR_191800_CCA	(PNG ICAO Medium Level SIGWX Area S ASIA)

An automated SIGWX Correction message would be sent with the following:

```
FXUK66 EGRR 200343

RETRANSMITTED WAFC LONDON DATA:

DATA TYPE: WAFC LONDON SIGWX BUFR AND PNG

ORIGINAL WMO AHL: PG//// EGRR 191800

                  JU//// EGRR 191800

RETRANSMITTED WMO AHL: PG//// EGRR 191800 CCA

                       JU//// EGRR 191800 CCA

WHERE PG//// REPRESENTS ALL WAFC LONDON SIGWX PNG FILES

AND JU//// REPRESENTS ALL WAFC LONDON SIGWX BUFR FILES

ALL WAFC LONDON SIGWX BUFR AND PNG FILES INDICATED ABOVE ARE

NOW BEING RE-TRANSMITTED.

ISSUED BY WAFC LONDON=
```

In addition, the usual `FXUK65 EGRR` message will be issued to inform those users who a) have not got systems that can re-process the re-issued files, or are – for whatever reason – unable to obtain updated visualisations (soft or hard copy).

1) Should further corrections be necessary, then the sequence `CCB`, `CCC`, `CCD` etc will be followed.

2) Should such messages be received from WAFC Washington, then they will be processed as described above for WAFC London SIGWX. The `FXUS66 KKCI` would be issued by WAFC Washington and distributed to inform users, and act as a trigger.

For GRIB2 data:

On the SADIS FTP, GRIB2 data is in the 'GRIB2' folder. There is a subfolder;

```
06/15/2011 12:00AM      Directory COMPRESSED
```

And two lower level subfolder for WAFC London and WAFC Washington data.

```
08/20/2013 12:14PM      Directory EGRR
08/20/2013 12:14PM      Directory KWBC
```

Folders for CB, icing and turbulence are provided, and time-step concatenated GRIB2 bulletins. (sub folders in the CAT, CB, ICE and TURB also concatenate the GRIB2 data into separate time steps).

```
08/20/2020 12:14PM      Directory CAT
08/20/220 12:14PM       Directory CB
08/20/2020 12:14PM       Directory CB_0.25
08/20/2020 12:14PM      Directory ICE
08/20/2020 12:14PM      Directory ICE_0.25
08/20/2020 12:14PM      Directory TURB
10/21/2020 12:45PM      Directory T+06
10/21/2020 12:45PM      Directory T+09
10/21/2020 12:45PM      Directory T+12
10/21/2020 12:45PM      Directory T+15
10/21/2020 12:45PM      Directory T+18
10/21/2020 12:45PM      Directory T+21
10/21/2020 12:45PM      Directory T+24
10/21/2020 12:45PM      Directory T+27
10/21/2020 12:45PM      Directory T+30
10/21/2020 12:45PM      Directory T+33
10/21/2020 12:45PM      Directory T+36
```

So, typically, for the T+06 folder:

```
10/21/2020 03:30AM      1,550,574 T+06_0000
10/21/2020 03:30AM            256 T+06_0000.SIG
10/21/2020 09:30AM      1,550,375 T+06_0600
10/21/2020 09:30AM            256 T+06_0600.SIG
```

A very truncated 'text' version of the T+06_0000 file is shown below, the WMO AHL of the bulletin is highlighted:

```
0002938400
639
YUXC85 EGRR 210000
GRIB          r¥     J Ý
       H————————————————————————    £                                  '          …]J€
0 ——————————————————————————————————————————————————————————————————————————————
 ÿd  ÓæÆmÑ×òmòð÷ÿ•       n³ ÿ"Ïü0ìPToìin£³Ä»lÇmTL«¾Êüû`JÉì?b0Z%îG»
etc etc
```

On SADIS FTP, each concatenated file will contain corrected bulletins (note modified WMO AHLs):

```
0002938400
639
YUXC85 EGRR 210000 CCA
GRIB          r¥     J Ý
       H————————————————————————    £                                  '          …]J€
0]J€b0 Ð Ð@   €ÈjwE,£jU¥,o!FRð;Â}@Ó§————————————————————————=i°åh]^'ðžW
etc etc
640
YUXC70 EGRR 210000 CCA
GRIB          oË     J Ý
```

etc etc

An automated GRIB2 Correction message will be sent with the following:

```
FXUK66 EGRR 200343

RETRANSMITTED WAFC LONDON DATA:

DATA TYPE: WAFC LONDON GRIB2 UPPER AIR FORECASTS

ORIGINAL WMO AHL: Y/X/// EGRR 210000

RETRANSMITTED WMO AHL: Y/X/// EGRR 210000

WHERE Y/X/// REPRESENTS ALL WAFC LONDON GRIB2 WAFS FILES

ALL WAFC LONDON GRIB2 WAFS FILES INDICATED ABOVE ARE NOW

BEING RE-TRANSMITTED.

ISSUED BY WAFC LONDON=
```

Should further corrections be necessary, then the sequence CCB, CCC, CCD etc will be followed.

— END —