



Agenda Item 2: Implementation of the World Area Forecast System (WAFS)

(Presented by the Secretariat)

Summary

This working paper presents information on the implementation status of the World Area Forecast System (WAFS) in CAR/SAM States.

References:

- Report of the Thirteenth Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/13), (Santiago, Chile 14 to 18 December 2005);
- Report of the Fourteenth Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/14, San José, Costa Rica, 15 to 20 April 2007);
- Report of the Third Meeting of the WAFS Operations Group (WAFSOPSG/3, Paris, France, 26 to 29 September 2006); and
- Report of the Fourth Meeting of the WAFS Operations Group (WAFSOPSG/4, Cairo, Egypt, 26 to 28 February 2008).

1. Introduction

1.1 The Meeting will recall that, according to its Terms of Reference, the WAFSOPSG, among others, reviews regularly “WAFS global procedures” contained in the air navigation plans/documents on facilities and services (ANP/FASID), and initiates amendments to all the ANP/FASID. Such proposals for amendment are subsequently referred to ICAO Regional Offices to be processed and retransmitted to the States, as appropriate. Likewise, the WAFSOPSG prepares proposals for the development of the WAFS in order to ensure that it continues to meet evolving global, and, where appropriate, regional operational requirements, under ICAO procedures for the amendment to Annex 3.

2. Discussion

a) review the outcome of WAFSOPSG/3 and WAFSOPSG/4 Meetings

2.1 The Third (WAFSOPSG/3) and Fourth (WAFSOPSG/4) Meetings of the WAFS Operations Group were carried out from 26 to 29 September 2006 in Paris, France, and from 26 to 28 February 2008, in Cairo, Egypt, respectively. The executive summary of the third meeting was sent to CAR/SAM States, as it will be done with the summary of the fourth meeting; however, in order that the Meeting is aware of the discussions, agreements and decisions of this Group, it is reproduced at **Appendix A**. Complete information regarding WAFSOPSG meetings can also be found at the WAFSOPSG website: <http://www.icao.int/anb/wafsopsg>.

2.2 The following paragraphs present the actions taken by Lima and Mexico Regional Offices for the implementation of the conclusions of the Third Meeting of the WAFS Operations Group, and those to be taken in respect of the conclusions of the fourth meeting, regarding CAR/SAM Regions.

2.3 When reviewing, during its third meeting (WAFSOPSG/3), the regional procedures related to world area forecast system (WAFS), the group formulated Conclusion 3/2 – Amendment to WAFS-related regional procedures in the ANP/FASID, which would render them compatible with Annex 3 – *Meteorological Service for International Air Navigation* provisions by eliminating the formal requirement for significant weather (SIGWX) forecasts in T4 chart form. In view of the continuation of the provision of SIGWX forecasts in the PNG chart form, as a back-up, it was agreed that this should be reflected in a note to the regional procedures.

2.4 Following the referred Conclusion, the Lima Office consolidated and processed these amendments (SAM 07/3-MET, FASID and SAM 07/2-MET, ANP Basic) in accordance with the procedures approved by ICAO Council. The amendments included an amendment to the CAR/SAM FASID Tables MET 5, the deletion of MET Charts 4, 5 and 6 associated to Table MET 6 and to ANP Basic, with regard to the world area forecast system (WAFS). The approval of these amendments was sent to the States on 28 September and 11 October 2007, respectively. During its review of the procedures at the fourth meeting (WAFSOPSG/4), the group formulated Conclusion 4/2 – Amendment to WAFS-related regional procedures in the ANP/FASID, to introduce a reference to the new gridded forecasts of cumulonimbus clouds, icing and turbulence. As follow-up to this conclusion, **Appendix B** presents the amendment to CAR/SAM FASID Tables MET 5 and MET 6, which will be circulated to States in the CAR/SAM Regions, once the Air Navigation Commission reviews the report.

2.5 With regard to GREPECAS Conclusion 12/55 requesting the WAFSOPSG to study the possibility to develop an ISCS user Guide, the group formulated Conclusion 2/5 – Development of the ISCS User Guide, at its third meeting, and was pleased to note that the WAFS Washington Provider State would make the International Satellite Communications System (ISCS) User Guide available, through its file server, to all States and users under the ISCS 1/2 broadcast area. The group agreed that it was also desirable to include the ISCS User Guide in ICAO websites, as it has been done with the SADIS User Guide. Regular updates to the ISCS User Guide would be prepared by the ISCS Provider State for consideration by future WAFSOPSG meetings.

2.6 With regard to the dissemination of the analysis of the global forecasts to WAFS user States, in accordance with Conclusion 13/19 formulated by the CAR/SAM Regional Planning and Implementation Group (GREPECAS), the group considered not to be appropriate to include the referred

synoptic analyses in ICAO satellite broadcasts, since it might conflict with the *Working Arrangements between the International Civil Aviation Organization and the World Meteorological Organization* (Doc 7475).

2.7 When the third and fourth meetings reviewed the matter related to WAFS operation, the group agreed that to deal with errors in significant weather (SIGWX) forecasts in the BUFR code and the portable network graphics (PNG) chart forms, an administrative message should be issued by the world area forecast centre (WAFS) Provider State (Decision 4/5). The introduction of such administrative message would not software changes by the users.

2.8 The group also reviewed during its last two meetings an Agenda Item related to WAFS development, and agreed to improve the spatial and temporal resolution of WAFS upper-air and other upper-air forecasts in the GRIB code.

2.9 The migration from GRIB 1 code form to GRIB 2 code form was considered essential since it would enable the operational implementation of the new WAFS forecasts for icing, turbulence and convective clouds and would allow more data to be transmitted at a fixed bandwidth. The group agreed (Conclusion 3/13) that in order to foster the correct use of the new icing, turbulence and convective clouds forecasts in GRIB code form, it was necessary to convene regional training seminars and develop appropriate guidance material to be available for WAFS users through the WAFSOPSG website. In this regard, the meeting could formulate the following draft conclusion:

DRAFT
CONCLUSION 09/XX - SEMINAR ON THE USE OF GRIDDED FORECASTS FOR ICING, TURBULENCE AND CONVECTIVE CLOUDS

That ICAO, in coordination with WAFS Provider States, organizes a seminar on the use of gridded forecasts for icing, turbulence and convective clouds, in order to assist WAFS States and users in the implementation of the new provisions related with gridded forecasts.

2.10 According with the information provided at the fourth meeting, WMO would be prepared to establish a trust fund for the purpose of providing financial support for developing States to facilitate their migration to the GRIB 2 code form.

b) review the status of implementation of ISCS

2.11 With regard to the provision of SIGWX forecasts in chart form beyond 30 November 2006, the group formulated Conclusion 3/9 inviting WAFS Provider States to discontinue T4 chart form as of 1 December 2006 and WAFS Washington to continue with the issuance of WAFS SIGWX forecasts in the PNG chart form on the ISCS FTP service. The provision of PNG chart forms should continue at least until 2010.

2.12 In response to GREPECAS Conclusion 13/17, Lima and Mexico Regional Offices consulted States. The list of ISCS focal points, including the information so far received of the personnel responsible for the operation of the workstations, according to the request of the WAFS Provider State, is presented in **Appendix C**, and the surveys received from eleven States of the SAM Region and 3 from the

CAR Region were sent to the WAFIC Washington Provider State. The meeting could be aware that despite GREPECAS Conclusion 14/15 -Review of agreements between civil aviation administrations and MET authorities in CAR States, the level of response from CAR States to ICAO communications is still very low.

c) review the status of implementation and utilization of the WAFS products

2.13 Based on the implementation plan for the transition from GRIB 1 code form to GRIB 2 code form adopted (Decision 4/18) by the WAFSOPSG, the meeting could convene that in order to ensure the reception of the new WAFS forecasts for icing, turbulence and convective clouds and the migration from GRIB 1 code form to GRIB 2 code form without difficulties in CAR/SAM States, a plan including the dates in which the States should take the required actions for the training and upgrading of WAFS workstations should be established and, therefore, the following draft conclusion was formulated:

**DRAFT
CONCLUSION 09/XX - IMPLEMENTATION PLAN FOR THE TRANSITION FROM
GRIB 1 TO GRIB 2 CODE FORM**

That the implementation plan for the transition from GRIB 1 code form to GRIB 2 code form, presented as **Appendix D** to this part of the report, be adopted.

3. Action required by the meeting

3.1 The meeting is invited to:

- a) take note of the contents of this working paper;
- b) take note of the Executive Summaries of the WAFSOPSG Third and Fourth Meetings;
- c) update, if required, the ISCS list of focal points presented in Appendix C; and
- d) consider the draft conclusions of paragraphs 2.9 and 2.13.

THIRD MEETING

WORLD AREA FORECAST SYSTEM OPERATIONS GROUP (Paris, France, 26 to 29 September 2006)

EXECUTIVE SUMMARY¹

1. INTRODUCTION

1.1 The third meeting of the World Area Forecast System Operations Group (WAFSOPSG/3) was held in the European/North Atlantic (EUR/NAT) Regional Office, Paris, 26 to 29 September 2006. The meeting was attended by twenty-eight experts from fourteen States and four international organizations (the Agency for the Safety of Aerial Navigation in Africa and Madagascar (ASECNA), the International Air Transport Association (IATA), the International Federation of Air Line Pilots' Associations (IFALPA) and the World Meteorological Organization (WMO)).

1.2 The Chairman, Mr. D. Visoiu, presided over the meeting throughout its duration.

2. FOLLOW-UP OF WAFSOPSG/2 CONCLUSIONS

2.1 With regard to the follow-up of the conclusions, the group noted that action had been completed on all the issues except for Conclusions 2/7 b), and 2/21, which were re-addressed under Agenda Items 5.2 and 6.6 (Decision 3/1 refers).

3. REVIEW OF ICAO PROVISIONS RELATED TO WAFS

3.1 Under this agenda item, the group reviewed the regional procedures related to world area forecast system (WAFS) and proposed amendments which would render them compatible with Annex 3 — *Meteorological Service for International Air Navigation* provisions by eliminating the formal requirement for significant weather (SIGWX) forecasts in T4 chart form. In view of the continuation of the provision of SIGWX forecasts in the PNG chart form (endorsed under Agenda Item 5), as a back-up, it was agreed that this should be reflected in a note to the regional procedures (Conclusion 3/2 refers).

3.2 Regarding Appendix 1 to Annex 3, the group endorsed proposals made by the world area forecast centre (W AFC) Provider States concerning, inter alia, the removal of thunderstorm symbols from the model charts and chart legends, and the systematic indication of limiting flight levels for jet-streams and tropopause heights (Conclusion 3/3 refers).

3.3 The group re-assessed the provision related to satellite broadcasts contained in Annex 10 — *Aeronautical Telecommunications* and agreed that it continued to be relevant in view of the essential role of the international satellite communications system (ISCS) and the satellite distribution system for information relating to air navigation (SADIS) broadcasts. The provision was proposed to be upgraded to a Standard, with an addition of a reference to the second important function of these broadcasts, i.e. the dissemination of OPMET data (Conclusion 3/4 refers).

¹The full report is available at the following website: www.icao.int/anb/wafsopsg

3.4 Concerning the development of guidance on the use of fixed-time WAFS forecasts in flight documentation called for by Conclusion 16/42 of the ASIA/PAC Air Navigation Planning and Implementation Regional Group (APANPIRG), the group agreed that the development of such guidance by the Secretariat would be of assistance to States and users (Conclusion 3/5 refers).

4. OPERATION OF THE WAFS

4.1 The group took note of the WAFS management report which had been prepared by the WAFS Provider States and placed on the WAFSOPSG website. The group reviewed the management report, noted its content and expressed satisfaction with the scope of information provided.

4.2 With regard to back-up procedures at the WAFCs, it was noted that the WAFS Provider States had re-assessed the need by WAFS London to establish a bulletin monitoring facility for supporting a back-up data service to the ISCS. The group concurred with the findings by the WAFS Provider States, i.e. there was no need to establish such a facility (Decision 3/6 refers).

4.3 Concerning the performance of the WAFS, the group reviewed the output performance indicators developed for this purpose and used during operational trials by the WAFS Provider States. It agreed that the indicators met the operational requirements and should therefore be implemented on a permanent basis (Conclusion 3/7 refers).

4.4 The group was pleased to note that the WAFS Washington Provider State had developed a draft International Satellite Communications System (ISCS) User Guide. It was noted that the WAFS Washington Provider State would make the ISCS User Guide available through its file server to all States and users under the ISCS 1/2 broadcast area. The group agreed that the ISCS User Guide should also be included in appropriate ICAO websites, similar to the SADIS User Guide. Regular updates to the ISCS User Guide would be prepared for consideration by future WAFSOPSG meetings (Decision 3/8 refers).

4.5 In order to assess the need for WAFS forecasts in chart form beyond 30 November 2006, the Secretariat had undertaken a survey on the implementation of BUFR-coded SIGWX forecasts by States through the Regional Offices. The results of the survey indicated that currently some 60 per cent of States (out of 72 which had replied) were in a position to receive BUFR-coded SIGWX forecasts and that by the end of 2006, the percentage was expected to rise to 79 per cent. The group reiterated the view that the use of the BUFR code form for SIGWX forecasts should remain the primary means of receiving SIGWX forecasts within WAFS since it was the only method compatible with the objective of the WAFS spelled out in Annex 3, 3.1. However, in view of the slower-than-expected pace of implementation, the group agreed that SIGWX forecasts in the PNG chart form should continue to be provided as a back-up to the BUFR-coded forecasts at least until 2010 (Conclusion 3/9 refers).

4.6 Concerning the dissemination of the analysis of the global forecasts to WAFS user States called for by Conclusion 13/19 of the CAR/SAM Regional Planning and Implementation Group (GREPECAS), the group concluded that the inclusion of such basic synoptic analyses in ICAO satellite broadcasts would not be appropriate since it would be in conflict with the *Working Arrangements between the International Civil Aviation Organization and the World Meteorological Organization* (Doc 7475) (Decision 3/10 refers).

5. DEVELOPMENT OF THE WAFS

5.1 The group addressed the possibility of improving the temporal and spatial resolutions of WAFS upper wind and other upper-air forecasts in the GRIB code form based on a study undertaken by

the WAFC Provider States. The results showed that while the costs of distributing 40-km horizontal resolution data over the satellite broadcast would be substantial, two additional vertical levels between FL 300 and FL 400, and forecasts with a temporal resolution of 3 hours could be provided at a reasonable cost and accommodated within the existing SADIS and ISCS broadcasts. Since the benefits of higher resolution data were not yet fully known, the group agreed that a further study should be undertaken in this area, before proposing amendments to Annex 3 provisions (Conclusion 3/11 refers).

5.2 Concerning the development of an objective icing index, the group noted the progress report by the WAFC Provider States. It dealt with the development of a metrics for the reporting and forecasting of icing which would link an icing intensity index to meteorological variables and which would be an aircraft-independent and objective measure of icing based on the rate at which icing accumulates on an airframe. Due to the close relation between the icing index and the development of improved WAFS forecasts for icing in the GRIB code form, it was agreed that future work related to the objective icing index should be undertaken in connection with the development of the improved forecasts for icing, turbulence and convective clouds (Decision 3/12 refers). Regarding the status of the development of such forecasts, the group noted that considerable progress had been made by the WAFC London Provider State. Trial forecasts were now being generated routinely four times per day; the new products were expected to be available soon through the SADIS FTP Service. The group agreed that the utility of the trial forecasts should be evaluated by users through a formal feedback mechanism. In order to promote the appropriate use of the new forecasts of icing, turbulence and convective clouds in the GRIB code form, it was considered desirable to convene regional training seminars and to develop appropriate guidance, to be made available to WAFS users through the WAFSOPSG website (Conclusion 3/13 refers).

5.3 The feasibility of advancing the time of issuance of SIGWX forecasts to meet the needs for long-haul flights was confirmed by investigations undertaken by the WAFC Provider States. It transpired that both WAFCs could issue high-level (SWH) and medium-level SIGWX (SWM) forecasts 17 and 16 hours before the validity time, respectively. The group agreed that the SIGWX forecasts for high levels (SWH) in the BUFR code form were the most time critical for flight planning of long-haul operations and agreed therefore that the lead time of these forecasts should be the longest (Conclusion 3/14 refers).

5.4 With regard to the migration to the GRIB 2 code form, it was considered that the replacement of the GRIB 1 code form by the GRIB 2 code form was essential since it would enable the operational implementation of new WAFS forecasts for icing, turbulence and convective clouds and would allow more data to be transmitted at a fixed bandwidth. To achieve this, the group agreed that a detailed implementation plan of the GRIB 2 code form should be elaborated (Conclusion 3/15 refers).

6. LONG-TERM PLANNING OF THE WAFS IMPLEMENTATION

6.1 In response to Conclusion 16/41 of the APANPIRG calling for the WAFSOPSG to consider the development of a long-term plan for the WAFS, the group concurred that such a plan would be warranted and that the WAFC Provider States should elaborate a concise roadmap covering a period of five years for the endorsement by the WAFSOPSG/4 Meeting (Conclusion 3/16 refers).

7. FUTURE WORK PROGRAMME

7.1 The group reviewed the work programme and proposed additional changes based on the discussions during the meeting (Decision 3/17).

8. **ANY OTHER BUSINESS**

8.1 The group considered that there would be a need to provide a correction to WAFS SIGWX forecasts in the BUFR code form, should an error be found following transmission of the product and that WMO standards should, in principle, be adopted for this purpose. Since the proposed change could have an impact on user software, the group felt that the WAFS Provider States should undertake a study to assess its implications on WAFS users (Conclusion 3/18 refers).

8.2 A proposal to join any two subsequent fixed time WAFS charts of the same product and level to provide information relevant to long-haul flights was considered in order to eliminate the need to provide more than one WAFS forecast for the same product and level for different fixed valid time. This approach was not currently envisaged in Annex 3 and the inclusion of such provisions in Annex 3 could have considerable financial implications for States and users, since substantial modifications to visualization software would have to be made. Therefore, the group considered that this proposal should be subject to a careful assessment by an ad-hoc group (Conclusion 3/19 refers).

— END —

FOURTH MEETING

WORLD AREA FORECAST SYSTEM OPERATIONS GROUP (Cairo, Egypt, 26 to 28 February 2008)

EXECUTIVE SUMMARY¹

1. INTRODUCTION

1.1 The fourth meeting of the World Area Forecast System Operations Group (WAFSOPSG/4) was held in the Middle East (MID) Regional Office, Cairo, 26 to 28 February 2008. The meeting was attended by twenty-nine experts from fifteen States and four international organizations (the Agency for the Safety of Aerial Navigation in Africa and Madagascar (ASECNA), the International Air Transport Association (IATA), the International Federation of Air Line Pilots' Associations (IFALPA) and the World Meteorological Organization (WMO)).

1.2 The Vice Chairman, Mr. A. Al Harty, presided over the meeting throughout its duration.

2. FOLLOW-UP OF WAFSOPSG/3 CONCLUSIONS

2.1 With regard to the follow-up of the conclusions, the group noted that action had been completed on all the issues except for Conclusion 3/13 b) 2), which was re-addressed under Agenda Item 6.3 (Decision 4/1 refers).

3. REVIEW OF ICAO PROVISIONS RELATED TO WAFS

3.1 Under this agenda item, the group reviewed the regional procedures related to world area forecast system (WAFS) and proposed amendments which would introduce a reference to the new gridded forecasts of cumulonimbus (CB) clouds, icing and turbulence (Conclusion 4/2 refers).

3.2 The group also reviewed and endorsed the draft Amendment 75 to Annex 3 which would:

- a) improve the spatial and temporal resolution of WAFS forecasts in the GRIB code form;
- b) increase the lead time for issuance of significant weather (SIGWX) forecasts;
- c) allow the introduction of WAFS forecasts for CB clouds, icing and turbulence in the GRIB code form;
- d) simplify the content of SIGWX forecasts by eliminating elements that have never been included in such forecasts issued within the WAFS;

¹The full report is available at the following website: www.icao.int/anb/wafsopsg

- e) eliminate the requirement to indicate, subject to regional air navigation agreement, the areas of flight documentation available at international aerodromes; and
- f) eliminate amendments to WAFS forecasts. (Conclusion 4/3 refers).

4. OPERATION OF THE WAFS

4.1 The group took note of the WAFS management report which had been prepared by the WAFC Provider States and placed on the WAFSOPSG website. The group reviewed the management report, noted its content and expressed satisfaction with the scope of information provided.

4.2 The group noted that the OPMET bulletins were not identical in the international satellite communications system (ISCS) and the satellite distribution system for information relating to air navigation (SADIS) broadcasts and concurred that the format of ISCS and SADIS OPMET bulletins should be harmonized by the end of summer 2008 (Conclusion 4/4 refers).

4.3 To deal with errors in significant weather (SIGWX) forecasts in the BUFR code and the portable network graphics (PNG) chart forms, the group agreed that an administrative message should be issued by the world area forecast centre (WAFC) Provider States (Decision 4/5 refers). The introduction of such administrative messages would not require costly software changes by WAFS users.

4.4 In view of differences that existed between WAFC in the provision of height coordinates for forecasts of tropopause and maximum wind, the group agreed that the height coordinates should be harmonized. To minimize the impact on users, no changes should be made to the current GRIB 1-formatted forecasts; such changes should only be applied to the future GRIB 2-formatted forecasts. (Conclusion 4/6 refers).

4.5 In order to improve information on tropical cyclones (TC) and volcanic ash (VA) in the SIGWX forecasts, the group agreed that:

- a) indication of non-named TC should be clarified by eliminating the term “NIL” used hitherto (Decision 4/7 refers);
- b) feasibility of establishing coordination between WAFC and tropical cyclone advisory centres (TCAC) should be assessed as called for by the eighteenth meeting of the ASIA/PAC Air Navigation Planning and Implementation Regional Group (APANPIRG/18) (Conclusion 4/8 refers); and
- c) tropical cyclone advisories from non-TCAC could be used when adequate advisory guidance from the designated TCAC was not available (Decision 4/9 refers).

4.6 Regarding transparency during times of WAFC backup, the group noted that if the WAFC back-up were entirely transparent for end users as called for by the Satellite Distribution System Operations Group (SADISOPSG), WAFC production suites and vendors workstation software would require adjustments. Therefore, the group agreed that WAFC back-up should continue to be seamless, but not necessarily transparent, for end-users (Decision 4/10 refers).

4.7 To address the APANPIRG Conclusion 17/36 related to WAFS output performance indicators, the group concurred that their extension and the possibility of producing more operationally oriented output performance indicators should be studied (Conclusion 4/11 refers).

5. DEVELOPMENT OF THE WAFS

- 5.1 The group endorsed the results of the study undertaken by IATA which called for the
- a) introduction of two additional levels at FL 320 (275 hPa) and at FL 360 (225 hPa);
 - b) replacement of the thinned grid with a regular grid with a resolution of 1.25; and
 - c) improvement in the temporal resolution from 6 to 3 hours (Conclusion 4/12 refers).

The use of finer resolutions as suggested under a) to c) above was expected to lead to improvements in the WAFS upper-air forecasts, which would contribute to increase the user confidence in such forecasts and could subsequently result in a reduced demand for additional fuel, thus in reduced fuel burn and in a genuine cost savings for airlines. To address the APANPIRG Conclusion 18/41, the group agreed that the requirements of polar operations should be further studied by the WAFCs (Conclusion 4/12 refers). The group called for the WAFC Provider States to develop the higher resolution upper air forecasts, in time for the WAFSOPSG/5 Meeting in order to ensure their timely implementation (Conclusion 4/13 refers).

5.2 Concerning the gridded WAFS forecasts for icing, turbulence and CB clouds in the GRIB 2 code form, the WAFSOPSG Members from IATA, IFALPA and user States had evaluated the trial products available from the SADIS FTP service and the WAFC Provider States had developed guidelines for the visualization of these gridded forecasts. Concerning the evaluation undertaken by users, the group concurred with their views that the advantages of the new gridded forecasts included their high consistency, their compatibility with wind and temperature forecasts, and their relevance to flight operations irrespective of the duration of the flight. The group further agreed that the following issues should be addressed:

- a) *Overlapping period.* To minimize confusion, the overlap of the existing SIGWX forecasts with the new gridded forecasts be short; during the overlapping period, the gridded test forecasts should be clearly labelled as such;
- b) *Ease of use.* The visualization of the new gridded forecasts should be such that it would combine the high “at a glance” value of existing SIGWX forecasts with greater detail inherent to gridded forecasts;
- c) *Use of terminology.* All the qualifiers used to describe icing, turbulence and CB clouds in the gridded forecasts should relate to terms well-known to the user; and
- d) *Accuracy of the gridded forecasts.* It was considered important that the accuracy of the new gridded forecasts be assessed in order to ensure that their accuracy is similar, or superior, to that of the existing SIGWX forecasts (Conclusion 4/14 refers).

With regard to guidance related to gridded forecasts, the group endorsed the guidelines developed by the WAFC Provider States (Decision 4/15 refers) and called for the WAFC Provider States to develop comprehensive guidance in time for the WAFSOPSG/5 Meeting (Conclusion 4/16 refers). Finally, the group identified some outstanding issues related to the gridded forecasts and agreed that the WAFC

Provider States should undertake a systematic comparisons of these forecasts in order to establish their characteristics and limitations, in time of the WAFSOPSG/5 Meeting (Conclusion 4/17 refers).

5.3 The group considered the migration to the GRIB 2 code form and endorsed the implementation plan developed by the WAFC Provider States, in close coordination with WMO, based on IATA user requirements (Decision 4/18 refers).

5.4 With regard to the visualization of WAFS forecasts in flight documentation, the group considered two issues:

- a) *Use of concatenated WAFS forecasts for long-haul flights.* Based on the results of a study undertaken by an ad hoc group, it was agreed that the Secretariat should develop Annex 3 provisions to enable the provision of concatenated route-specific wind/temperature forecasts generated from interpolating data from consecutive forecast times, for review by the WAFSOPSG/6 Meeting. Furthermore, the ad hoc group was tasked to study if the interpolation could similarly be applied to the new gridded forecasts (Conclusion 4/19 refers); and
- b) *Establishment of a web-based distribution of WAFS forecasts.* In view of the complexity of software required for the visualization of the new gridded forecasts, it was agreed that WAFC Provider States should develop a web-based interface for the provision of a minimum set of WAFS charts. The web-based interface would be easily accessible and user friendly, and allow users to visualize a selection of products; it would replace the provision of WAFS SIGWX forecasts in the PNG chart form (Conclusion 4/20 refers).

5.5 With regard to the quality control of meteorological information included in the automatic dependent surveillance (ADS) messages, the group agreed that, in view of the explosive growth of WMO aircraft meteorological data relay (AMDAR) reports, there was no need to pursue work on the quality control of MET information contained in ADS reports (Decision 4/21 refers).

6. LONG-TERM PLANNING OF THE WAFS IMPLEMENTATION

6.1 The group reviewed and endorsed the WAFS 5-year plan, covering years 2008 to 2012, developed by the WAFC Provider States (Decision 4/22 refers).

7. FUTURE WORK PROGRAMME

7.1 The group reviewed the work programme based on the discussions during the meeting (Decision 4/23).

8. ANY OTHER BUSINESS

8.1 In order to facilitate the implementation of the new gridded WAFS forecasts of CB clouds, icing and turbulence, and in particular their visualization, the group considered that it would be essential to convene a workshop involving the WAFC Provider States, and WAFS user States and users. In view of the planned implementation of the gridded forecasts in 2010 and of the plans to convene a series of regional seminars on these forecasts during 2010, it was considered that the proposed

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workshop should be held during 2009. Since the workshop would involve some WAFSOPSG members and could facilitate discussions at the WAFSOPSG/5 Meeting, it was agreed that a two-day workshop should be convened during the week of the WAFSOPSG/5 Meeting (Conclusion 4/24 refers).

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APPENDIX B

ANP BASIC

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WORLD AREA FORECAST SYSTEM (WAFS) (FASID Tables MET 5, MET 6 and MET 7)

27. FASID Table MET 5 sets out the CAR/SAM Regions requirements for WAFS forecasts to be provided by WAFC Washington.
[WAFSOPSG, Conclusion 1/2]

28. FASID Table MET 6 sets out the responsibilities of WAFCs London and Washington for the production of WAFS forecasts. For back-up purposes, each WAFC should have the capability to produce WAFS forecasts for all the required areas of coverage.
[WAFSOPSG, Conclusion 1/2]

29. WAFS ~~products~~ forecasts should be disseminated by WAFC Washington using the international satellite communications system (ISCS1) covering the reception area shown in FASID Chart CNS [4].
[WAFSOPSG, Conclusion ~~2/24/2~~]

30. Each State should make the necessary arrangements to receive and make full operational use of WAFS ~~products~~ forecasts disseminated by WAFC Washington. FASID Table MET 7 lists the authorized users of the ISCS1 satellite broadcast in the CAR/SAM Regions and location of the operational VSATs.
[WAFSOPSG, Conclusion ~~1/24/2~~]

FASID

VI-MET 5-1

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TABLE MET 5/TABLA MET 5

REQUIREMENTS FOR WAFS ~~PRODUCTS~~FORECATS

REQUISITOS DE ~~INFORMACIÓN~~PRONÓSTICOS ELABORADA POR EL WAFS

EXPLANATION OF THE TABLE

Column

- 1 WAFS ~~products~~forecasts required by the CAR/SAM States, to be provided by WAFC Washington.
- 2 Area of coverage required for the WAFS forecasts, to be provided by WAFC Washington.

EXPLICACIÓN DE LA TABLA

Columna

- 1 ~~Pronósticos~~Productos del WAFS requeridos por los Estados CAR/SAM, que ha de proporcionar el WAFC de Washington.
- 2 Zona de cobertura requerida para los pronósticos del WAFS, que ha de proporcionar el WAFC de Washington.

Forecast required/Pronóstico requerido	Areas required/Zonas requeridas
1	2
SWH forecasts (FL 250 – 630) in the BUFR code form/ Pronósticos de SWH (FL 250 – 630) en la clave BUFR	Global/Mundial
SWM forecasts (FL 100 – 250) in the BUFR code form/ Pronósticos de SWM (FL 100 – 250) en la clave BUFR	NIL
Forecasts of upper-air wind, temperature and humidity, cumulonimbus cloud, icing, and clear-air and in-cloud turbulence and of altitude of flight levels in the GRIB code form Pronósticos de vientos en altitud , temperatura y humedad en altitud, nubes cumulonimbus, engelamiento, y turbulencia en aire claro y en las nubes y de niveles de vuelo en altitud en la clave GRIB	Global/ Mundial

Note 1. — SWM forecasts are provided for limited geographical areas as determined by regional air navigation agreement.

Nota 1. — Se proporcionan pronósticos SWM para zonas geográficas limitadas según se determine por acuerdo regional de navegación aérea.

Note 2. — WAFCs will continue to issue forecasts of SIGWX in PNG chart form for back-up purposes for fixed areas of coverage as specified in Annex 3.

Nota 2. — Los WAFc continúan emitiendo mapas PNG pronosticados de SIGWX con fines de respaldo para zonas de cobertura según se especifica en el ANEXO 3.

Note 3. — Forecasts of cumulonimbus clouds, icing and clear-air and in-cloud turbulence are experimental forecasts which are expected to become available by the end of 2009.

Nota 3. — Los pronósticos de nubes cumulonimbus, engelamiento, y turbulencia en aire claro y en las nubes son experimentales que se espera estén disponibles a finales de 2009.

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VI-MET 6-4

TABLE MET 6/TABLA MET 6
RESPONSIBILITIES OF THE WORLD AREA FORECAST CENTRES
RESPONSABILIDADES DE LOS CENTROS MUNDIALES DE PRONÓSTICOS DE ÁREA

EXPLANATION OF THE TABLE

Column

- 1 Name of the world area forecast centre (WAFC).
- 2 Area of coverage of significant weather (SIGWX) forecasts in the BUFR code form prepared or relayed by the WAFC in Column 1.
- 3 Area of coverage of forecasts of upper-wind, temperature, cumulonimbus clouds, icing, clear-air and in-cloud turbulence, and humidity, and of altitude of flight levels and humidity forecasts in the GRIB code form issued by the WAFC in Column 1.

EXPLICACIÓN DE LA TABLA

Columna

- 1 Nombre del centro mundial de pronósticos de área (WAFC).
- 2 Zona de cobertura de los pronósticos del tiempo significativo (SIGWX) en la clave BUFR preparados o retransmitidos por el WAFC indicado en la Columna 1.
- 3 Zona de cobertura de los pronósticos en altitud de viento, temperatura, nubes cumulonimbus, engelamiento y turbulencia en aire claro y en las nubes, y humedad, y de altitud de niveles de vuelo y humedad en la clave BUFR, emitidos por el WAFC indicado en la Columna 1.

Areas of coverage of/Zonas de cobertura de		
W AFC	SIGWX forecasts/ Pronósticos de SIGWX	Forecasts of upper-air wind, temperature, cumulonimbus clouds, icing, and clear-air and in-cloud turbulence, humidity, and of altitude of flight levels/ Pronósticos de vientos en altitud, temperatura, nubes de cumulonimbus, engelamiento y turbulencia en aire claro y en las nubes, humedad, y de niveles de vuelo en altitud
	In the BUFR code form/ En la clave BUFR	In the GRIB code form/En la clave GRIB
1	2	3
London	SWH (FL 250 – 630): global/mundial SWM (FL 100 – 250): ASIA SOUTH, EUR and/y MID	Global /mundial
Washington	SWH: (FL 250 – 630): global/mundial SWM (FL 250 – 250): NAT	Global /mundial

Note 1. - WAFCs continue to issue forecasts of SIGWX in PNG chart form for back-up purposes for fixed areas of coverage as specified in Annex 3.

Note 2. - Forecasts of cumulonimbus clouds, icing, and clear-air and in-cloud turbulence are experimental products which are expected to become available by the end of 2009.

Nota 1. - Los W AFC continúan emitiendo mapas pronosticados PNG de SIGWX con fines de respaldo para zonas fijas tal como se especifica en el Anexo 3.

Nota 2. - Los pronósticos de cumulonimbus, engelamiento y turbulencia en aire claro y en las nubes son productos experimentales que se espera estén disponibles a fines de 2009.

APPENDIX C

**ISCS OPERATIONAL FOCAL POINTS/
PUNTOS FOCALES OPERACIONALES DEL ISCS**

Updated on/Actualizada el 11/04/08

*Note. - This list is kept up-to-date by the ICAO Secretariat based on the input from States
Nota. - Esta lista será actualizada por la Secretaría de la OACI con base en la información
suministrada por los Estados*

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APPENDIX D

TRANSITION PLAN FOR THE IMPLEMENTATION OF GRIB 2 CODE FORM

	Date	Status
WAFCs develop and test WAFS forecasts in the GRIB 2 code form, encompassing higher-resolution data, as well as gridded icing, turbulence and cumulonimbus cloud forecasts	April 2008 to September 2009	
SADIS and ISCS Provider States implement increased satellite bandwidth for WAFS broadcasts, if required, to facilitate parallel broadcasting of GRIB 1 and GRIB 2 forecasts	September 2009	
GRIB 2 code form available on ISCS and SADIS FTP services, in parallel with GRIB 1 code form	September 2009	
WAFS workstation vendors develop GRIB 2 decoders and software to enable the visualisation of WAFS upper-air forecasts (including higher-resolution fields and gridded icing, turbulence and cumulonimbus cloud forecasts)	September 2009 to November 2011	
Training on the new gridded forecasts of cumulonimbus clouds, icing and turbulence	2009	
Applicability of enabling clauses in Annex 3 for the use of gridded WAFS forecasts for icing, turbulence and cumulonimbus clouds	November 2010 (Amendment 75)	
Confirm date for the cessation of satellite broadcast of forecasts in the GRIB 1 code form	February 2011	
States upgrade workstations to accept GRIB 2 code form	November 2011 to November 2013	
Cessation of WAFS forecasts in the GRIB 1 code form	November 2013 (Amendment 76)	