



International Civil Aviation Organization

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Agenda Item 8 (2): Review Transition to the final phase of WAFS

WAFC LONDON BACKUP PROCEDURES DURING TRANSITION TO EXETER

(Presented by the United Kingdom and the United States)

SUMMARY

A comprehensive range of WAFS backup procedures have been established to cover both the period of relocation of WAFC London from Bracknell to Exeter, and after operations commence in Exeter.

1. Introduction

1.1 During 2003 the Met Office, including all aspects of WAFC London, will be relocating from Bracknell to Exeter (a distance of approximately 240 km). This move involves the physical relocation of all the operational aspects of WAFC London's operations, including forecast production facilities, data collection and distribution services, and supercomputer infrastructure. Throughout the period of transition of services to Exeter, it is our objective to minimize and ideally eliminate any disruption to operational services.

1.2 Transition will be a staged project, implemented over a protracted period of time. The majority of operationally critical systems will migrate to Exeter during the period May to November 2003. Throughout this transition there will be specific periods during which WAFC London is at risk from potential disruption to services. This paper details the backup plans that are in place to ensure that in the event of service delivery problems, operational WAFS products can still be distributed to customers.

2. Main System Move Dates

2.1 It is clear that WAFC London is dependent on a complex series of interrelated services to enable it to carry out its roles as a WAFC. However some of these services are particularly important to the functioning of the WAFC. It is during the periods when these operationally critical services are being relocated to Exeter and subsequently brought back into operational service, that WAFC London is exposed to extra risk. These critical systems and scheduled relocation periods are highlighted below.

System	Scheduled Move/Implementation Dates
Super Computers – T3Es	17 June – 29 July, and 2 September – 9 October 2003
Computational front end computers –GPCS	11 July – 22 July, and 29 July – 5 August 2003

Message Switch – FROST
SADIS
National Meteorological Centre

5 May – 28 May, and 5 June to 12 June 2003
16 October – 14 November 2003
5 – 25 August 2003

3. Backup Plan throughout Transition

3.1 Throughout the transition period two physically separate ‘fat pipes’ (i.e. large capacity – 155Mbps – bandwidth fibre optic cables) will link Bracknell and Exeter. This allows systems to be physically separate from one another, but operate as a complex, interconnected web.

The backup plan will be presented by way of actions and procedures that are in place to cover a number of different scenarios.

3.2 Numerical Weather Prediction (NWP) production interruption (supercomputer)

3.2.1 A global grid point atmospheric model runs as part of the Met Office operational suite. The NWP output from this model forms the basis for the wind and temperature messages produced in GRIB and T4 (fax) bulletins. In addition, the model output is available to the WAFC London forecasters. Two, nearly identical, supercomputers are used by the Met Office, allowing the global model to run on either machine. The supercomputers will be installed in Exeter during July and September 2003. At no time during transition will there be a period when a backup supercomputer is unavailable. This ensures that routine or non-routine maintenance can be performed on one of the supercomputers without affecting the operational capability of WAFC London.

3.2.2 In the event that the global model cannot be run on either supercomputer two courses of action are possible. The first time a model run is delayed or cannot be produced, WAFC London will use the data from the previous model run incremented forwards by six hours. In the event that a second consecutive run is unsuccessful, WAFC London will use the data from the last good run, incremented forwards by 12 hours. If three or more successive runs fail then a decision will be taken as to whether data from the last good run is used, or whether NWP data routinely received from WAFC Washington is used for the production of the products. If a decision is taken to use the Washington data then it will be ‘re-processed’ with WAFC London headers so that it is accepted by end systems.

3.3 NWP Post-Processing Interruption (GPCS)

3.3.1 It is possible that the global model may run successfully, and the post-processing computer (GPCS) fails to produce the GRIB and T4 data, and diagnostic fields for the significant weather forecasts. The first time a post-processing run is delayed or cannot be produced, the data from the previous run would be used. For longer or prolonged outages the WAFC Washington post-processed data may be requested and distributed normally when received. However it should be noted that in such a situation the distributed data would contain WAFC Washington headers. Throughout the period of transition there will always be an operational GPCS and a hot standby. These two systems will at times be located in entirely different physical locations.

3.4 Significant Weather (SIGWX) Production Interruption

3.4.1 In the event of a failure at the primary WAFC operational workstation, the forecaster would use a backup workstation located on the forecast floor. In Exeter, an entire backup production centre is available. Sections 3.1 and 3.2 address the procedures that would be used in the case of a failure of the NWP system. If Bracknell or Exeter is completely out, section 3.6 describes the plans for “Complete Loss of WAFC Products.”

3.5 *Message Switch Interruption*

3.5.1 Two message switches exist. Prior to transition, the primary is located at the Met Office in Bracknell with a backup at High Wycombe. In the event of a failure at the primary switch, the backup switch would be used to send and receive data. The backup switch is connected to Washington and Toulouse, but not to the SADIS. (See the section 3.6 on the: “Complete loss of WAFS products.”) During the period of transition, three message switches will be available. At any one time there will always be a live operational switch, and a hot standby. These switches will at times be located in physically separate places, though accessible to each other via the ‘fat pipes’.

3.6 *Satellite Up-link and Satellite System Interruption*

3.6.1 The operation of the communication satellite used for the SADIS is outside the control of WAFS London. The reliability and availability of these communication services is guaranteed by the commercial provider used – Cable & Wireless. The first schematic diagram below highlights the infrastructure that is in place to populate the SADIS with operational WAFS data. The second diagram shows the reciprocal arrangement in the U.S. for populating the ISCS with data.

3.6.2 It should be noted that at the time of writing action is being taken to establish an ISDN service between the Washington message switch and the SADIS uplink station that could be used to transmit operational data to the satellite in the event of a major communications failure in the UK.

Diagram 1. SADIS Communications Infrastructure.

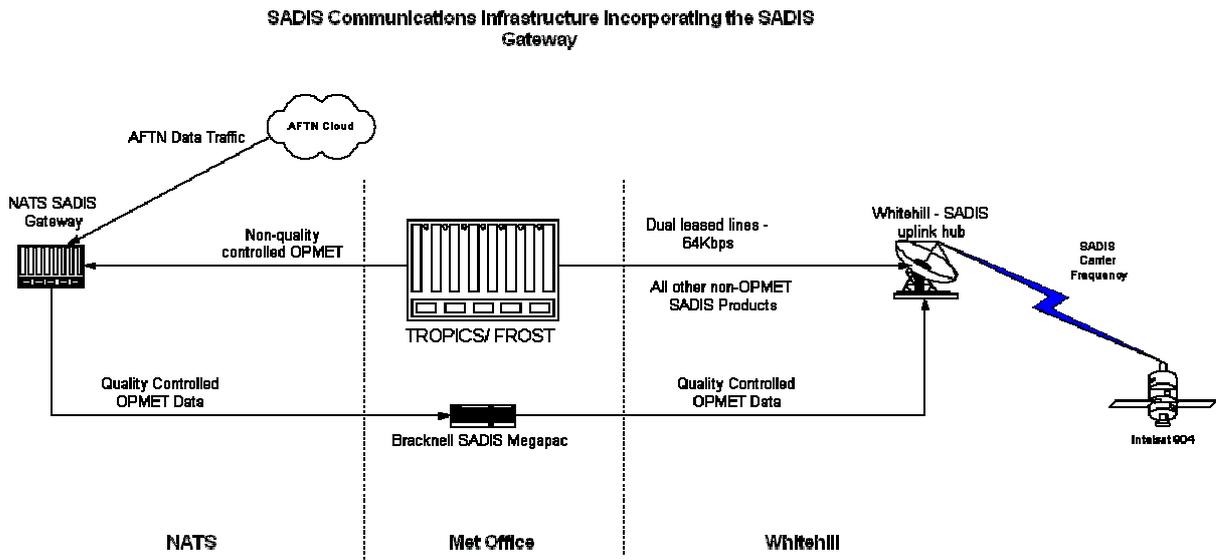
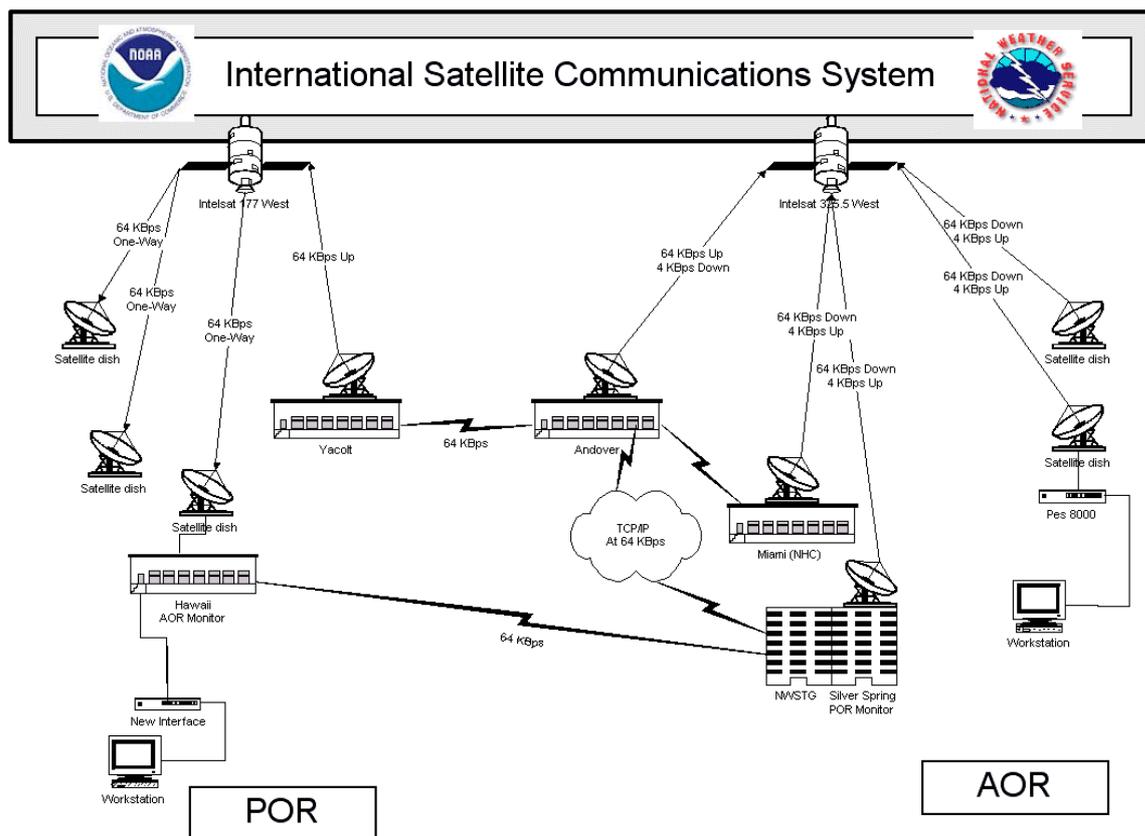


Diagram 2. ISCS Communications Infrastructure.



3.7 Complete loss of WAFIC Products

3.7.1 In the event that WAFIC London (Bracknell) is completely out, the forecasters could relocate to High Wycombe to produce the significant weather products for a limited time. In the event that the primary production facilities at WAFIC London (Exeter) are out, the forecasters will relocate to the backup forecast office. However during transition, more than likely, WAFIC Washington would be called on to produce all of the WAFIC London GRIB and T4 products, since the NWP computers may also be out.

3.7.2 When Bracknell is completely out the ISDN dial-up line maintained between Washington and High Wycombe is used to receive data from Washington. A similar arrangement will be in place between Washington and Exeter (IT hall 2). This circuit is a physical backup to the link that is normally in place between Washington and London (Bracknell), and is used only when a major failure occurs at Bracknell or the normal link is severed. When a decision is made to utilise this line, the Washington message switch (NWSTG) is notified by the Met Office to begin sending data on the ISDN circuit.

3.7.3 Data received from Washington at the High Wycombe switch is routed only to those recipients connected to the backup switch. Currently, this includes stations within the UK, and Toulouse (for onward distribution). There is no link between High Wycombe and the SADIS up link site at Whitehill. Thus, WAFS products sent to High Wycombe from Washington cannot be placed on the SADIS broadcast. A dial-up ISDN service is in the process of being installed between NWSTG (Washington) and Whitehill to enable Washington to populate SADIS with operational WAFS products in the event of WAFIC London being completely out. It should be noted that in such a scenario, the SADIS FTP backup service (commonly called the SADIS Standard Service) would be unavailable.

4. Routine and Backup Significant Weather Chart Information

4.1 The following table summarises the ICAO areas and associated WMO headers for both routine and backup high-level significant weather charts. This information may be used to update WAFS workstation data management systems.

SWH Area	Originating WAFC	WMO Header
A	Routine: Washington	PGEE07 KKCI
	Backup: London	PGEE07 EGRR
B	Routine: London	PGSE06 EGRR
	Routine: Washington	PGIE07 KKCI
B1	Routine: Washington	PGIE07 KKCI
	Backup: London	PGIE07 EGRR
C	Routine: London	PGRE06 EGRR
	Backup: Washington	PGRE06 KKCI
D	Routine: London	PGZE06 EGRR
	Backup: Washington	PGZE06 KKCI
E	Routine: London	PGGE06 EGRR
	Backup: Washington	PGGE06 KKCI
F	Routine: Washington	PGGE07 KKCI
	Backup: London	PGGE07 EGRR
G	Routine: London	PGCE06 EGRR
	Backup: Washington	PGCE06 KKCI
H	Routine: London	PGAE06 EGRR
	Routine: Washington	PGAE07 KKCI
I	Routine: Washington	PGBE07 KKCI
	Backup: London	PGBE07 EGRR
J	Routine: Washington	PGJE07 KKCI
	Backup: London	PGJE07 EGRR
K	Routine: London	PGKE06 EGRR
	Backup: Washington	PGKE06 KKCI
M	Routine: Washington	PGDE30 KKCI
	Backup: London	PGDE30 EGRR

Please note that WAFS chart covering area B1 is not currently part of the SADIS broadcast schedule.

SWM Area	Originating WAFC	WMO Header
EURO	Routine: London	PGDE15 EGRR
	Backup: Washington	
MID	Routine: London	PGCE15 EGRR
	Backup: Washington	
ASIA SOUTH	Routine: London	PGZE15 EGRR
	Backup: Washington	
NAT	Routine: Washington	TTAAii KKCI
	Backup: London	

5. Backup Tests

5.1 During 2003 the following backup tests have been implemented:

WAFC London backing up WAFC Washington SWH charts. [Successfully implemented March 2003.]

WAFC Washington backing up WAFC London SWH charts. [Successfully implemented March 2003.]

WAFC Washington backing up WAFC London SWH and SWM charts. [Successfully implemented 28 May 2003.]

WAFC London distributes 're-processed' WAFC Washington derived WAFS GRIB data. [Test to be scheduled.]

6. Conclusion

The relocation of WAFC London to Exeter will provide many advantages that include access to state-of-the-art production facilities with a dedicated backup infrastructure, and a work environment conducive to team working and innovation. The significant efforts that are taking place to minimise customer exposure to risk throughout our relocation are designed to ensure that it is 'business as usual' for WAFC London throughout 2003.