W O R L D M E T E O R O L O G I C A L O R G A N I Z A T I O N

WMO Integrated Global Observing System (WIGOS) Pilot Project for AMDAR *(Fifth Session)* and AMDAR Panel Management Group Meeting (Second Session)

De Bilt, The Netherlands, 28 February - 04 March 2011

FINAL REPORT

EXECUTIVE SUMMARY

The Joint Meeting of the Fifth Session for the WMO Integrated Observing System (WIGOS) Pilot Project for AMDAR and the Second Session of the AMDAR Panel Management Group (in this report will be refer to as Joint Meeting) was opened by Dr Frits J.J. Brouwer, Director General of KNMI and the Permanent Representative of the Netherlands with WMO, at KNMI Headquarters in De Bilt, The Netherlands, at 1:00 pm on Monday, 28 February 2010.

The Joint Meeting discussed suggested changes proposed to the Version 4 of AMDAR BUFR Template (3 11 010) elaborated at the Fourth Session of the WIGOS Pilot Project for AMDAR, Geneva, Switzerland in August 2010. The Joint Meeting agreed that these suggested changes be included in a newly revised AMDAR BUFR Template Version 5, including changing the 0 07 004 Pressure descriptor to 0 07 010 Pressure Altitude (Flight Level) as well as increasing the resolution for mass mixing ratio. BUFR Template Version 5 was coordinated with the E-AMDAR Technical Advisory Group as well as members of IPET-DRC, through Dr Eva Červená, who was instrumental in its finalizing. The Joint Meeting noted that these proposed changes to the AMDAR BUFR Template are now in line with those changes proposed in the upgrades for the ARINC620 v4 Specification. The Joint Meeting agreed that after approval of the Version 5 AMDAR BUFR Template by the IPET-DRC, the validation process would include a preliminary check of the content and correctness as well as a more formal validation process to be undertaken by both producers and users of the AMDAR data. The Joint Meeting proposed that the E-AMDAR and the USA AMDAR Programs would be involved on the data production side of the validation testing process.

The Joint Meeting noted the complexity associated with an agreement of wider AMDAR community with generic Quality Control procedures and requested Jitze van der Meulen to develop a Strategy on principle and procedures for the Quality Control of AMDAR Data for consideration by the next Joint Meeting of the AMDAR Panel and ET-AIR, November 2011.

The Joint Meeting agreed on updates of the components of metadata associated with AMDAR and in particular, metadata needed for describing data and products, metadata needed for usage of data, and metadata needed for the operation of the AMDAR observing system as well as information relevant to airports used by AMDAR equipped aircraft. It was agreed that following the approval of the identified aircraft and airport Metadata by E-AMDAR Programme Members, the Metadata would be passed to an active E-AMDAR airline for review and approval.

The Joint Meeting agreed that the WMO Secretariat in coordination with the AMDAR Panel Chairperson, will provide a proposal on the strategy for integration of AMDAR Reference manual (WMO No. 958) into the WMO Regulatory Material, such as the Manual and Guide on the Global Observing System, the Manual and Guide on the GTS and the Guide to Meteorological Instruments and Methods of Observations to the next Joint Meeting of the AMDAR Panel and ET-AIR, Quebec, Canada, November 2011. The Joint Meeting also agreed that as part of this development new AMDAR Implementation guidance material should be developed for those WMO Members interested in developing national AMDAR programmes.

The Final Report of the Fifth Session for the WMO Integrated Observing System (WIGOS) Pilot Project for AMDAR and the Second Session of the AMDAR Panel Management Group can be accessed at the following web address: http://amdar.wmo.int/Reports.html.

GENERAL SUMMARY OF THE WORK OF THE SESSION

1. OPENING OF THE MEETING

1.1 Opening of the meeting

1.1.1 The Joint Meeting of the Fifth Session for the WMO Integrated Observing System (WIGOS) Pilot Project for AMDAR and the Second Session of the AMDAR Panel Management Group (Joint Meeting) was opened by Dr Frits J.J. Brouwer, Director General of KNMI and Permanent Representative to the WMO, at KNMI Headquarters in De Bilt, The Netherlands, at 1:00 pm on Monday, 28 February 2010. Dr Brouwer noted that the AMDAR Program as a fully operational observing system is progressing well as it migrates into WIGOS. He also noted that he looks forward to seeing the expansion of the Global AMDAR Program covering more areas of data sparse areas such as Africa. The list of participants is provided in Appendix I.

1.1.2 Dr Miroslav Ondráš, Chief of WMO Observing Systems Division of WMO, thanked Dr Brouwer and KNMI for hosting the Joint Meeting on behalf of the WMO. He wished the participants a constructive and successful meeting and assured that the WMO Secretariat will provide all the support needed for a successful outcome.

1.2 Adoption of the agenda

1.2.1 The Joint Meeting accepted the meeting agenda.

1.3 Working arrangements

1.3.1 The Chairperson of the AMDAR Panel informed the meeting that it would have a short morning break starting around 10:30 am and a lunch break starting at approximately 12:00 pm and another short break at around 3:30 pm. The meeting agreed on the working arrangements and adopted a tentative work plan.

2. STATUS OF THE WIGOS PILOT PROJECT FOR AMDAR

2.1 AMDAR BUFR Template

2.1.1 Updates to AMDAR Panel Template

2.1.1.1. The Joint Meeting reviewed the outcomes relating to the development of the Standardized Template for AMDAR that where made at the 13th Session of the AMDAR Panel and the 2nd Session of the ET-AIR. It also reviewed the suggested changes proposed to the Version 4 BUFR Template (3 11 010) made at the 4th Session of the WIGOS Pilot Project for AMDAR, Geneva, Switzerland in August 2010. These suggested changes included; changing the 0 07 004 Pressure descriptor to 0 07 010 Pressure Altitude (Flight Level) as well as increasing the resolution for mass mixing ratio. The Joint Meeting noted that these proposed changes to the AMDAR BUFR Template are now in line with those changes proposed in the upgrades for the ARINC620 v4 Specification.

2.1.1.2 By advice from Dr Eva Červená, IPET-DRC representative, the Joint Meeting agreed that following the IPET-DRC approval of the Version 5 AMDAR BUFR Template, the validation process would include a preliminary check of the content and correctness by Dr Červená. Following this preliminary check a more formal validation process still would be required and should be undertaken by both producers and users of the AMDAR data. The Joint Meeting proposed that the E-AMDAR and the USA AMDAR Programs would be involved on the data production side of the validation testing process.

2.1.1.3 The Joint Meeting also was informed that the proposed updates to the ARINC620 v4 Specification could take approximately 2 year to be finalized through the DataLink Systems Sub-Committee. The Joint Meeting agreed that Stewart Taylor will make available the ARINC A Project Initiation/Modification (API/M), which will include the proposed updates to the ARINC620 v4 Specification, to the AMDAR Panel at its meeting in November 2011 before it is submitted to the DataLink Systems Sub-Committee.

2.1.2 Improved Water Vapor Mass Mixing Ratio and Other New Parameters in the AMDAR BUFR Template

2.1.2.1 The joint Meeting was informed of the additional requirements to the AMDAR BUFR Template based on increasing number of aircraft being equipped with humidity sensors. It noted that based on the outputs from the current water vapour sensor being employed by AMDAR the resolution of the water vapour mass mixing ratio for AMDAR purposes should be at least 10^{-4} g/kg or 10^{-7} kg/kg .

2.1.2.2 The Joint Meeting agreed, based on advice from Eva Červená, that the AMDAR BUFR Template would include the new Code Table, 0 02 170 “Aircraft Humidity Sensor”, as well as the expanded Coded Table 0 33 026 “Moisture Quality”. The Joint Meeting also agreed that the additional and new Code Table, “Aircraft Status” should be regarded as a longer term solution and that further consultation with other operational AMDAR programs would be required before it could be implemented in the AMDAR BUFR Template.

2.1.2.3 The Joint Meeting noted that the proposed upgrade to ARINC 620 Specification also consists of parameters describing the particle size spectrum of the volcanic ash. The Joint Meeting agreed that issues relating to the reporting of volcanic ash should be conducted through the IAGOS Working Group on volcanic ash reporting. The Joint Meeting also agreed that in order to provide this group with AMDAR expertise in this area Axel Hoff should represent the AMDAR Panel at the WMO/IAGOS Technical Experts Workshop on Requirements of In-Service Aircraft Aerosol Measurement Systems, WMO Headquarters, Geneva, Switzerland, 22-24 March 2011, with his travel funded through the AMDAR Panel Trust Fund.

2.1.3 AMDAR BUFR Template, version 5

2.2.3.1 The AMDAR BUFR Template, version 5 and the newly proposed descriptors were consequently submitted to IPET DRC and discussed at the E-AMDAR TAG meeting, Plitvice, 15-17 March 2011. The outcome of the E-AMDAR TAG proposals and comments from IPET-DRC were introduced in the final version of the AMDAR BUFR Template, which is reproduced in Appendix II.

2.2.3.2 Members of the AMDAR Panel will be informed on the new version of the AMDAR BUFR Template, seeking their concurrence and assistance in the validation of the template.

2.2 AMDAR Metadata Practices

2.2.1 The Joint Meeting discussed the outcomes from the Third Session for the WMO Integrated Observing System (WIGOS) Pilot Project for AMDAR, focusing on WIGOS Pilot Project for AMDAR objective 2, application of WMO Metadata relevant to AMDAR. The Joint Meeting agreed on updates of the components of metadata associated with AMDAR and in particular, metadata needed for describing data and products, metadata needed for usage of data, see Appendix III, and metadata needed for the operation of the AMDAR observing system as well as information relevant to airports used by AMDAR equipped aircraft, see Appendix IV. It was agreed that following the approval of the identified aircraft and airport Metadata by E-AMDAR Programme Members, the Metadata would be passed to an active E-AMDAR airline for review and approval. The Joint Meeting noted that existing databases, such as those maintained by ICAO or IATA, could be used as a system of maintaining metadata on airports.

2.2.2 The Joint Meeting agreed that Stewart Taylor would consult with the airline industry partners in Europe to test whether the current version of the AMDAR Metadata for aircraft are feasible. Following this process the Joint Meeting agreed that the aircraft and airport metadata should then be made available to AMDAR Programs for comment before the final versions are submitted to the WMO Information System (WIS).

2.3 Best Practices for Quality Control Procedures for AMDAR

2.3.1 The Joint Meeting was informed that as a result of the decision by Cg-XIV a Quality Management Framework is developed which is relevant for all WMO Programs. As part of the further integration of AMDAR observations within WIGOS, a WIGOS pilot project for AMDAR has started in 2008. One of the items within this project is the development of QMF Requirements for Observational Data. It was noted that presently there are no Lead Centers for AMDAR data storage. The Joint Meeting agreed that a proposal on the Lead Centers for AMDAR data storage should be developed at the next Joint Meeting of the AMDAR Panel and ET-AIR that could be made available to the following Session of CBS for consideration.

2.3.2 A major activity within QMF is the establishment of WMO technical regulations and relevant documentations. Currently a draft version of WMO Technical Regulations Volume IV - Quality Management (WMO-No.49) is available. This volume focuses on the development and implementation of a quality management system (QMS) in line with ISO 9000 and refers to a number of WMO Guides (see QMF website)

2.3.3 The Quality Management Framework deals with the overall end-to-end policy on quality assurance and with an accent on the services provided by the NMHSs. For the Global AMDAR Programme the relevant part of QMF is the quality assurance of AMDAR observational data. For this theme reference is made to the WMO Guide to Meteorological Instruments and Methods of Observation (WMO-No. 8, Seventh edition), Part III, Chap. 1, Quality Management. The seventh edition contains extended guidelines and recommended practices in line with the recommendations endorsed by the QMF Task Team.

2.3.4 Because the observations for AMDAR are carried out under the responsibility of the aircraft owners and not by NMHSs, quality control and assurance is a critical issue. As described in the Manual on the Global Data Processing and Forecasting System (Man. GDPFS; WMO No. 485), WMO Members may only disseminate data over the GTS if these data conform to the quality requirements. Further details on these requirements can be found in both the Guide to the Global Observing System (WMO No. 488) and the AMDAR Reference Manual (WMO No. 958).

2.3.5 To establish an appropriate QMS for AMDAR data, disseminated world wide over the GTS, clear harmonization of the quality control principles and conditions will be a critical issue. Procedures and conditions are stated and defined in the Manual on the GDPFS. Nevertheless national practices have introduced their own quality control procedures in due course, so harmonization is relevant. Also, the AMDAR Reference Manual provides appropriate quality control and evaluation guidelines as part of data management. The relevant paragraphs in this manual can be extended with more quantitative details in line with QMF recommendations.

2.3.6 Currently three types of quality control activities are in practice:

- Real time evaluation of data before dissemination over the GTS
- Delayed evaluation of data after dissemination over the GTS
- Data monitoring after reception of data from the GTS (off line).

2.3.7 Real time evaluation filters all data using a predicted value (obtained by NWP) as reference to flag or rejects data if the values do not conform to defined constraints. Moreover such control systems may also check the availability of data (e.g. to find gaps in series of data relevant for profile information), may check for inconsistency of the position of an aircraft (LAT/LON and altitude) and of the timestamps. Also checks can be performed on the validity of aircraft reports (to avoid ghost reports, e.g. from aircraft during maintenance).

2.3.8 Delayed evaluation can be carried out shortly after reception using current background data from NWP as reference, e.g. within a 3 hour time window. For operational practices however, such type of validation and analyses is carried out hourly or every three hours (NWP runtime intervals) but reported to the local operators or coordinators once a day to support the switch off of data streams from suspected aircraft. With delayed data analysis the same checks will be carried out as with real time monitoring. Such analysis is more sophisticated (or reliable) because the available background reference (from NWP) provides a more accurate reference than the predicted values used for real time monitoring.

2.3.9 Data monitoring can also be carried out shortly after reception using background data from NWP as reference. For operational practices however, such type of validation and analyses is carried out on a daily basis to inform local operators once a day to switch off data streams from suspected aircraft. With off line data analysis the same checks can be carried out as with real time monitoring. In addition to this activity, statistics can be performed (e.g. on a daily basis) to indicate particular aircraft with unacceptable (daily) bias (or critical trends), frequent gross errors or timeliness.

2.3.10 To implement a QMS a strategic approach for data monitoring and/or quality evaluation should be defined beforehand. For such a strategy it is relevant to decide first to have the quality evaluation (or monitoring) as an integral part of the local (regional or national) AMDAR data acquiring and processing infrastructure or not. Quality evaluation (QEv) inside the system has

the advantage of direct (active) interaction with the local operators or technical coordinators. Quality control outside the system provides more or less quality monitoring only and is therefore a more passive activity.

2.3.11 For a number of check or control items the methods to evaluate observational and meta data (like positioning and time stamps) need to be investigated and to be developed to obtain a more accurate or reliable result. To evaluate the quality of observational data such as air temperature and wind the use of a high resolution (in time and place) NWP background is appropriate. For the evaluation of mixing ratio, icing and turbulence more experience is required to demonstrate the validity of the quantitative evaluation results using NWP. A challenging issue still is the QEv of positional information (horizontal and vertical) and on the time stamps. (If place and time are wrongly encoded a QEv system may indicate errors for temperature or wind although measured correctly). There are some techniques to check for inconsistencies, but the output is limited. Further research is required to improve the quality of the QEv methods.

2.3.12 For the further implementation of WIGOS a number of pilot projects with actions on QMF have been carried out already for other WMO programs. These actions have resulted in recommended practices for (in situ) data real time quality control. To have an efficient and effective approach, these practices can be evaluated first for the further development of AMDAR QEv methods. Examples of such practices are published by the oceanographic community, like by the Date Buoy Co-operation Panel (DBCP). These practices are published as handbooks, which contain an extensive, detailed and structured set of real time quality checks (RTQCs) directly convertible into AMDAR QEv (near) real time quality checks.

2.3.13 The Joint Meeting noted the complexity associated with an agreement of wider AMDAR community with generic QC procedures and requested Jitze van der Meulen to develop a Strategy on principle and procedures for the Quality Control of AMDAR Data for consideration by the next Joint Meeting of the AMDAR Panel and ET-AIR, November 2011.

2.4 Validation of Available Water Vapour Sensor

The joint Meeting was informed on the current status of the validation of the available humidity sensors for AMDAR, including testing on the Facility for Airborne Measurement (FAAM) research aircraft. Two units of the humidity sensor type WVSS-II of SpectraSensors Inc., USA are operated in a piggy-back mode. The parallel use of two systems is done because they have different intake and outlet gadgets. Besides of the serial gadget a total air temperature (TAT) housing is used to achieve the impact pressure to be inside of the sampling tube where the Laser absorption method is applied. Very first preliminary results are shown in Fig. 1 and Fig. 2. The WVSS-II measurements of the water vapour mass mixing ratio are nearly identical to each other and in congruence to the output of the chilled mirrors. The pressure inside of the system's sampling tubes differs by around 70 hPa. The unit with the TAT housing has the higher value. The sampling tube's temperature differs because the internal heating of the unit connected with the TAT inlet is intentionally switched off. It will have to be cleared why even in the non heated unit the temperature goes to 30 °C (at ambient temperature of around 0 °C). This difference by the adiabatic impact effect only comes up at about 200 hPa and Mach 0.8.
A final evaluation will be available in summer 2011.

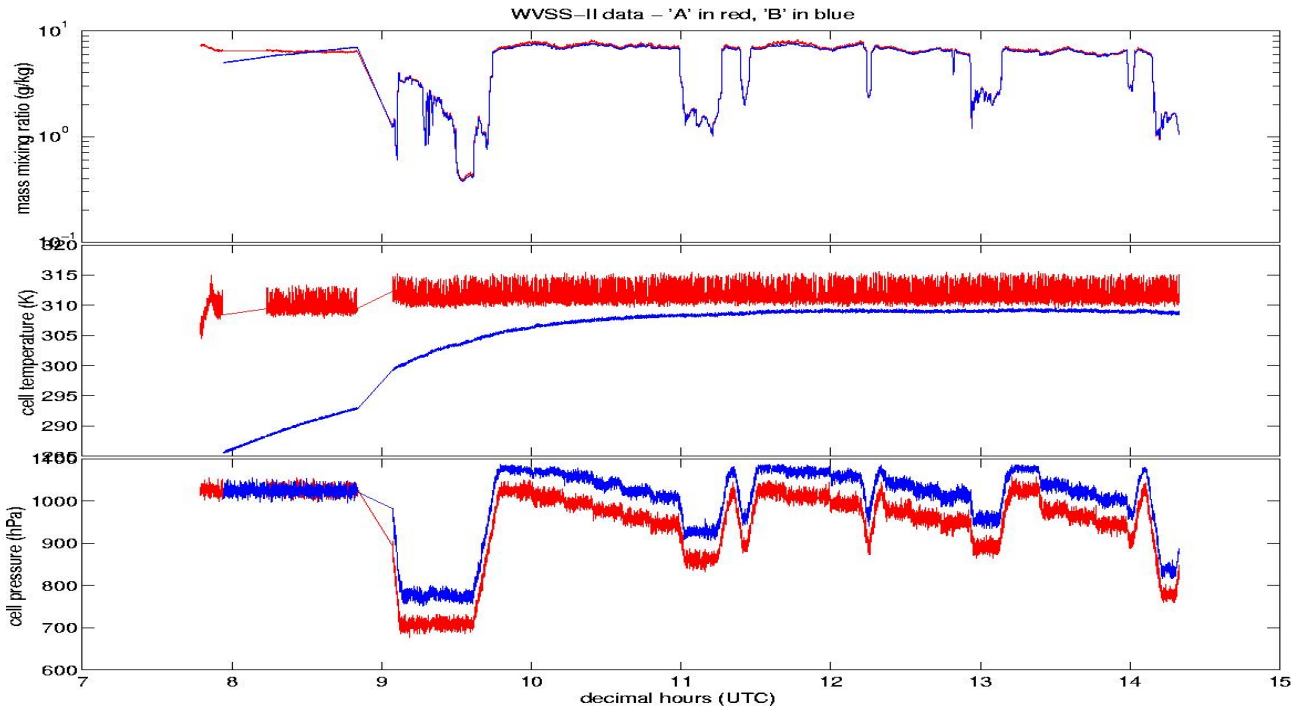

Fig. 1: Time series (more than 5 flight hours after start) of WVSS-II's measurement parameters (sampled by FAAM, 24 Feb 2011).
Upper diagram: Water vapour mass mixing ratio in g / kg of both units
Middle diagram: Inside temperature of the sampling tubes
Lower diagram: Inside pressure of the sampling tubes

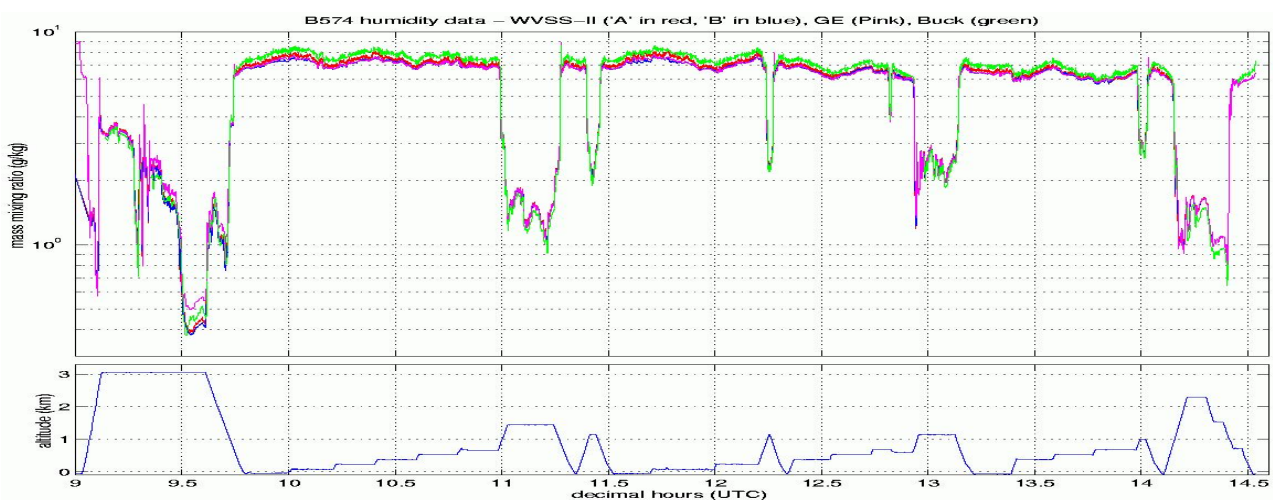

Fig. 2: Flight parameters (sampled by FAAM, 24 Feb 2011) 5.5 flight-h since 9 UTC .
Upper diagram: Water vapour mass mixing ratio in g / kg of both WVSS-II units together with reference data of chilled mirrors (General Eastern and Buck Research)
Lower diagram: Flight altitude.

2.5 Update of the AMDAR Reference Manual and a Framework for Generic Software Specification for AMDAR

2.5.1 The Joint Meeting noted that as part of the Implementation Plan for the WIGOS Pilot Project for AMDAR, the Update of the AMDAR Reference manual (WMO NO. 958) and the Development of the Framework for Generic Software Specification are considered as "longer-term" action items.

2.5.2 The Joint Meeting noted that the development of framework for generic software specification was heavily dependent on the decision made by the DataLink Systems Sub-Committee on the APIM developed by the AMDAR Panel for the ARINC620 Specification. As this process may take several years before a final decision can be made on the upgrade to the ARINC620 Specification the Joint Meeting agreed that this particular WIGOS PP for AMDAR task will be placed on hold until a decision is made by the DataLink Systems Sub-Committee.

2.5.3 The Joint Meeting agreed that the WMO Secretariat in coordination with the AMDAR Panel Chairperson, will provide a proposal on the strategy for integration of AMDAR Reference manual (WMO No. 958) into the WMO Regulatory Material, such as the Manual and Guide on the Global Observing System, the Manual and Guide on the GTS and the Guide to Meteorological Instruments and Methods of Observations to the next Joint Meeting of the AMDAR Panel and ET-AIR, Quebec, Canada, November 2011. The Joint Meeting also agreed that as part of this development new AMDAR Implementation guidance material should be developed for those WMO Members interested in developing national AMDAR programmes..

3. REVIEW OF THE WORK PROGRAMME AND ACTION ITEMS FROM THE JOINT AMDAR PANEL AND CBS EXPERT TEAM ON AIRCRAFT BASED OBSERVATIONS MEETING (GENEVA, 2010)

3.1 Review AMDAR Panel Terms of Reference

3.1.1. The Joint Meeting agreed to a number of proposed changes to the Rules and Procedures for the AMDAR Panel, see Appendix V. These proposed changes will be presented to the Session of the AMDAR Panel later in 2011.

3.2 Review AMDAR Panel Action Items in coordination with the ET-AIR Work plan

3.2.1. The Joint Meeting agreed on a number of changes to the AMDAR Panel Action Items agreed at the last Joint Meeting of the AMDAR Panel and ET-AIR, see Appendix VI.

3.3 Status of the Manual suitable for the Airline Industry

3.3.1. The Joint Meeting reviewed the status report of the manual for the airline industry. It noted that the general structure of the intended report and the approach has been established as per the guidelines agreed at the 13th AMDAR Panel Meeting with the primary focus of value provided to the airline industry. The Joint Meeting also agreed that this material will not include material relating to the TAMDAR System but only to ACARS Equipped aircraft.

3.3.2. The Joint Meeting noted that the first deliverable will be the provision of a bibliography of relevant source material, due 7 March 2011. It was also noted that an Internet search revealed

approximately 600 entries for automated aircraft reports and that the most relevant would be made available in a search-able database. It was also noted that the assistance from relevant areas of the AMDAR Panel may be required if the report is to be a success.

3.4 Preparations for the Workshop in Mexico

3.4.1. Following a review of public holidays in Mexico and Central and South America the Joint Meeting agreed on new dates, 8-10 November 2011, for the AMDAR Workshop in Mexico City. These new dates for the AMDAR Workshop in Mexico City have been agreed to by Servicio Meteorologico Nacional (SMN). The Joint Meeting noted that the WMO Secretariat have provided SMN with required action items, including deadlines, for the preparation of the Workshop in Mexico City. These action items have been assigned to SMN, the AMDAR Panel and the WMO Secretariat:

- AMDAR Panel and SMN agree the workshop will be held November 8-10, 2011 (by 28 February, 2011).
- AMDAR Panel Chair/Vice-Chair to inform Mexican PR of the agreed workshop dates (by March 4, 2011).
- WMO will prepare a workshop program/agenda and will provide names of subject matter experts/lecturers to be invited by WMO (by March 4, 2011).
- Mexican PR is to send a letter to WMO inviting the AMDAR Panel to conduct a workshop on the agreed dates (by March 31, 2011).
- SMN (assuming you are hosting the workshop) is to send to WMO information on the local arrangements (by April 15, 2011)
- SMN is to invite workshop participants, e.g., airlines, representatives from neighboring countries, etc. (by May 3, 2011).
- SMN is to finalize all local arrangements including hotel rooms, meeting facilities and infrastructure, interpretation/translation capabilities, etc. (by May 3, 2011).
- WMO is to send invitations to subject matter experts/lecturers to attend the workshop (by May 13, 2011).

3.4.2. The Joint Meeting agreed that the proposed agenda, see Appendix VII, for the AMDAR Workshop in Mexico will require amending once the final list of attendees and Workshop lecturers are finalized. The Joint Meeting agreed that an alternate location for the AMDAR Workshop be investigated if Mexico City can not be organized for 2011. The Joint Meeting agreed that Carl Weiss would investigate whether interpretation would be required during the Workshop.

3.4.3. The Joint Meeting agreed on a number of changes to the AMDAR Workshop Guidelines and Procedures, see Appendix VIII, and recommended that these guidelines be included in the Terms of Reference for the AMDAR Panel.

4. ARRANGEMENTS FOR THE AMDAR PANEL #14

4.1 The Joint Meeting was informed that Canada has officially invited to host the joint meeting of AMDAR Panel and CBS ET-AIR in Quebec City, from 2 November to 4 November 2011.

4.2 The Joint Meeting agreed on a number of changes to the proposed agenda for the next Joint Meeting of the AMDAR Panel and ET-AIR, see Appendix IX.

5. AMDAR PANEL ORGANIZATIONAL ISSUES

5.1. AMDAR Representation at Meetings

5.1.1. The Joint Meeting agreed on a number of changes to the proposed schedule of meetings with AMDAR Panel involvement, see Appendix X.

5.2. Status of Trust Fund and AMDAR Panel Finances

5.2.1. The Joint Meeting reviewed the status of the AMDAR Trust Fund, see Appendix XI. It was noted that the AMDAR Panel Trust Fund remains in a relatively healthy position heading into the next financial period. It was also reported that the current level of voluntary contributions being made by AMDAR Panel Members has been maintained at a fairly acceptable level.

5.3 AMDAR Governance

5.3.1. The Joint Meeting reviewed the current status of the governance and noted that the first steps in addressing the governance of WMO AMDAR Panel have essentially been completed. It was also noted that as a further advancement to full integration of aircraft observations into WIGOS, a number of ET-AIR and AMDAR Panel experts were nominated and accepted into the working structure of CIMO, at the CIMO-XV (Helsinki, Finland September 2010). Dr Axel Hoff (with support of Dr Jitze van der Meulen) now has the new role of Theme Leader on Aircraft Measurements.

6. ANY OTHER BUSINESS

6.1 No other business was discussed.

7. CLOSURE OF THE SESSION

The Meeting closed at 12:00pm on 4 February 2011.

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APPENDIX I

LIST OF PARTICIPANTS

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APPENDIX II

BUFR TEMPLATE FOR AMDAR, 3 11 010, version 5 (21 March 2011)

0	01	008		Aircraft identification (1)
0	01	023		Sequence number (2)
0	01	006		Flight number (3)
0	01	110		Aircraft tail number (1) (4)
0	01	111		Origination airport (4)
0	01	112		Destination airport (4)
2	04	002		Add associated field (of 2 bits) (19) (20)
0	31	021		Associated field significance (19) (20) (= 8 Two bits quality information)
3	01	011		Year, month and day
3	01	013		Hour, minute and second
3	01	021		Latitude and longitude (high accuracy)
0	07	010		Pressure Altitude (Flight Level)(5)
0	10	053		GNSS Altitude (4)
0	08	009		Detailed phase of flight (6)
0	11	001		Wind direction
0	11	002		Wind speed
0	02	064		Aircraft roll angle quality (25)
0	11	100	Optional	Aircraft true airspeed (7)
0	11	101	Optional	Aircraft ground speed (u-component) (4)
0	11	102	Optional	Aircraft ground speed (v-component) (4)
0	11	103	Optional	Aircraft ground speed (w-component) (4)
0	11	104	Optional	Aircraft true heading (4)
0	12	101		Temperature/air temperature (8)
0	02	170		Aircraft humidity sensors (4) (24)
2	01	138		Change data width (26)
2	02	131		Change scale (26)
0	13	002		Mixing ratio (22)
2	02	000		Cancel change scale (26)
2	01	000		Cancel change data width (26)
0	13	003		Relative humidity
1	01	000		Delayed replication of 1 descriptor
0	31	000		Short delayed descriptor replication factor
0	12	103	Optional	Dew-point temperature (9)
0	33	026		Moisture quality (23)
1	01	000		Delayed replication of 1 descriptor
0	31	000		Short delayed descriptor replication factor
0	20	042	Optional	Airframe icing (10)
1	03	000		Delayed replication of 3 descriptors
0	31	000		Short delayed descriptor replication factor
0	20	043	Optional	Peak liquid water content (11)
0	20	044	Optional	Average liquid water content (11)
0	20	045	Optional	Supercooled large droplet (SLD) conditions (11)
1	01	000		Delayed replication of 1 descriptor

0	31	000		Short delayed descriptor replication factor
0	33	025	Optional	ACARS interpolated values indicator (12)
1	03	000		Delayed replication of 3 descriptors (13)
0	31	001		Delayed descriptor replication factor (14)
0	11	075	Optional	Mean turbulence intensity (EDR)
0	11	076	Optional	Peak turbulence intensity (EDR)
0	11	039	Optional	Extended time of occurrence of peak EDR (15)
1	02	000		Delayed replication of 2 descriptors
0	31	000		Short delayed descriptor replication factor
0	11	037	Optional	Turbulence index (EDR)
0	11	077	Optional	Reporting interval or averaging time for EDR (16)
1	03	000		Delayed replication of 3 descriptors
0	31	000		Short delayed descriptor replication factor
0	11	034	Optional	Vertical gust velocity (17)
0	11	035	Optional	Vertical gust acceleration (17)
0	11	036	Optional	Maximum derived equivalent vertical gust speed (17)
2	04	000		Cancel add associated field (19) (20)
1	19	000		Delayed replication of 19 descriptors (18)
0	31	001		Delayed descriptor replication factor (18)
3	01	011		Year, month and day
3	01	013		Hour, minute and second
3	01	021		Latitude and longitude (high accuracy)
0	07	007		Height
0	11	105	Optional	EDR algorithm version (4)
2	04	007		Add associated field (of 7 bits) (21)
0	31	021		Associated field significance (21) (= 7 Percentage confidence)
0	11	076	Optional	Peak turbulence intensity (EDR)
0	11	075	Optional	Mean turbulence intensity (EDR)
2	04	000		Cancel add associated field(21)
0	11	106	Optional	Running minimum confidence (4)
0	11	107	Optional	Maximum number bad inputs (4)
0	11	108	Optional	Peak Location (4)
0	11	109	Optional	Number of good EDR (4)
0	12	101	Optional	Temperature/air temperature
0	11	001	Optional	Wind direction
2	01	130	Optional	Change data width
0	11	084	Optional	Wind speed
2	01	000	Optional	Cancel change data width

*Table 1. S*tandardized BUFR Template for AMDAR *3 11 010 version 5*

Notes for Standardized BUFR Template for AMDAR data 3 11 010, version 5:

(1) Aircraft identifier 0 01 008 can cope with ASDAR, ADS and other AMDAR identities. ADS reports use a 24-bit ICAO airframe identifier, equating to an 8-character BCD number. Look at developing a standard naming convention for the various AMDAR regions and/or programmes. The WIGOS meeting agreed that additional information such aircraft type and navigation systems would be part of the Meta data, not part of the Standardized BUFR Template for AMDAR. It was noted that AMDAR Meta data would be addressed by the WIGOS Pilot Project

for AMDAR. This identifier is used for masking the identity of the aircraft. For the real identification, 0 01 110 can be used and is therefore classed as optional.

(2) The sequence number is a simple observation count to be included in the down-linked message. It should be reset at 0000 UTC each day and can be useful for quality control, data management and archiving purposes. The WIGOS meeting has made the recommendation that if this parameter is not used by an operational AMDAR programme or NWP Centre then this parameter be removed from the new Standardized BUFR Template for AMDAR.

(3) 0 01 006 (Flight number) will assist with the quality control of aircraft track data, by providing information on the route the aircraft is expected to take, including information on the departure airport and the expected arrival airports. Presently 8 characters has been used as an estimate as the maximum length for any given flight number.

(4) Refer to Table 2 for the required BUFR descriptors including the units, scale, reference value and data width.

Table reference		**BUFR**			
F X Y	**Element name**	**Unit**	**Scale**	**Reference value**	**Data width**
0 11 100	Aircraft true airspeed	m s^{-1}	1	0	12
0 11 101	Aircraft ground speed u-component	m s^{-1}	1	–4096	13
0 11 102	Aircraft ground speed v-component	m s^{-1}	1	–4096	13
0 11 103	Aircraft ground speed w-component	m s^{-1}	1	–512	10
0 11 104	Aircraft true heading	Degree true	0	0	9
0 10 053	Global Navigation Satellite System Altitude	m	0	-1000	17
0 01 110	Aircraft tail number	CCITT IA5	0	0	48
0 01 111	Origination airport	CCITT IA5	0	0	24
0 01 112	Destination airport	CCITT IA5	0	0	24
0 11 105	EDR algorithm version	Numeric	0	0	6
0 11 106	Running minimum confidence	Numeric	1	0	4
0 11 107	Maximum number bad inputs	Numeric	0	0	5

0 11 108	Peak Location	Numeric	1	0	4
0 11 109	Number of good EDR	Numeric	0	0	4
0 02 170	Aircraft humidity sensors	Code table	0	0	6

Table 2. Proposal for new AMDAR descriptors in 3 11 010, version 5.

(5) Following advice from the airline industry it was recommended that Pressure (0 07 004) not be included as the primary height field and that Pressure Altitude (PALT) (0 07 010) replace this field. Note: PALT should be identical to that of the previously used AMDAR primary height field Flight Level (0 07 010), it is recommended that the definition of Flight Level include definition for PALT ($h_lh_lh_l$ as per the FM42 definition) to remove confusion (it refers to Pressure Altitude as a measure of height relative to standard datum plane of 1013.2 hPa).

(6) This phase of flight table is expanded to indicate wind quality from roll angle, or roll and pitch combined and also to indicate the method of ascent and descent observation interval selection either by time or pressure increments. The WIGOS meeting agreed that the Phase of flight 0 08 004 would not be included in the new Standardized BUFR Template for AMDAR as the required level of detail has been incorporated in the detailed phase of flight 0 08 009. The WIGOS meeting also discussed whether there is a requirement for adding a new condition to the detailed phase of flight 0 08 009 that would cover an aircraft being placed in a holding pattern.

(7) Refer to AMDAR Reference Manual for definition.

(8) This parameter has been renamed Temperature/air temperature.

(9) 0 12 103 Dew-point temperature had been introduced in the templates for AMDAR profile data to simulate radiosounding data.

(10) The old ACARS airframe icing code table 0 20 041 is not included.

(11) A special automatic icing report, including these elements, is expected to become available from some aircraft and a down-link code has been published.

(12) 0 33 025 ACARS interpolated values was primarily used in the USA AMDAR Programme to indicate time and position being reported or interpolated. The name for this element has been changed to ACARS interpolated values indicator.

(13) Delayed replication 1 03 000 refers to the following three descriptors 0 11 075, 0 11 076 and 0 11 039 to allow reporting of the Extended time of occurrence of peak EDR of all included values of 0 11 076 (Peak (EDR)). This allows each turbulence peak to be reported.

Explanatory remarks to Note (13):

According to Note (14), up to ten values of 0 11 076 (Peak (EDR)) may be reported. However, 0 11 039 (Extended time of occurrence of peak EDR) was included only once in the template 3 11 010, version 0. Therefore, it was not clear to which out of those ten values of 0 11 076, the time specification 0 11 039 referred. If it had been the maximum value, the name of 0 11 039 should have been modified to read “Extended time of occurrence of maximum peak EDR”. If the time information on all the reported values of 0 11 076 (Peak (EDR)) is required, then 0 11 039 (Extended time of occurrence of peak EDR) should be included under the delayed replication as shown in the proposed template 3 11 010, version 5

(14) Some aircraft report up to 10 pairs of (EDR) values per observation. The corresponding times and position could be found by interpolation from the previous report. If the aircraft does not report it the number of replication 0 31 001 is set to zero.

(15) 0 11 039 allows observation intervals up to one hour. 0 11 038 allows up to 15 minutes only whereas observation intervals of 30 minutes or more are commonly used, hence 0 11 038 had been replaced by 0 11 039.

(16) The EDR observing interval and associated averaging time differs according to individual observing schedule and cannot be assumed to be identical to the observation interval for the main elements. It is desirable to include this information in the coded data.

(17) Vertical gust velocity 0 11 034, Vertical gust acceleration 0 11 035 and Maximum derived equivalent vertical gust speed 0 11 036 have been added to meet the request for reflecting all entries of 3 11 004 in the Standardized BUFR template for AMDAR. The current ICAO standard for automated turbulence reporting is EDR.

(18) Up to 254 EDR reports may be included in a BUFR message. If the aircraft does not report them, the number of replication 0 31 001 is set to zero.

(19) Operator descriptor 2 04 Y has been introduced for representation of AMDAR quality information instead of flag table 0 33 079 () used in the previous versions of the AMDAR template 3 11 010. Some elements (such as Wind Speed, Wind Direction, Air Temperature) may appear more than once in the data described by 3 11 010. Operator descriptor 2 04 Y allows to assign unambiguously the required quality information to the element to which it refers.

(20) Each of the following elements, apart from delayed replication factors 0 31 000 and 0 31 001, shall be preceded by two bits providing information on the element being suspected or not. If the quality information on the element is not required, the associated field shall be set to 3. For this purpose, **code figure 8 (Two bit quality information**) is proposed to be used as defined in the Code table 0 31 021 (Associated field significance). :

0 31 021

Code figure	
8	0 - Not suspected 1 - Suspected 2 - Reserved 3 - Information not required

(21) Peak turbulence intensity (EDR) and Mean turbulence intensity (EDR) shall be preceded by seven bit information containing percentage confidence of Peak turbulence intensity (EDR) and Mean turbulence intensity (EDR), respectively.

(22) Mixing ratio 0 13 002 is to be used for water vapour mass mixing ratio

(23) New code figures have been introduced into 0 33 026 (Moisture quality) as shown in the table below.

0 33 026 (Moisture quality)

Code figure	
0	Normal operations - measurement mode
1	Normal operations - non-measurement mode
2	Small RH
3	Humidity element is wet
4	Humidity element contaminated
5	Heater fail
6	Heater fail and wet/contaminated humidity element
7	At least one of the input parameters used in the calculation of mixing ratio is invalid
8	Numeric error
9	Sensor not installed
10	Calculated RH > 100%
11	Input laser power too low
12	Probe WV Temp. out of range
13	Probe WV Press. out of range
14	Spectral line out of range
15	No laser output
16-62	Reserved
63	Missing value

(24) A new entry 0 02 170 is proposed for Aircraft humidity sensors (Code table, 0, 0, 6):

Code Figure	Sensor Type	Status
0	SpectraSensors WVSS-II, Version 1	Operational
1	SpectraSensors WVSS-II, Version 2	Operational
2	SpectraSensors WVSS-II, Version 3	Operational
3 – 61	Reserved	
62	Other	
63	Missing Value	

(25) 0 02 063 (Aircraft Roll Angle, Value) will not be reported but 0 02 064 (Aircraft Roll Angle Quality, Code Flag Table) will because this provides the required information on the Roll Angle (e.g. Code Figure 1, Bad, means Roll Angle > 5 degrees from vertical)

(26) This is used to increase scale 5, data width 14 to scale 8, and data width 24 to cover the full range for water vapour mass mixing ratio being reported in kg kg^{-1} with precision in 10^{-8} of kg kg^{-1}.

APPENDIX III

Aircraft Metadata

Parameter	Description	Examples	Additional Comments
Programme	AMDAR Programme responsible for the AMDAR report	E-AMDAR	
Country/Member	Country Member responsible for AMDAR report	UK	
Originating Centre	Centre for issuing the AMDAR report (ICAO Code)	EGRR	
Metadata File Identifier		wamis-bulletin-albania-en	
Metadata Publication Date		20090526	
Resource Name		AMDAR data	
Publisher Person Name		Michael Berechree	
Publisher Organization Name		WMO Observing Systems Division	
Publisher Phone		41227308212	
Publisher Fax		+4122 7308042	
Publisher Street Address			
Publisher City		Geneva	
Publisher Post Code		1211	
Publisher Country		Switzerland	
Publisher Person Email		(TBD) ……..@wmo.int	
Resource Publication Date		2009	
Regional AMDAR Programme Contact Name			
Regional AMDAR Programme Organization Name			
Regional AMDAR Programme Phone			
Regional AMDAR Programme Fax			

Regional AMDAR Programme Street Address			
Regional AMDAR Programme City			
Regional AMDAR Programme Post Code			
Regional AMDAR Programme Country			
Regional AMDAR Programme Person Email			
Airline Contact Name	Person responsible - aircraft calibration & maintenance		
Airline Organization Name		British Airways	
Airline Phone			
Airline Fax			
Airline Street Address			
Airline City			
Airline Post Code			
Airline Country			
Airline Person Email			
Airline operating ISO 17025	Is the airline's calibration procedures well documented	Yes/No	
AMDAR Programme Identifier	Unique AMDAR aircraft identifier	AU0001	
Date Aircraft was activated for AMDAR		ddmmyyyy	
Aircraft Manufacturer		Boeing	
Aircraft MSN	Airframe unique identifier	nnnn	
Aircraft Model		B747	
Aircraft Series		4nn	
Avionics manufacturer		Teledyne	
Avionics Hardware part no.			
Avionics Software part no.			
Navigation System	Lat/Long and time (GPS or inertia)	GPS	Should move to GPS eventually

AMDAR Software		AAA	
AMDAR Software Version		V1	
Ascent/Descent interval reporting trigger type		Pressure level/time	
Date Ascent/Descent interval reporting trigger modified		ddmmyyyy	
AMDAR Software Temperature Smoothing		Yes/No	Would these be required in a final version of instrument level metadata.
Date Temperature Smoothing modified		ddmmyyyy	
AMDAR Software Wind Speed & Direction Smoothing		Yes/No	
Date Wind Speed & Direction Smoothing modified		ddmmyyyy	
AMDAR Software Humidity Smoothing		Yes/No	
Date Humidity Smoothing modified		ddmmyyyy	
Last date of aircraft maintenance and control	For all aircraft instrumentation/sensors	ddmmyyyy	Airline to provide information
Last type of aircraft maintenance and control performed	Airline specific		
Aircraft Temperature Sensor Manufacturer	All information relating to the measurement of temperature	Rosemount	Requirements for multiple sensors?
Aircraft Temperature Sensor Part no.		PT100	Which sensor(s) is used for AMDAR?
Aircraft Temperature Sensor Serial no.		nnnn	
Temperature Sensor Operational		Yes/No	
Date Temperature Sensor's Operational Status modified		ddmmyyyy	
Aircraft Temperature Sensor Date of installation		ddmmyyyy	
Aircraft Temperature Sensor Date of calibration		ddmmyyyy	
Aircraft Pressure Sensor Manufacturer	All information relating to the measurement of Pressure		

Aircraft Pressure Sensor Part no.			
Aircraft Pressure Sensor Serial no.		nnnn	
Pressure Sensor Operational		Yes/No	
Date Pressure Sensor's Operational Status modified		ddmmyyyy	
Aircraft Pressure Sensor Date of installation		ddmmyyyy	
Aircraft Pressure Sensor Date of calibration		ddmmyyyy	
Aircraft Pitot Sensor Manufacturer	All information relating to the measurement of Pitot		
Aircraft Pitot Sensor Part no.			
Aircraft Pitot Sensor Serial no.		nnnn	
Pitot Sensor Operational		Yes/No	
Date Pitot Sensor's Operational Status modified		ddmmyyyy	
Aircraft Pitot Sensor Date of installation		ddmmyyyy	
Aircraft Pitot Sensor Date of calibration		ddmmyyyy	
Aircraft Humidity Sensor Manufacturer	SpectraSensors Inc., USA		
Aircraft Humidity Sensor Part no.			see Engineering Bulletin
Aircraft Humidity Sensor Serial no.		nnnn	Changes at each C-Check
Humidity Sensor Operational		Yes/No	
Date Humidity Sensor's Operational Status modified		ddmmyyyy	
Aircraft Humidity Sensor Date of installation		ddmmyyyy	
Aircraft Humidity Sensor Date of calibration		ddmmyyyy	
Aircraft Turbulence Sensor Manufacturer	All information relating to the measurement of Turbulence		
Aircraft Turbulence Sensor Part no.			

Aircraft Turbulence Sensor Serial no.		nnnn	
Turbulence Sensor Operational		Yes/No	
Date Turbulence Sensor's Operational Status modified		ddmmyyyy	
Aircraft Turbulence Sensor Date of installation		ddmmyyyy	
Aircraft Turbulence Sensor Date of calibration		ddmmyyyy	
Aircraft Icing Sensor Manufacturer	All information relating to the measurement of Icing		
Aircraft Icing Sensor Part no.			
Aircraft Icing Sensor Serial no.		nnnn	
Icing Sensor Operational		Yes/No	
Date Icing Sensor's Operational Status modified		ddmmyyyy	
Aircraft Icing Sensor Date of installation		ddmmyyyy	
Aircraft Icing Sensor Date of last calibration		ddmmyyyy	

APPENDIX IV

Airport Metadata

Airport Metadata Parameters	Description	Examples	Comments
Airport Name		London (Heathrow)	
Airport Country		UK	
IATA code		LHR	These organization shall inform the NMHS of any changes to these codes through the WMO
ICAO code		EGLL	
WMO Code		03772	
Lat/Long		51.3/-0.3	
Altitude (with respect to msl?)	+ msl	25m	
Programme responsible for maintaining information	Regional AMDAR Programme responsible for maintaining information	E-AMDAR	
Date last updated	Refers to the table update	ddmmyyyy	

APPENDIX V

Purpose AND TERMS OF REFERENCE FOR THE WMO PANEL ON AIRCRAFT METEOROLOGICAL DATA RELAY (AMDAR PANEL)

I. GENERAL

The purpose of the Panel shall be to enhance the upper-air component of the Global Observing System of the World Weather Watch through cooperation among Members in the acquisition, exchange and quality control of meteorological observations from aircraft using automated reporting systems.

Recognizing a fundamental principle of WMO to broaden and enhance the free and unrestricted international exchange of data and noting the increasing availability of aircraft platforms with suitable sensors, avionics and communication systems, the Panel is established to take advantage of the opportunity to use these new cost-effective global data sources to better respond to the needs of WMO, WMO-sponsored programmes such as the WWW, WCRP, GCOS and GOOS, other global programmes such as GEOSS, and to bring potential benefits to end-users in aviation and other communities. The Panel is considered necessary to ensure a coordinated approach to the development of AMDAR as an operational global programme with particular benefits in data-sparse areas of the world.

To achieve the purpose, the Panel on Aircraft Meteorological Data Relay shall:

1. Consider the expressed needs of the international meteorological and climatological communities for data from automated meteorological reports from aircraft and initiate action from its members, or others as appropriate, to meet these needs;

2. Facilitate the coordination of existing national and international programmes of automated meteorological reporting from aircraft so as to optimize the provision and timely exchange of high-quality data at minimum cost;

3. Propose, organize and implement through the coordination of national and regional efforts, the expansion of the current and future Aircraft Meteorological Data Relay (AMDAR) Programme, to obtain such data particularly in data-sparse areas of the world;

4. Promote the exchange and dissemination of all appropriate automated meteorological reports from aircraft through the Global Telecommunication System and other systems as appropriate;

5. Promote the dissemination, exchange and use of information on AMDAR data availability and quality among Members and data providers with a view to initiating appropriate corrective action;

6. Promote the exchange of information on AMDAR and encourage the development and transfer of appropriate technology;

7. Ensure that other bodies actively involved in automated meteorological reporting from aircraft are informed of the workings of the Panel and encourage, as appropriate, their participation in the Panel's deliberations;

8. Make and regularly review administrative arrangements as necessary, including securing the services of a Technical Coordinator when necessary;

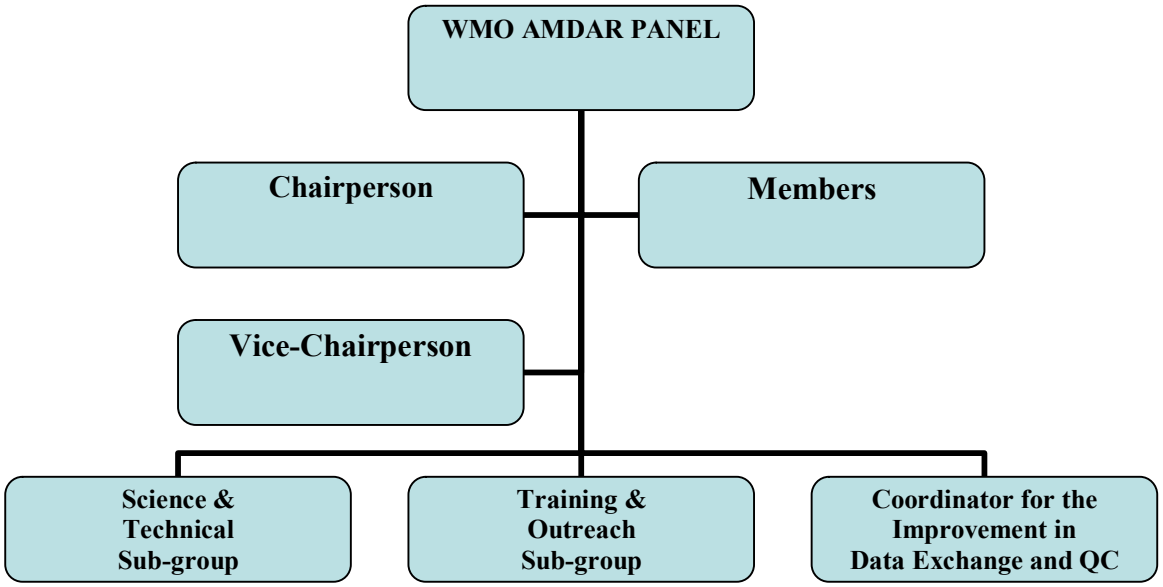
9. Promote joint funding arrangements, as appropriate, for the development, implementation and operation of the AMDAR Programme;

10. Liaise and interact with the Commission for Basic Systems (CBS) regarding further integration of AMDAR into GOS and WMO Integrated Global Observing System (WIGOS);

11 Liaise and interact as appropriate with the relevant sections of the aviation community on issues of common concern such as data acquisition, data management, communications and costs; and

12. Submit annual progress reports to the relevant WMO constituent body sessions and/or their subsidiary bodies.

II. WORKING STRUCTURE OF THE AMDAR PANEL



III. MANAGEMENT GROUP:

1. The Management Group is created to steer the AMDAR Panel activities between AMDAR Panel sessions.

2. The Management Group is composed of:
   a. the AMDAR Panel Chairperson
   b. Vice-Chairperson of the AMDAR Panel
   c. Science and Technical Subgroup Coordinator
   d. Training and Outreach Sub-Group Coordinator
   e. Coordinator for the Improvement in Data Exchange and Quality Control
   f. Representative from CBS ET-AIR

3. The AMDAR Panel Management Group may call representatives of national and/or regional AMDAR programs for specific agenda items.

4. The work of the AMDAR Panel Management Group is supported by the WMO Secretariat.

5. The AMDAR Panel Management Group will normally meet once per year.

IV. SUB_GROUP AND COORDINATORS:

1. Sub-groups have been established to deal with specific issues related to scientific, technical, training, Outreach and the improvement in data exchange and quality control activities of the Panel.

2. The Panel agreed on terms of reference for the sub-groups and coordinators.

V. MEMBERSHIP FOR THE WMO PANEL ON AIRCRAFT METEOROLOGICAL DATA RELAY (AMDAR PANEL)

The Panel is recognized as a body within the WMO structure, with the endorsement of the WMO Executive Council and anchored to the Commission for Basic Systems (CBS), fostering active cooperation among Members in the implementation and operation of AMDAR as a component of the WWW Composite Observing System.

Members:

Panel members shall be Members of WMO that operate or intend to operate AMDAR programs and are willing to contribute to the Panel's activities or the AMDAR Panel Trust Fund.

Observers:

Representatives of any organization or programme actively involved in the use, development, collection or provision of automated meteorological reports from aircraft, or which specifically require such data, may be invited to participate as observers in meetings of the Panel.

VI. OPERATING PROCEDURES FOR THE WMO AMDAR PANEL

1. The Panel will normally meet annually. The Panel will elect a Chairperson and Vice-chairperson, from among the representatives of the Panel members by a simple majority of the participating Panel Members. Also, the AMDAR Panel will appoint coordinators of its sub-groups as necessary to carry out the agreed work programme of the Panel between sessions. The Chairperson will prepare reports for WMO, as required;

2. The Chairperson may call on representatives of individual Panel members for assistance in matters such as the representation of the Panel at meetings of other bodies, the preparation of reports on specific topics, etc.;

3. A position in the WMO Secretariat (Scientific Officer-Aircraft and Remote Sensing Observations) also covers the duties of the AMDAR Technical Coordinator to support the work of the AMDAR Panel. The cost for this position is shared between the WMO Secretariat and the AMDAR Panel Trust Fund.

4. The Panel's budget and associated income and expenditures will be reviewed and approved at the annual meetings of the Panel;

5. The WMO Secretary-General will provide appropriate support to the Panel and manage any trust funds established;

6. The working language of the Panel shall be English; and

7. The Panel's terms of reference, membership and operating procedures shall be reviewed and revised as necessary at the annual meetings. The Chairperson shall prepare recommendations to be distributed before the meeting.

VII. TERMS OF REFERENCE FOR THE WMO AMDAR TRUST FUND

1. The purpose of the AMDAR Fund is to support the AMDAR Programme and the activities of the Panel on Aircraft Meteorological Data Relay (AMDAR Panel).

2. The AMDAR Fund is a Trust Fund within the provisions of Articles 9.7, 9.8 and 9.9 of the WMO Financial Regulations (1991 edition).

3. The Fund shall be managed according to the budget adopted by the AMDAR

Panel.

4. The budget will be constructed according to a format agreed by the Panel, in which all income and expenditures will be identified in general articles and specific chapters. The format of the budget may be revised by the Panel as necessary. The budget may take note of other monies and resources made available for support of the operational AMDAR Programme, but which are not included as part of the Fund. These might include, for example, meeting support provided by WMO VCP contributions, support of conditioned and agreed activities or support in kind. Only those monies placed in the Fund, however, shall be subject to these terms of reference.

5. The unit of account shall be the Swiss Franc. When commitments are made, the appropriate funds will be converted, as necessary, to the currency of commitment in at least the amount of the commitment.

6. The income of the Fund will include:

(i) Annual voluntary contributions;

(ii) Funds deposited for specific purposes, hereafter referred to as deposits;

(iii) Other contributions;

(iv) Interest on investments as may be made by the Secretary-General in accordance with the provisions of Financial Regulation 12.2; and

(v) Miscellaneous income.

7. The fund will be used as agreed by the AMDAR Panel:

(i) To finance technical and operational support services for AMDAR, including the proportional part of the cost associated with the position of the Scientific Officer (Aircraft and Remote Sensing Observations);

(ii) To assist in the establishment and operation of programmes of automated meteorological reporting from aircraft;

(iii) To meet appropriate administrative costs incurred by WMO in providing support to AMDAR Panel activities;

(iv) To meet other administrative costs including such items as meetings and consultants;

(v) To purchase specified items of equipment and software; and

(vi) To support other activities required to meet the basic goal of the AMDAR Panel.

8. Authority for the disbursement of funds, in respect of contracts and agreements properly concluded, will be delegated to the Chairperson of the AMDAR Panel, together with the Secretary-General of WMO, or his representative. The Chairperson of the AMDAR Panel will authorize the Secretary-General of WMO, or his representative to disburse the funds by means of a written communication to the WMO Secretariat.

9. Where required by their internal regulations, individual contributors to the AMDAR Fund may wish to negotiate additional conditions governing the application, conditions of deposit and disbursement of funds. Such additional conditions shall not inhibit the efficient and proper use of the Fund nor modify the intent of the Fund. They shall require the acceptance in writing by the Chairperson of the AMDAR Panel and the Secretary-General of WMO or his representative.

10. The Fund shall be maintained on a continuous basis and amounts standing to the credit of the Fund at the end of any annual period shall remain in the Fund for use in the subsequent period.

11. All funds credited to the AMDAR Fund, including those for VCP purposes, shall be subject to these terms of reference and to the terms of reference of the AMDAR Panel.

12. Following cessation of AMDAR Panel activities the Trust Fund will be closed.

13. The Trust Fund will be closed when all remaining funds are exhausted.

VIII. TERMS OF REFERENCE FOR THE WMO AMDAR PANEL SCIENCE AND TECHNICAL SUB-GROUP (STSG)

1. The Purpose of the Sub-Group

The purpose of the AMDAR Panel Science and Technical Sub-Group (STSG) shall be to coordinate and provide information on scientific and technical matters relating to AMDAR for Panel members and the wider meteorological and aeronautical communities. It shall coordinate and where appropriate, undertake activities and investigations into specific matters of scientific and technical value to improve data quality and extend the range of reported meteorological elements. The Sub-Group will also assist with expansion of the operational use of AMDAR data.

2. Membership

2.2. The members of the Sub-Group shall elected by the AMDAR Panel.

2.3. The AMDAR Panel shall select a Coordinator with the responsibility for:

(a) Leading and coordinating the activities of the STSG; and

(b) Reporting back to the AMDAR Panel on the STSG's activities and achievements.

2.3 The Panel will review the membership on an annual basis taking into consideration the recommendations of the STSG.

3. Activities

The Science and Technical Sub-Group in collaboration with CBS ET-AIR and CIMO Theme Leader Aircraft Measurements shall:

3.1 Review and exchange information on scientific and technical matters of relevance to AMDAR.

2.6 Coordinate and facilitate studies or experiments related to AMDAR science and technical activities.

2.7 Advise the AMDAR Panel on scientific and technical aspects of the AMDAR programme.

2.8 Provide guidance and information to agencies undertaking activities in the development of AMDAR sensors and operational systems.

2.9 Provide documentation relevant to AMDAR science and technical activities for publication on the WMO AMDAR Website and other fora where appropriate.

2.10 Provide advice and input to the organization of AMDAR Panel Science and Technology workshops.

2.11 Provide advice, input and coordination to other AMDAR Panel Sub-Groups and Coordinators.

2.12 Provide progress reports to the AMDAR Panel Meetings and seek review and approval.

2.13 Coordinate STSG's activities with the WMO Secretariat Scientific Officer (Aircraft and Remote Sensing Observations).

2.14 Provide support to the Panel regarding the AMDAR standardization related to the WMO Integrated Global Observing System (WIGOS).

IX. TERMS OF REFERENCE FOR THE WMO AMDAR PANEL TRAINING AND OUTREACH SUB-GROUP (TROSG)

1. The Purpose of the Sub-group

The AMDAR Panel is recognized as a body fostering active co-operation among members in the implementation and operation of AMDAR as a component of the WWW

Global Observing System. The purposes of the Training and Outreach Sub-group (TrOSG) shall be:

(i) To support technical training and outreach activities of the AMDAR Panel. It shall co-ordinate and where appropriate, support training workshops organized by the Panel for the implementation and operation of AMDAR. It shall, where appropriate, support participation in outreach activities for the purpose of promoting AMDAR. Also, it shall seek new outreach opportunities for the benefit of the AMDAR program; and

(ii) To support the CBS-OPAG-IOS activities to set up an implementation plan for training relevant to AMDAR including familiarization and awareness for the global meteorological community of the availability and use of AMDAR data, its benefits and limitations as a form of basic upper air data in operational meteorology.

2. Membership and Responsibilities

2.1 The members of the Sub-Group shall elected by the AMDAR Panel.

2.2 The AMDAR Panel shall select a Coordinator with the responsibility for

- Leading and coordinating the activities of the TrOSG; and
- Reporting back to the AMDAR Panel on the activities and achievements of the TrOSG.

2.3 The Panel will review the membership of the Sub-Group on an annual basis taking into consideration the recommendations of the TrOSG.

2.4 Meetings of the Sub-Group will be held in conjunction with AMDAR Panel meetings, otherwise the group works by correspondence.

3 Activities

The Training and Outreach Sub-Group shall:

3.1 Identify existing training material and programmes, and assess its suitability for technical training activities and for posting or cross-referencing on the WMO AMDAR website. Identify, support and participate in appropriate outreach activities and assess their suitability for posting on the WMO AMDAR website.

3.2 Support technical training workshops and outreach activities organized by the Panel.

3.3 Support the CBS-OPAG-IOS activities to set up a training implementation plan.

3.4 Liaise with and support WMO Members and other appropriate agencies by

providing expert information and advice relevant to national and regional training activities.

3.5 Co-ordinate TrOSG's activities with the Science and Technical Sub-Group.

3.6 Coordinate TrOSG's activities with the WMO Secretariat Scientific Officer (Aircraft and Remote Sensing Observations).

3.7 Provide support to the Panel regarding the capacity building and training component of the WMO Integrated Global Observing System (WIGOS).

3.8 Provide progress reports to the AMDAR Panel and seek review and approval.

X. TERMS OF REFERENCE FOR THE WMO AMDAR PANEL COORDINATOR FOR THE IMPROVEMENT IN DATA EXCHANGE AND QUALITY CONTROL

Recognizing a fundamental principle of WMO to broaden and enhance the free and unrestricted international exchange of data and noting the increasing availability of aircraft platforms with suitable sensors, avionics and communication systems, The AMDAR Panel Coordinator shall:

1. Promote the exchange and dissemination of all appropriate automated meteorological reports from aircraft through the Global Telecommunication System (GTS)/WMO Information System (WIS) and other systems as appropriate;

2. Promote the dissemination, exchange and use of information on AMDAR data availability and quality among Members and data providers with a view to initiating appropriate corrective action;

Activities

The Coordinator for the Improvement in Data Exchange and Quality Control shall:

- Assess present data exchange among Members and end-users;
- Review requirements for exchange; and
- Develop recommendations for exchange.
- Assess present quality control activity by Members and end-users;
- Review requirements for quality control; and
- Develop recommendations for quality control in accordance with WIGOS Standardization activities

XI. PROPOSALS FOR DUTIES AND RESPONSIBILITIES OF THE WMO SCIENTIFIC OFFICER RESPONSIBLE TO SUPPORT WMO AMDAR PANEL ACTIVITIES

Under the overall guidance of the Chief of the WMO Observing Systems Division, the incumbent will perform the following duties:

a) Act as Secretariat lead for the aeronautical and in-situ remote sensing observations;

b) Coordinate the planning and implementation activities relevant to aircraft-based and in-situ remote sensing observational systems within the WMO Integrated Global Observing System (WIGOS), including the World Weather Watch (WWW), AMDAR and Instruments and Methods of Observation (IMOP) Programmes, on matters related to the standardization of the above observations, observing systems design, optimization and evolution, and instrument and systems evaluations. Ensure liaison with other relevant programmes, technical commissions, international organizations, aircraft and instrument manufacturers as well as aviation communication providers;

c) Coordinate and support the work of the relevant CBS, CIMO and AMDAR Panel subordinate bodies (including pre-session and in-session documents and final reports), as well as organize and support expert meetings, technical conferences and training workshops. Assist and provide specialist support to the chairpersons of the respective CBS, CIMO and AMDAR Panel subsidiary bodies in conducting their duties, such as in coordinating and monitoring programmatic and development activities, in preparing technical and scientific analysis, budget proposals and in monitoring expenditures;

d) Provide scientific/technical advice to technical cooperation projects and other support activities related to AMDAR and in-situ remote sensing observations as a part of CBS and CIMO responsibilities;

e) Coordinate quality monitoring of data generated by the surface-based Global Observing System (GOS) and prepare scientific reports, studies and analyses;

f) Promote observational data and product utilization by coordinating and supporting the generation of the observational data products, especially from the remote sensing systems, as well as by supporting the training and education activities relevant to the aircraft and remote sensing observations;

g) Inform regularly the Members and user community of conducted activities and plans. Maintain up to date the respective components of the WMO Website;

h) Carry out other relevant duties as required.

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APPENDIX VI

AMDAR Panel Action Items

PRIORITY	PROGRAMS/ PROJECTS/ ACTIVITIES	OBJECTIVES/GOALS	RECENT ACTIVITIES	FUTURE ACTIVITIES	DEADLINE FOR ACTION	BUDGET (ESTIMATE) (CHF)	RESPONSIBLE
1	**WIGOS PILOT PROJECT FOR AMDAR**	Improve practices impacting AMDAR data collection, processing, archiving and dissemination	Meetings held: 1st – ad hoc Steering Group 2nd – Standardized BUFR Template for AMDAR & QM for AMDAR data 3rd – Metadata 4th – ARINC620 update 5th WIGOS PP for AMDAR Meeting	Conduct testing and validation of the standardized BUFR template for AMDAR	4th Quarter 2011		David Helms, Stewart Taylor
				Redraft current proposal based on airline input and then test with single airline within E-AMDAR Program for implementing the application of WMO Metadata relevant to AMDAR	3rd Quarter 2011	3000	Stewart Taylor
				Develop a Strategy for the standardized Quality Management Framework for AMDAR data; and	4th Quarter 2011	3000	Jitze van der Meulen
				Report on validation of the Water Vapor sensor performance (based on available research and commercial aircraft tests)	4th Quarter 2011	5000	David Helms, Axel Hoff
				Proposal to AMDAR Panel on inclusion of the AMDAR Reference Manual WMO-No.958 into WMO regulatory material	4th Quarter 2011	30000	WMO Secretariat in coordination with Frank Grooters

PRIORITY	PROGRAMS/ PROJECTS/ ACTIVITIES	OBJECTIVES/GOALS	RECENT ACTIVITIES	FUTURE ACTIVITIES	DEADLINE FOR ACTION	BUDGET (ESTIMATE) (CHF)	RESPONSIBLE
				Develop the framework for generic software specification for AMDAR	Pending Decision of the DataLink Systems Sub-committee (4th Q 2012)	5000	Frank Grooters (& through the services of a contractor)
2	**POTENTIAL NEW NATIONAL & REGIONAL PROGRAMMES**	The provision of effective assistance and coordination to potential AMDAR Programmes	AMDAR Panel members and the Technical Coordinator have continued to provide support for new and regional programs	Coordinate AMDAR Mexico workshop and national Programmes of the region	4th Quarter 2011		USA AMDAR Programme & AMDAR Panel
				Review NMHSs activities in relation to AMDAR and report to next AMDAR Panel Meeting	4th Quarter 2011		WMO Secretariat and AMDAR Panel Chairman
3	**AMDAR DATA REQUEST**	To provide the best possible global coverage of AMDAR data	E-AMDAR is now providing data for Singapore, Curacao, India and South Africa and has received requests for data from Malaysia	Explore opportunities in Africa and Central and South America	4th Quarter 2011		USA AMDAR Programme & AMDAR Panel
4	**ONBOARD SOFTWARE DEVELOPMENT**	Develop a standardized software package for AMDAR capable aircraft	See report from Australia, Netherlands and the Russian Federation	Full implementation of AAAv3 for the SAWS AMDAR program	3rd Quarter 2011		SAWS AMDAR program

PRIORITY	PROGRAMS/ PROJECTS/ ACTIVITIES	OBJECTIVES/GOALS	RECENT ACTIVITIES	FUTURE ACTIVITIES	DEADLINE FOR ACTION	BUDGET (ESTIMATE) (CHF)	RESPONSIBLE
5	**WEB SITE**	To have an effective means of communicating AMDAR related information and activities	WMO AMDAR Webpage completed	Populate the new AMDAR Webpage	Ongoing		WMO Secretariat, STSG & TrOSG
6	**NEW AMDAR PROGRAMMES - [Central & West Africa (ASECNA)]**	The provision of effective assistance and coordination to new AMDAR programs	Ongoing monitoring and support provided by AMDAR TC and Panel Members	Monitor and provide technical support	Ongoing		WMO Secretariat and AMDAR Panel Members
7	**IMPACTS/BENEFITS DOCUMENT**	To inform NMHSs, airlines and related industries on the benefits of AMDAR	Contractor employed under WMO SSA to undertake the development a AMDAR Manual for airlines	Contractor to develop AMDAR Manual to assist airlines in developing an AMDAR program	4th Quarter 2011	25000	AMDAR Panel Chairman (& through the services of a contractor)

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APPENDIX VII

Mexico City AMDR Workshop 8-10 November 2011
PROVISIONAL AGENDA

Day 1:

09:00	Workshop opening – (PR Mexico, Chairman of the WMO AMDAR Panel, WMO Secretariat)
09:30	Workshop working arrangements – (Mexico focal point, Flores Liera Perla)
09:35	Basic introduction for AMDAR – (AMDAR Panel Chairman)
09:45	Upper-air Observing Networks RA-III and RA-IV – (WMO Secretariat)
10:00	Description of the Global AMDAR System – (WMO Secretariat)
10:30	Break
10:45	ARINC – (ARINC Representative)
11:15	Collaborative or Regional AMDAR Programs – (E-AMDAR Representative)
11:30	FAA – (FAA Representative)
12:00	NMHS and Airlines Responsibilities – (WMO Secretariat)
12:30	Lunch
14:00	AMDAR background information – (E-AMDAR Representative)
14:20	Proposed Programme for Mexico – (USA AMDAR Representatives)
14:50	Proposed Regional Programme (Caribbean, Central and South America) – (WMO Secretariat and USA AMDAR Representative)
15:30	Break
15:45	Operational AMDAR Infrastructure – (E-AMDAR Representative)
16:15	TBD – (South West Airlines Representative)
16:45	Discussion and Review
17:00	Close

Day 2

09:00	Data Quality Monitoring and Control – (AMDAR STSG)
09:25	Benefits and Impacts of AMDAR Data – (USA AMDAR Representatives)

09:50	AMDAR Data Exchange – (AMDAR STSG)
10:15	Break
10:30	Data Targeting – (USA AMDAR Representatives)
10:40	Comparison of AMDAR data with other data sources – (Ralph Peterson)
11:30	AMDAR contribution to WIGOS – (WMO Secretariat)
12:00	Future Directions – (AMDAR Panel Chairman)
12:30	Lunch
14:00	TBD – (FAA Representative)
14:30	AMDAR for Aviation Meteorology (USA AMDAR Representatives)
15:00	TBD
15:30	Break
15:45	TBD
16:15	Questions, Clarification and Discussion - Aviation Industry Representatives
16:30	Questions, Clarification and Discussion - NMHS Representatives
16:45	Discussion and Review
17:00	Close

Day 3

09:00	Response to Questions from Workshop Discussion – (WMO Secretariat and AMDAR Panel Chairman, AMDAR STSG, AMDAR TROSG)
09:45	Commence Development of Draft Collaboration and Implementation Plan – (WMO Secretariat and AMDAR Panel Chairman)
10:15	Break
10:30	Commence Development of draft Collaboration and Implementation Plan - Continue
11:30	Conclusions, Further Actions, Final Summary and Report Notes – (WMO Secretariat, AMDAR Panel chair- and vice-chair persons, David Helms)
12:30	Close

APPENDIX VIII

AMDAR Workshop Guidelines and Procedures

1 Objective of the AMDAR workshops is to promote development and implementation of national/regional AMDAR programs by supplying technical and programmatic support. The intention of the AMDAR Workshop is to identify roles and responsibilities essential in the development and implementation of a national and/or regional AMDAR Program.

2 It is not aimed at training of weather/aviation forecasters on the use of AMDAR data, training on coding/decoding of AMDAR data or training of other operational personnel of NMHSs. Such training workshops normally would follow once the national/regional AMDAR programme is about to be implemented and shall be negotiated by Members with respective WMO Secretariat Departments, especially through the WMO Education and Training Programme.

3 Interested WMO Members or appropriate international organization related to air transport should notify officially (in writing) their desire for a workshop through AMDAR Panel chairperson, chairperson of the CBS Expert Team on Aircraft-based Observations or directly to WMO Secretariat.

4 Members' should demonstrate their intent and potential capability to develop a national AMDAR program.

- This intent should come from all national stakeholders, i.e., national meteorological services, relevant airline operators and/or civil aviation authorities;
- Additionally, any identified candidate airline operator must be capable of supporting an AMDAR infrastructure, e.g., avionics, communications. This will be done through completing the AMDAR compliance questionnaire, to be provided by WMO Secretariat.

5. Priority will be given to organizing one workshop in a sub-region in the case where multiple written notifications where received in that area.

6. Once the workshop is approved by AMDAR Panel and funding is available, the Permanent Representative of the requesting WMO Member should send an invitation to WMO offering their willingness to host the AMDAR workshop.

7. Workshops of about 2½ days normally would be organized conjointly with the annual AMDAR Panel meetings.

8. Host countries will be responsible for all necessary local arrangements, such as meeting room facilities, audio visual equipment (computer, projector, etc.), internet connection, hotel booking, and inviting local and/or international participants.

9. AMDAR Panel will be responsible for identification of workshop lectures, conducting workshop and providing support to lectures.

AMDAR Panel will provide further assistance to a Member(s) to develop and implement national AMDAR programme.

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APPENDIX IX

PROPOSED DOCUMENTATION PLAN

for AMDAR Panel meeting that will be supplemented later by items relevant to CBS ET-AIR meeting

Agenda Item	Subject of document	Submitted by	Deadline
1.	**OPENING OF THE MEETING**		
2.	**ORGANIZATION OF THE MEETING**		
2.1	Provisional annotated agenda	Secretariat	TBA
n/a	List of Participants	Secretariat	TBA
n/a	Practical information on Geneva for Participants	Secretariat	TBA
3.	**AMDAR IMPLEMENTATION**		
3.2	Report on the status of the AMDAR Programme	Secretariat / AMDAR Panel Chairman	TBA
3.1	Report on activities by the Science Sub-Group	Chair Science Sub-Group	During the session
	Report on activities by the Training Sub-Group	Chair Training Sub-Group	TBA
3.3	**STATUS REPORTS ON NATIONAL AND REGIONAL PROGRAMMES**		
3.3.1	**ESTABLISHED AMDAR PROGRAMMES**		
	Australia	Australian Focal Point	TBA

Agenda Item	Subject of document	Submitted by	Deadline
	Canada	Canadian Focal Point	TBA
	China	China Focal Point	TBA
	E-AMDAR Programme	E-AMDAR Focal Point	TBA
	France	French Focal Point	TBA
	Germany	German Focal Point	TBA
	Hong Kong, China	Hong Kong, China Focal Point	TBA
	Japan	Japanese Focal Point	TBA
	New Zealand	New Zealand Focal Point	TBA
	Republic of Korea	Republic of Korean Focal Point	TBA
	South Africa	South African Focal Point	TBA
	Netherlands	Netherlands Focal Point	TBA
	United Kingdom	United Kingdom Focal Point	TBA
	United States	United States Focal Point	TBA
3.3.2	**NEW EMERGING AND POTENTIAL AMDAR PROGRAMMES**		
	Chile	Chile Focal Point	TBA
	Malaysia	Malaysian Focal Point	TBA
	Singapore	Singaporean Focal Point	TBA

Agenda Item	Subject of document	Submitted by	Deadline
	India	Indian Focal Point	TBA
	ASECNA	ASECNA Focal Point	TBA
	Kenya	Kenyan Focal Point	TBA
	Mexico	Mexican Focal Point	TBA
3.4	**AIRCRAFT AND AMDAR DEVELOPMENTS**		
3.4.1	WIGOS Pilot Project for AMDAR	Secretariat	TBA
3.4.2	Improvement in Data Exchange and Quality Control	Project Leader Improvement in Data Exchange and Quality Control	TBA
3.4.3	AMDAR DATA Policy	Chair Science Sub-Group	TBA
3.4.4	IAGOS	IAGOS Focal Point	TBA
4.	**FINANCIAL AND ADMINISTRATIVE MATTERS**		
4.1	Future AMDAR Work Programme	Secretariat / AMDAR Panel Chairman	TBA
4.2	Budget 2010-2011	Secretariat / AMDAR Panel Chairman	TBA
4.3	Review of Established Rules and Procedures	AMDAR Panel Chairman	TBA
4.4	QMF requirements for observational data	Chair Science Sub-Group	TBA
4.5	Future governance for the AMDAR Programme	Secretariat / AMDAR Panel Chairman	TBA

Agenda Item	Subject of document	Submitted by	Deadline
4.6	Election of Officers	---	During the session
5.	**ANY OTHER BUSINESS**		
6.	**DATE AND PLACE OF NEXT MEETING**		
7.	**CLOSURE OF THE MEETING**		

APPENDIX X

Proposed Schedule of Meetings with AMDAR Panel Involvement

	Dates	Representation	Remarks
Meeting			
E-AMDAR TAG-17	15-17 March	Chairman, WMO Secretariat	
16th Congress	16 May – 3 June	Chair, WMO Secretariat	
63rd EC	6-8 June	TBA	
CBS ET-EGOS/6	14-17 June	Chairman, WMO Secretariat	
AEEC Data Link User Forum	14-15 September	WMO Secretariat, TC E-AMDAR	EuroControl
ET-AIR/3 & Panel-14	2 – 4 November	All	Quebec, Canada
ICG-WIGOS-1	October/November	AMDAR	Must be member of ICG
6th WIGOS PP on AMDAR	December (TBA)	Experts, WMO Secretariat	Finalizing short term activities
AMDAR Outreach			
ARINC Customer Meeting	10-11 May	TC E-AMDAR	
AMDAR Workshop	8-10 November	Chair, WMO Secretariat	Mexico
AMDAR Meeting	TBA	Chair, WMO Secretariat, ASECNA, FP South Africa, TC E-AMDAR	Kenya
Experimental Aircraft Association AirVenture	25-31 July 2011	USA AMDAR	Wisconsin

APPENDIX XI

Status of the AMDAR Panel Trust und

AMDAR TRUST FUND: INCOME AND EXPENDITURE (Actual Jan 2009 - Dec 2010, January 2011-Dec 2012)
Based on WMO Finance Information 20/02/2010 in **Swiss Francs**

	Actual Jan-Dec 2009	Estimated Jan-Dec 2010	Estimated Jan-Dec 2011	Estimated Jan-Dec 2012
Receipts				
Brought Forward	864,487	919,647	912,681	871,881
Contributions	218,713	163,161	123,800	123,800
Interest	2,671	1,200	1,200	1,200
Total Receipts	**1,085,871**	**1,084,007**	**1,037,681**	**996,881**
Expenditure/Oblig'ns				
Consultancy				
Tech Coordinator	153,239	135,972	60,000	80,000
Consultant		12,751	15,000	15,000
Travel				
Tech Coordinator	7,691	14,750	15,000	15,000
Consultants	3,407	7,309	55,000	55,000
Projects & Activities				
Technical Support				
Provision of Data				
Support Data Exchange				
Software Development				
ARINC Membership	1,092			
Workshops & Training		501	20,000	20,000
Indirect Costs	796	43	800	800
Total Expenditure	**166,225**	**171,326**	**165,800**	**185,800**
Balance of Fund	**919,647**	**912,681**	**871,881**	**811,081**
Contributions				
Australia	0 *	0 E	14,000 E	14,000 E
Austria	3,500	3,500	3,500 E	3,500 E
Canada	20,000	10,000	10,000 E	10,000 E
France	31,895	29,490	30,000 E	30,000 E
Germany	38,829	33,948 E	35,000 E	35,000 E
Hong Kong China	3,000	0 E	0 E	0 E
Republic of Korea	0	8,733	4,300 E	4,300 E
Netherlands	7,623	7,070	7,000 E	7,000 E
Norway	16,500	0 E	0 E	0 E
Sweden	5,000	5,000	5,000 E	5,000 E
Switzerland	50,000	50,000	0 E	0 E
United Kingdom	17,341	15,419	15,000 E	15,000 E
United States of America	25,025	0 #	0 E	0 E
Total	**218,713**	**163,161**	**123,800**	**123,800**

E Estimated Values
* In-kind contribution to the AMDAR Panel through the development and provision of the AAAv3 AMDAR Software package
# In-kind contribution to the AMDAR Panel through the provision of VCP funds to cover AMDAR Technical Workshops for Mexico and Central America

AMDAR TRUST FUND

Interim Statement of Income and Expenditure
For the period 1 January to 31 December 2010
Amounts in Swiss Francs

1. Balance brought forward, 1 January 2010		919,440.56
2. Income		
2.1 Voluntary contributions	163,159.72	
2.2 Voluntary contributions-Accrued (Pledges)	3,725.87	
2.3 Interest credited	2,645.44	
2.4 Unrealized gain on exchange difference	1,094.99	
2.5 Total income		170,626.02
3. Total available funds during reporting period		1,090,066.58
4. Expenditure		
4.1 Direct project costs		
4.1.1 Regular staff salary	135,972.49	
4.1.2 Institutional consultants (honorarium)	12,750.96	
4.1.3 Travel -Other representatives to attend other WMO meetings	4,105.35	
4.1.4 Travel -Other representatives ad hoc travel	3,203.58	
4.1.5 Travel of staff to other WMO meetings	2,190.90	
4.1.6 Ad hoc travel of staff to attend non-WMO meetings	12,559.59	
4.1.7 Cost for membership in ARINC Aviation Industry Activity	500.75	
4.1.8 Total project direct costs		171,283.62
4.2 Indirect project costs		
4.2.1 Bank charges	43.18	
4.2.2 Total indirect project costs		43.18
4.3 Total project expenditure		171,326.80
5. Balance of fund at 31 December 2010		918,739.78

Contributions received

Austria	3,500.00
Canada	10,000.00
France	29,490.49
Germany	33,947.53
Korea	8,733.46
Netherlands	7,069.60
Sweden	5,000.00
Switzerland	50,000.00
United Kingdom	15,418.64
Total	163,159.72

Contributions pledged

South Africa	3,725.87