

**INTERNATIONAL CIVIL AVIATION ORGANIZATION**  
**CAR/SAM REGIONAL AIR NAVIGATION PLANNING AND IMPLEMENTATION GROUP**  
**(GREPECAS)**  
**FOURTH MEETING OF THE AERONAUTICAL METEOROLOGY SUBGROUP**  
**(AERMETSG/4)**

(Mexico City, 22 to 26 May 2000)

Agenda Item 3: **Review of the operation of the WAFS in the CAR/SAM Regions**

(Presented by the Secretariat)

**SUMMARY**

This paper reviews the current status of the operation of the WAFS in the CAR/SAM Regions , including progress in the WAFS transition plan towards its final phase. Likewise, the paper also documents a number of outstanding matters related with the development of the WAFS towards the final phase of the system.

**References:**

- COM/MET Divisional Meeting Report, Doc 9367;
- GREPE CAS/6, GREPECAS/7 and GREPECAS/8 Meeting Reports;
- CAR/SAM/3 RAN Meeting Report (Yellow cover);
- AERMETSG/3 Meeting Report; and
- Summary of discussions for the WAFSSG/7.

**1. Introduction**

1.1 As the Subgroup is aware, all three WAFS satellite broadcasts (ISCS (1), ISCS (2) and SADIS) which are an integral part of the Aeronautical Fixed Service (AFS) and, therefore, under the control of civil aviation, are fully operational. Nearly forty States in the CAR/SAM Regions had installed international satellite communication system (ISCS) VSAT equipment and workstations (STAR4), most of them two-way VSAT/STAR4 stations, specially in the CAR Region to be used for exchange of OPMET information in alphanumeric formats. It should be noted that the highly satisfactory pace of implementation had been largely due to the provision of assistance through the WMO voluntary cooperation programme (VCP) by donor States such as Finland, France, the United Kingdom and the United States.

**2. Progress in the transition to the final phase of the WAFS in the CAR/SAM Regions**

2.1 The Subgroup will recall that the AERMETS/3 meeting agreed with a proposal made by its WAFS Task Force concerning the updating transition plan and procedures for the transfer of responsibilities of the high level (SWH) SIGWX forecasts from RAFCs Brasilia and Buenos Aires to the WAFS Washington.

2.2 The transition plan (See **Appendix A** to this paper) was reviewed and adopted by GREPECA S/8 (Conclusion 8/24). As the Subgroup is aware, the plan involves the production/transmission of test SIGWX charts by the WAFS Washington for the area of coverage for which the plan caters. The charts were then subject to evaluation by the RAFCs Brasilia and Buenos Aires and some States within RAFC service areas, making use of the evaluation forms developed by the WAFS Task Force, and the feedback was provided to the WAFS. Information available states that apparently, Brasilia was the only RAFC providing feedback on the test charts sent by WAFS Washington.

2.3 The Subgroup may wish to review the result of the evaluation to be presented by the Rapporteur of the WAFS Task Force and in consequence decide if it is necessary to enlarge the established trial period or on the contrary, the results obtained suggest the handover of RAFCs responsibilities to WAFS Washington. It should be noted that:

- a) in case the Subgroup agreed that the Washington WAFS SIGWX charts met the CAR/SAM requirements, the RAFCs Brasilia and Buenos Aires could cease to function as RAFCs and transfer its responsibilities to the WAFS Washington at a convenient date in the near future. In this context, the Subgroup may wish to formulate a project of conclusion as follows:

**PROJECT OF CONCLUSION 4/.. - TRANSFER OF BRASILIA AND BUENOS AIRES RAFC'S RESPONSIBILITIES TO WAFS WASHINGTON**

The Meeting noting that the RAFCs Brasilia and Buenos Aires are satisfied with the tests by the WAFS Washington, agreed that the referred RAFCs shall cease to function as a RAFC with effect from ----- .

- b) In case the Subgroup consider that the Washington WAFS SIGWX charts do not meet the CAR/SAM requirements, the Subgroup may wish to agree to update the WAFS transition plan and procedures accordingly and to formulate a project of conclusion as follows:

**PROJECT OF CONCLUSION 4/.. - UPDATED CAR/SAM WAFS TRANSITION PLAN AND PROCEDURES**

That, the CAR/SAM WAFS transition plan and procedures for the transfer of responsibilities of the RAFCs Brasilia and Buenos Aires to the WAFS Washington be updated as shown in Appendix ... to this report.

### **3. The final phase of WAFS**

3.1 The Subgroup may wish to note that during the WAFSSG/7 Meeting ( Kansas City, 28 September- 1 October 1999 ), a proposal put forwarded by the United Kingdom concerning a possible scenario for the final phase of the WAFS as perceived by the W AFC London and in particular the possible future changes in the interface between the WAFS and the national produced SIGWX charts was not accepted by the WAFSSG, and that the framework of the final phase should follow the precepts laid down by the 1982 and 1990 conjoint divisional meetings/CAeM sessions and also meet the current stated requirements of IATA and IFALPA.

3.2 The foregoing means that the final phase should be based on the production, and dissemination by satellite broadcast, of global upper wind, temperature and humidity GRIB data and global SIGWX in BUFR code for SWH, and SWM for agreed sub-areas of coverage, with no T4 charts being produced. The elimination of the T4 requirement being predicated on the development of a GRIB/BUFR decoder developed by interested commercial vendors to specifications drawn up by the two WAFCs, together with technical assistance, if requested. The Subgroup should note that it is the responsibility of ICAO Contracting States to ensure that national MET services were able to generate standard WAFS SIGWX charts fully in line with ICAO/WMO formatting requirements.

3.3 In the foregoing context the Subgroup may wish to consider the implications in their MET services the replacement of the transmission by the W AFC of the T4 facsimile charts by the GRIB/BUFR data.

### **4. Introduction of the BUFR code**

4.1 As referred in paragraph 3.2 above, into the new requirements connected with the final phase of the WAFS is the replacement of the dissemination of T4 facsimile SIGWX charts by the WAFCs by the full use of the BUFR code. In his regard, there are three main aspects to consider:

- a) production of SIGWX forecasts in BUFR code by the WAFCs;
- b) transmission from the WAFCs of BUFR coded data to users and user States; and
- c) conversion by users and user States of BUFR code to SIGWX chart form for flight documentation.

4.2 The production of SIGWX in BUFR code by the WAFCs is adequately demonstrated. Concerning the transmission of BUFR code there appears to be no difficulty. In the case of c) above, while many States are familiar with decoding BUFR code from WMO World Weather Watch (WWW) products, the final phase of the WAFS will depend on all States using WAFS being in a position to do so. Until such time as this was resolved, it will be difficult to eliminate T4 fax SIGWX charts from satellite broadcast entirely.

4.3 As previously referred and, irrespective of the above mechanics, the BUFR code was proposed to States as the code to be used for the transmission of WAFS SIGWX forecasts in the future. Noting that the final phase of the WAFS was predicated on two WAFCs producing global upper wind/temperature data and global SIGWX in binary format for transmission to States by satellite broadcast, there is no scope for T4 charts in the final phase. Charts will, of course, still be provided to airlines that required them, but these charts will be produced by the national MET services based on SIGWX forecast coded in BUFR from WAFCs.

4.4 The Subgroup may wish to be informed that during the discussion of this matter at the WAFSSG/7 a number of members of the study group and WMO pointed out that there is a heavy financial commitment involved and many countries might not be able to implement this GRIB/BUFR decoding/display/production of WAFS data sent out by the WAFCs in the final phase. In this regard the WAFSSG proposed two actions, the first involving ICAO regional planning groups in developing transition plans for replacing T4 charts by GRIB/BUFR charts production on site, and secondly, these groups should be assured that GRIB/BUFR upgrade specifications would be developed by the WAFCs and upgrade packages developed by interested vendors and offered, together with technical assistance, if necessary, to those States that wished to avail themselves of it.

## **5. ISCS operational availability**

5.1 The Subgroup will recall that GREPECAS/8 formulated Conclusion 8/20 concerning the collection and distribution of data on the operational availability of the ISCS, calling for the ICAO Regional Offices concerned, *inter alia*, to collect information on ISCS operational availability and the quality of the WAFS products. Likewise, the Subgroup may wish to note that a similar situation arose in the regions served by SADIS and that this had been addressed by the establishment of the SADIS Operations Group (SADISOPSG). To assist the SADISOPSG to establish the annual statement of operational efficacy of the SADIS a specific questionnaire has been used by in the ASI/PAC Region. In order to collect information on ISCS operational availability in the CAR/SAM Regions, the Subgroup may wish to agree preparing a similar form to be used in the regions. In this regard a draft form prepared in basis of that one used by the SADISOPSG is included in **Appendix B**. The Subgroup could review the form and to formulate a project of decision similar to the draft shown as follows:

### **PROJECT OF DECISION 4/.. - ASSESSMENT OF ISCS OPERATIONAL AVAILABILITY**

That the form shown in Appendix - be used to collect information on ISCS operational availability in the CAR/SAM Regions.

## **6. Internet access to the WAFS products and OPMET data**

6.1 The Subgroup will recall that the CAR/SAM/3 expressed some concerns regarding the unrestricted availability of WAFS products on the Internet. It was suggested that this could be detrimental to the future role of the meteorological services which would find it increasingly difficult to recover costs of investments in equipment and satellite broadcast data links, necessary for the reception of WAFS products. It was considered that the free uncontrolled access (i.e. without an access code) to WAFS data and products would circumvent the guidelines, noted by ICAO Council, concerning the authorized access to ICAO satellite broadcasts, which stated that it was up to the Contracting State to determine those who would be authorized to gain access. However, it should be noted that the CAR/SAM/3 realizes that at least in principle, there should be no difficulty with the cost recovery of WAFS products provided in accordance with requirements stated in Annex 3, since the States had the right to include these services and facilities in their cost base, no matter whether the service was used or not. Furthermore, it was emphasized that the Internet could provide a useful back-up to the satellite broadcast and that in fact, this option had been considered by the APANPIRG/10 meeting where the ICAO was invited to consider developing a policy for the use of the Internet by States to obtain WAFS products and OPMET data for operational purposes.

6.2 The Subgroup will also recall that the CAR/SAM/3 developed a Recommendation ( Rec. 13/15 ) urging ICAO to study in coordination with the WMO the possible effects on flight safety and financial impact on States of the uncontrolled availability of ICAO products on the Internet. In this regard the Subgroup may wish to note that ICAO has already a task in its Technical Work Programme (TWP) related to the impact of new institutional developments in the provision of meteorological services for international air navigation ( please see Appendix A, WP/09), and that the specific issue of the Internet could be addressed in that context.

6.3 Further the action requested by the APANPIRG/10 which will be considered by the ANC during its fall session, the Subgroup may wish to return to discuss the Internet access to the WAFS products and OPMET data. In this regard, the Members may wish to inform the meeting on the national Internet policy on the matter in study stage or already approved.

## **7. Back-up arrangements for SIGWX production in the event of an outage at one of the WAFCs**

7.1 The Subgroup may wish to be informed of the experiences gained during the move of the office of the Aviation Weather Centre ( WAFC Washington) to Kansas City on 17 March 1999. During the move WAFC London provided global SIGWX coverage to the aviation community directly and through the WAFC Washington.

7.2 As this outage was foreseen, representatives of both WAFCs used this time to consider the various options available and formulated working plans. During the outage, they were able to monitor progress and react to any unforeseen conditions. After the event the situation was reviewed, backup arrangements were updated and a set of recommendations for future enhancements were produced.

7.3 Relevant conclusions and recommendations considered by the WAFSSG/7 are shown in **Appendix C** to this paper, for information.

**8. Action by the AERMETSG**

8.1 The AERMETSG is invited to:

- a) note the material presented in this paper;
- b) consider the proposed Project of Conclusions referred to in paragraph 2.3 and the Project Decision of paragraph 5.1; and
- c) formulate other necessary actions resulting of the discussion held.

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**APPENDIX A**

**SEQUENCE OF EVENTS TO TRANSFER THE HIGH-LEVEL SIGWX FORECAST  
RESPONSIBILITY FROM RAFCS BRASILIA, BUENOS AIRES AND  
WASHINGTON TO WAFC WASHINGTON**

The WAFS Task Force proposed the following sequence of events to transfer the high-level SIGWX forecast responsibility from the RAFCs of Brasilia and Buenos Aires to the U.S. RAFC/WAFC:

- a) The RAFC/WAFC at the Aviation Weather Center (AWC) in Kansas City will generate experimental SIGWX charts for Brasilia and Buenos Aires areas of responsibility on or about 1 September 1997.
- b) During September 1997, the AWC will transmit SIGWX charts for Brasilia and Buenos Aires areas of responsibility marked "Experimental" on the WAFS satellite broadcast and also post them on the RAFC/WAFC Kansas City INTERNET home page whose address is:  
  
[http://www.awc-kc.noaa.gov/awc/Aviation\\_Weather\\_Center.html](http://www.awc-kc.noaa.gov/awc/Aviation_Weather_Center.html)
- c) RAFCs in Brasilia and Buenos Aires are encouraged to comment about the quality and accuracy as necessary. Comments may be sent by:
  - i. AFTN to KWBCYMYX and include the WMO communications header: BMAA3 1CCCC (CCCC of the sender local MET Office);
  - ii. email addressed to: [ronald.olson@noaa.gov](mailto:ronald.olson@noaa.gov);
  - iii. FAX at number: 816 426 3453; or
  - iv. voice telephone at number: 816 426 3367 extension 262.
- d) RAFC/WAFC Kansas City will contact RAFCs in Brasilia and Buenos Aires via email at suitable intervals to discuss the comments solicited in "c" above.
- e) when WAFC SIGWX charts generated in Kansas City for either Brasilia or Buenos Aires are evaluated to be of satisfactory quality and accuracy, coordination will begin between the Brasilia and Buenos Aires RAFCs, the ICAO Regional Offices in Lima and Mexico City and the Kansas City WAFC. The Kansas City WAFC requests a minimum of 30 days notification for the acceptance of SIGWX responsibility from the CAR/SAM ICAO to accept the Brasilia and Buenos Aires SIGWX responsibilities.

- f) There should be a minimum time interval set for the evaluation period. However, it is suggested that this evaluation should not extend beyond approximately 6-months after the testing period has begun.
- g) The test period should continue for a maximum of 6 months.
- h) In the event that the RAFCs can not agree with the WAFC that the experimental products are acceptable then ICAO would be asked to arbitrate.



**APPENDIX B**

**ASSESSMENT OF ISCS OPERATIONAL AVAILABILITY  
FOR THE PERIOD JUNE \_\_\_\_\_ MAY \_\_\_\_\_**

- 1. State: \_\_\_\_\_
- 2. Number of ISCS VSATs installed and operational in your State?: \_\_\_\_\_
- 3. Location of ISCS VSATs in your State? \_\_\_\_\_
- 4. Overall Assessment of the ISCS broadcast during the period June \_\_\_\_\_ May \_\_\_\_\_
  - a) signal quality (reception)
    - no problems encountered ( )
    - problems encountered ( )

Remarks: \_\_\_\_\_

\_\_\_\_\_

- b) data/product availability at the VSAT receiver (i.e., excluding the performance of user processing/display equipment and associated software)
  - i) WAFS products in T4 facsimile format
    - good ( )
    - average ( )
    - poor ( )

Remarks: \_\_\_\_\_

\_\_\_\_\_

- ii) WAFS global grid point upper wind/temperature data
  - good ( )
  - average ( )
  - poor ( )

Remarks: \_\_\_\_\_

\_\_\_\_\_

iii) OPMET Message information (METAR, TAF, SIGMET etc.)

- good ( )
- average ( )
- poor ( )

Remarks: \_\_\_\_\_

\_\_\_\_\_

c) administration (service) messages

Do you consider that the administrative messages broadcast on ISCS were sufficient to keep you advised for the broadcast status?

- Yes ( )
- No ( )

Remarks: \_\_\_\_\_

\_\_\_\_\_

5. a) Overall assessment of the reliability of VSAT receiving equipment  
(i.e, excluding user processing and display equipment and associated software)

- good ( )
- average ( )
- poor ( )

Remarks: \_\_\_\_\_

\_\_\_\_\_

b) If faults developed in the VSAT receiving equipment, were these faults repaired by:

- i) local technicians \* or ( )
- ii) shipping the unit back ( )  
to the service provider

\* Users should ensure that repair by local technicians does not infringe warranty of the equipment

If you ticked i), above indicate the nature of the repairs

If you ticked ii), above, were any difficulties encountered regarding the response of the service provider and/or shipping of the faulty units for repair?

- Yes            ( )
- No             ( )

Remarks: \_\_\_\_\_

\_\_\_\_\_

6. Assessment of ISCS 24-hour Helpline/Faults Desk

\_\_\_\_\_

7. During the period under review, did you have occasion to contact the ISCS 24-hour Helpline/Faults Desk?

- Yes            ( )
- No             ( )

If “yes” was the technical support provided satisfactory?

- Yes            ( )
- No             ( )

Remarks: \_\_\_\_\_

\_\_\_\_\_

*Note: If in your replies above you indicate “average” or “poor”, it would be appreciated if a brief explanation of the problem could be provided.*

**APPENDIX C****BACKUP ARRANGEMENTS FOR SIGWX PRODUCTION  
IN THE EVENT OF AN OUTAGE AT ONE OF THE WAFC S****1. INTRODUCTION**

1.1 Almost a year ago WAFC London were informed that the SIGWX production unit of WAFC Washington, the Aviation Weather Centre (AWC) Kansas City would be moving to a new purpose built facility. As part of the move AWC senior staff asked that WAFC London provide global SIGWX coverage. This would serve two purposes;

- a) it would give them peace of mind, knowing that there was a backup system in place, and
- b) it would allow both WAFC s to test the then current backup plan.

The move was scheduled for the first quarter of 1999

**2. DISCUSSION**

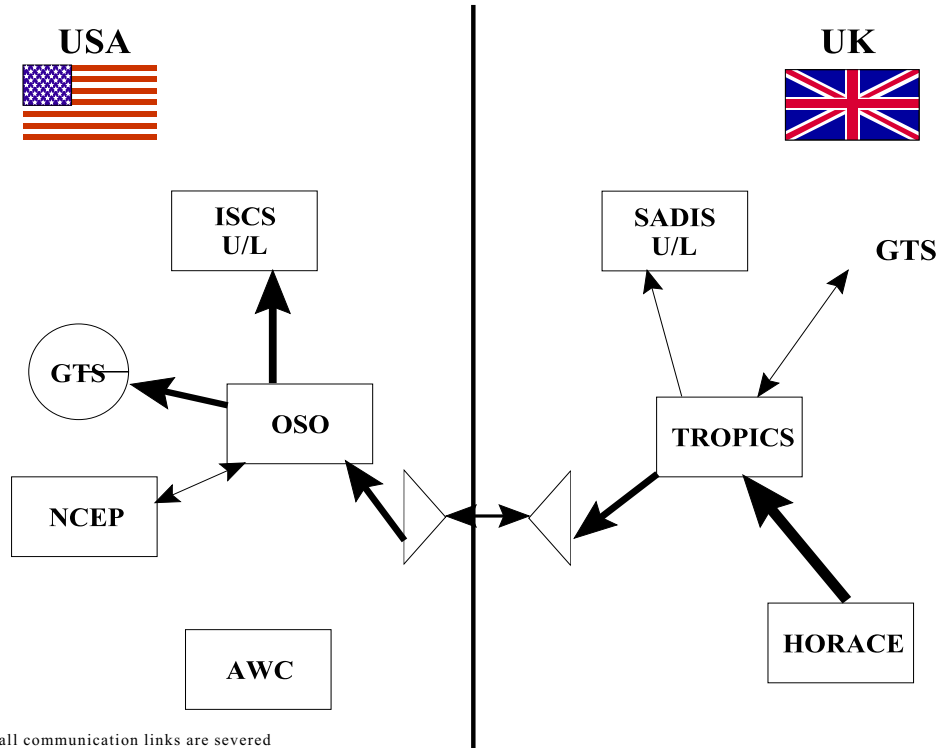
2.1 In the early stages of planning it was envisaged that the AWC would generate and disseminate all of their charts as normal and WAFC London would shadow them. At the American Meteorological Society annual meeting in Dallas Texas, in January 1999 representatives from the WAFC s met to put the finishing touches to this plan.

2.2 A date of 17 March 1999 was confirmed and the plan altered. The original plan had WAFC London in a passive shadow role and this did not test any backup communications arrangements. The significant change being that WAFC London would generate and disseminate the chart sets valid 18/0600, while AWC Kansas City acted as the backup. This would allow both WAFC s to demonstrate that not only did we have a backup plan, but we had a proven and tested backup plan.

2.3 On the 17 March 1999 at 1600utc (10:00 local time in Kansas City) a set of charts valid 18/0600 was issued from WAFC London. Everything went well until 21 30utc when WAFC Washington informed WAFC London that communication problems at Kansas City meant they were unable to connect to the distribution system and disseminate the products they had prepared. Fortunately we had considered this possibility in our planning scenario and at 2200utc WAFC London issued global SIGWX charts valid for 18/1200. By 2300utc AWC had full production and dissemination capability and the outage was finished.

2.4 The following diagram, Figure 1 shows chart production and dissemination in graphical terms.

AWC Outage on 17 March 1999



AWC move and all communication links are severed

WAFC London generate SIGWX charts on Homce and disseminate to OSO for satellite up link and onward transmission on the GTS.

At the end of the move AWC restore links to NCEP and also have direct links to OSO.

17 March 1999

Figure 1

**3. PRODUCTION ISSUES**

3.1 This planned outage proved to be very useful. Primarily it was planned and allowed both WAFCs time to prepare and test for the big day. Several lessons have been learned and we now have a much better understanding of how we would deal with an unplanned outage.

3.2 There was ample communication, email, fax and face to face in the planning stages. However, in the run up to the outage there was too little communication between forecasters at WAFC London and forecasters at the AWC. This problem was compounded by the time difference at the centres, 4am local time in Kansas City equates to 10 am in London. At these times WAFC London forecasters would have numerous managers and support staff available to assist, while the AWC only have operational staff on duty. These staff have other operational matters to deal with. Hence it is recommended that:

- **Liaison is very important: Communicate early, communicate often.**

3.3 If the AWC had an outage NOW, WAFC London would be able to effectively generate global SIGWX products in a further 3 to 4 hours. This delay in lead-in time is required because WAFC Washington are issuing products 14 hours ahead of validity, while WAFC London are issuing 10 hours ahead of validity. If both Centres were preparing charts for issue 14 hours ahead of validity this delay would be halved.

The background to the issue is

- WAFC London generates SIGWX charts valid at 1800 (T+18) and 0000 (T+24) based on the 0000 model run and 0600 (T+18) and 1200 (T+24) based on the 1200 model run.
- There is consistency between the GRIB data and SIGWX charts.
- AWC generate charts valid at T+24 based on model runs at 0000, 0600, 1200 and 1800.
- SIGWX charts valid at 0600 and 1800 could differ from GRIB products valid at the same time.

#### 4. CONCLUSIONS & RECOMMENDATIONS

##### CONCLUSION

4.1 Annex 3, particularly paragraphs 3.2.3 and 3.2.4. needs to be examined.

- Para 3.2.3 relating to GRIB is very clear as to what data should be used.
- Para 3.2.4 is open to interpretation.

##### RECOMMENDATION:

1. Consider amending para 3.2.4 of Annex 3.

##### CONCLUSION

4.2 Using four model runs the AWC can disseminate charts some 14 hours ahead of validity, compared to our 10 hours.

- For WAFC London to issue charts 14 hours ahead of validity will require data for T+30 to be used routinely, or for data valid at T+24 to be available from 6 hourly model runs. There are two main options:

##### Option 1

- It is highly desirable, we use data valid at T+24 from model runs at 00, 06, 12 and 18Z. Data valid at T+30 and 36 should be available as a backup.

- This will allow WAFC London to meet the time of issue criteria (Annex 3 para 3.2.4) planned for the final phase of WAFS; will provide better forecasts due to the better input from the later model runs; and will allow easier backup of the WAFC Washington product suite as both centres will simultaneously be issuing products valid at the same time.

#### **Option 2**

- The other option is to use data for T+24 and T+30. A consequence of this that we would require data at T+36 and T+42 for backup.

**Option 1 seems preferable!**

#### **RECOMMENDATIONS:**

2. Consider if 4 aviation model GRIB runs should become standard.
3. Review times of Issue and times of validity of SIGWX charts.

#### **CONCLUSION**

4.3 If the AWC had an outage NOW, WAFC London would be unable to effectively disseminate global SIGWX products. Problems would arise when the product set from WAFC London reached the 080 communications centre in WAFC Washington. During the planned outage the OSO "rebadged" WAFC London charts, making it look like they arrived from the AWC Kansas City, and then forwarded them through the ISCS system.

- This ensured that users downstream were not affected. This rebadge system in the 050 has to be started manually. A fully automatic backup system that functions properly will require some planning and co-ordination between the two WAFCs and the end users.

#### **RECOMMENDATION:**

4. Develop a contingency plan, detailing how we would deal with such an event. Followed by testing the plan

#### **CONCLUSION**

4.5 If WAFC London had an outage NOW, WAFC Washington would be able to effectively generate global SIGWX products in a further xxxx to xxxx hours. However, the communications links for disseminating WAFC Washington products via the SADIS system have not been set up or tested. These problems are the same as those identified in 4.3 above.

#### **RECOMMENDATIONS:**

5. Develop a contingency plan, detailing how we would deal with such an event. Followed by testing the plan

6. Once the plans are in place, we should have practices outages every 3 months. On the first Wednesday of February and August WAFC Washington will back up WAFC London, and on the First Wednesday of May and November WAFC London will backup WAFC Washington.

**5. ACTIONS**

- 5.1 The WAFS/SG are asked to note the information contained in this report.

- END -