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**JOINT MEETING:  
CBS EXPERT TEAM ON AIRCRAFT BASED  
OBSERVATIONS  
(Third Session)  
AND  
AMDAR PANEL  
(Fourteenth Session)**

(24.X.2011)

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ITEM: 4.1

Original: ENGLISH ONLY

(QUEBEC CITY, CANADA, 2-4 NOVEMBER 2011)

#### **4. PROJECTS, PLANNING AND WORK PROGRAMME**

##### ***4.1 WIGOS Pilot Project for AMDAR - Review and Planning Update***

WIGOS Pilot Project for AMDAR - Review and Planning Update

*(Submitted by the Secretariat)*

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#### **SUMMARY AND PURPOSE OF DOCUMENT**

Provides a summary of the background and current status of the AMDAR Pilot Project for AMDAR and makes recommendations for the planning process for furthering the aims of the project.

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#### **ACTION PROPOSED**

1. The Panel is invited to note the information contained in the document.
2. The Panel is invited to consider the recommendations made in the document.

#### **References:**

1. WMO, WIGOS Pilot Projects page:  
<http://www.wmo.int/pages/prog/www/wigos/projects.html#pilot>
  2. WIGOS Project Progress Report:  
[http://www.wmo.int/pages/prog/www/wigos/documents/Progress\\_Rep/PP-AMDAR\\_Progress-Report\\_2011-01.doc](http://www.wmo.int/pages/prog/www/wigos/documents/Progress_Rep/PP-AMDAR_Progress-Report_2011-01.doc)
  3. WMO Integrated Global Observing System (WIGOS) Pilot Project for AMDAR (Fifth Session) and AMDAR Panel Management Group Meeting (Second Session) Final Report:  
[http://www.wmo.int/amdar/Reports/WIGOS\\_PP/FinalReport\\_AMDAR-MG\\_WIGOS\\_PP-5\\_7April.pdf](http://www.wmo.int/amdar/Reports/WIGOS_PP/FinalReport_AMDAR-MG_WIGOS_PP-5_7April.pdf)
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## **BACKGROUND ON THE WIGOS PILOT PROJECT**

1. In July 2008, the AMDAR Panel was given the task of managing the WIGOS Pilot Project: Integration of AMDAR into WIGOS (WIGOS-PP-AMDAR). The overview of this project is:

*This Project will focus on the practices impacting AMDAR data collection, processing, archiving and dissemination. The standard practices used in observing the atmosphere need to be well documented to ensure sufficient detail accompany the observations so that users can interpret measurements correctly. In addition new methods and procedures will be required in preparation for the deployment of new operational instruments, such WVSSII water vapour sensor.*

2. The project plan focuses on a set of six short-term (4) and long-term (2) aims and tasks:

*Short-term:*

- (1) Development of a standardised BUFR Template for AMDAR;*
- (2) Application of WMO Metadata relevant to AMDAR;*
- (3) Development of a standardised Quality Management Framework for AMDAR data; and*
- (4) Validation and preparation for intercomparison of available Water Vapour sensor performance.*

*Long-term:*

- (5) Update of the AMDAR Reference Manual WMO-No.958; and*
- (6) Development of the framework for generic software specification for AMDAR.*

*Note: In case of lack of resources provided towards the WIGOS-PP-AMDAR, Project Aims will be prioritized accordingly.*

More detail on the project is available at:

[http://www.wmo.int/pages/prog/www/wigos/documents/PP\\_AMDAR.pdf](http://www.wmo.int/pages/prog/www/wigos/documents/PP_AMDAR.pdf)

3. The Implementation Plan for WIGOS-PP-AMDAR is provided as Appendix 1.

### **Progress and Current Status**

4. Since the AMDAR Panel XIII/ET-AIR-2, the WIGOS Project Report for WIGOS-PP-AMDAR has been completed and is provided as Appendix 2. The Project Report identifies the following issues being associated with the projected timelines for completion of tasks not having met the planned schedule:

- Lack of resources in terms of the time of and number of available Members with the necessary technical expertise to contribute;
- Lack of funding available to support the contribution of those Members outside Europe and the USA;
- The project is accorded lower priority status with respect to National duties by Members;
- The verification and finalization of an operational WVSS-II prototype has taken longer than expected.

### **WIGOS Pilot Project for AMDAR (Fifth Session)**

5. The WIGOS Pilot Project for AMDAR (Fifth Session) (WIGOS-PP-AMDAR-5) was held in De Bilt, Netherlands 28 February to 4 March 2011 conjointly with the AMDAR Panel Management

Group Meeting (Second Session). The status of WIGOS-PP-AMDAR was addressed under item agenda 2, Status of the WIGOS Pilot Project for AMDAR. The following summarises the discussion and outcomes from the meeting relating to WIGOS-PP-AMDAR:

6. Development of a BUFR Template for AMDAR:

- The changes to the template proposed by AMDAR Panel XIII were to be incorporated into the updated template and two steps taken to complete the approval process: 1) Preliminary check for content conducted by Dr Eva Červená, Inter-Programme, representative of the Expert Team on Data Representation and Codes (IPET-DRC); and 2) A formal validation process of the template to be carried out by two participating national data centres (E-AMDAR and USA AMDAR Programmes were proposed.)
- Combined with the changes to the proposed changes at AMDAR Panel XIII, the list of changes to be implemented to attain Version 5 of the template are the following:
  - 0 07 004 Pressure descriptor to 0 07 010 Pressure Altitude (Flight Level);
  - increasing the resolution for mass mixing ratio to  $10^{-4}$  g/kg;
  - The Joint Meeting agreed, based on advice from Eva Červená, that the AMDAR Template include:
    - the new Code Table, 0 02 170 "Aircraft Humidity Sensor";
    - the expanded Coded Table 0 33 026 "Moisture Quality".
- Version 5 of the AMDAR BUFR Template was provided as an Appendix II to the WIGOS-PP-AMDAR-5 Final Report.

7. Application of WMO Metadata relevant to AMDAR:

- Two Metadata sets were compiled and were tabled as Appendices III and IV of WIGOS-PP-AMDAR-5 Final Report. Appendix III provided the metadata needed for describing data and products and Appendix IV provided the metadata required for airports used by AMDAR equipped aircraft.
- WIGOS-PP-AMDAR-5 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).

8. Development of standardised procedure for Quality Management of AMDAR data:

- WIGOS-PP-AMDAR-5 was provided with a summary of the research that has been undertaken to date into the establishment of a Quality Management Framework for AMDAR by the Coordinator for the Improvement in Data Exchange and QC, Dr. Jitze Van der Muelen.
- The WIGOS-PP-AMDAR-5 requested that Dr. Van der Meulen develop a Strategy for the development of principles 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.

9. Validation and preparation for inter-comparison of available Water Vapour sensor performance:

- WIGOS-PP-AMDAR-5 was informed that two WVSS-II units in different configuration were being tested against humidity standards onboard the Facility for Airborne Measurement (FAAM). The first preliminary results showed that WVSS-II measurements of the water vapour mass mixing ratio were nearly identical to each other and in congruence to the output of the chilled mirror sensors on FAAM. A final evaluation was to be available in summer 2011.

10. Update of the AMDAR Reference Manual, WMO-No.958:
- As one of the longer-term tasks associated with WIGOSS-PP-AMDAR, there has not yet been any progress made.
  - WIGOS-PP-AMDAR-5 agreed that the WMO Secretariat in coordination with the AMDAR Panel Chairperson would 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.
  - WIGOS-PP-AMDAR-5 also agreed that this task would include the development of new AMDAR Implementation guidance material for WMO Members interested in developing national AMDAR programmes.
11. Development of the framework for generic software specification for AMDAR:
- As with the update of the AMDAR Reference Manual, the task associated with the development of a generic software specification for AMDAR is considered a longer-term task and it was also considered that the update of the ARINC 620 Meteorological Report specification should be given priority for resources.

### Subsequent Progress Made on WIGOS Pilot Project for AMDAR in 2011

12. Some further progress made on WIGOS-PP-AMDAR was noted at the AMDAR Panel Preparatory (APP) Meeting that took place in De Bilt over 21 to 22 July 2011. The table below provides a summary of the progress that has been made for WIGOS-PP-AMDAR over 2011 and since the WIGOS-PP-AMDAR-5.

Task	Progress in 2011
Development of a BUFR Template for AMDAR	<ul style="list-style-type: none"> <li>• Eva Cervena from the Expert Team on Data Representation and Codes (IPET-DRC) has undertaken preliminary testing of the AMDAR BUFR Template Version 5 and reflected the requirements for higher precision of relative humidity in the AMDAR BUFR Template Version 6 that was submitted to the 3<sup>rd</sup> session of the Inter-Programme Expert Team on Data Representation and Codes (20-23 September, Melbourne). The relevant new descriptors were approved for fast-track, the template for validation.</li> <li>• The AMDAR Panel has been offered the help of the ECMWF (Enrico Fucile) and UK Met Office (Richard Weedon) in carrying out the validation process.</li> <li>• The AMDAR Panel was notified by Eva Cervena that, if the validation was not completed by November 2011 in time for approval at the CBS session, then the BUFR template would not be able to be approved for use until November 2013 using this approval process. However, Ms Cervena notified that the template could be approved before then using the procedure for approval of amendments between sessions.</li> </ul>

Application of WMO Metadata relevant to AMDAR	<ul style="list-style-type: none"> <li>Stewart Taylor, E-AMDAR has provided the proposed aircraft metadata requirements to E-AMDAR contacts in British Airways to ascertain the viability of obtaining the metadata from airlines.</li> </ul>
Development of standardised procedure for Quality Management of AMDAR data	<ul style="list-style-type: none"> <li>The APP Meeting discussed the possibility of holding a meeting of data management experts for the purpose of assisting the development of a strategy for standardising practice in relation to AMDAR data quality management. It was proposed that a proposal for such a meeting be discussed at the AMDAR Panel Meeting in November 2011 with a view to holding it in early 2012 and subject to consistency with the strategy being developed by Dr. Van der Muelen.</li> </ul>
Validation and preparation for inter-comparison of available Water Vapour sensor performance	<ul style="list-style-type: none"> <li>Progress on this task was discussed at the APP Meeting.</li> <li>A draft report on the comparisons made on with the 2 WVSS-II systems on the FAAM research aircraft had been received by E-AMDAR and the final version was expected to be available by November 2011.</li> <li>The APP Meeting determined as a suitable course of action that: <ul style="list-style-type: none"> <li>E-AMDAR (Stig Carlberg) would receive the final report from the FAAM WVSS-II comparison tests and submit the report to the AMDAR Panel Science and Technical Sub-group for review;</li> <li>If results from the trial are favorable and the sensor meets prescribed CIMO requirements, the Convener of the STSG to oversee the development of a submission to the CIMO President, seeking the official endorsement of the WVSS-II sensor and the appropriate integration of the relevant documentation into CIMO regulatory material.</li> </ul> </li> </ul>
Update of the AMDAR Reference Manual, WMO-No.958	<ul style="list-style-type: none"> <li>No further progress has been made.</li> </ul>
Development of the framework for generic software specification for AMDAR	<ul style="list-style-type: none"> <li>This task was discussed at the APP Meeting and it was decided that a Description of Work (DoW) should be compiled for this task to determine if it could be carried out under the terms of a WMO Special Service Agreement if a suitable contractor could be found;</li> <li>The DoW was compiled and reviewed by the AMDAR Panel;</li> <li>Two potential contractors have been approached and have provided expressions of interest and quotations for the work.</li> </ul>

## RECOMMENDATIONS FOR THE WIGOS PILOT PROJECT FOR AMDAR

13. Of the four issues associated with the lessons learned from WIGOS-PP-AMDAR Project Report, three of them are less likely to be as significant in the future: With the move of the payment of the Technical Coordinator's salary (now defined within 50% of the role of the Scientific Officer Aircraft Observations and Remotely-sensed Observations in the Observing and Information Systems Department in the Secretariat) to WMO regular budget, the AMDAR Panel Trust Fund finances can potentially be used for the accomplishment of technical matters and capacity building, including the contracting of consultants and contractors. Trust funds can also potentially be used to facilitate the involvement and assistance of other AMDAR Panel representatives outside of the USA and Europe. It also appears that the validation and verification of the WVSS-II sensor is nearing completion.

14. With these considerations in mind, the following recommendations are made with respect to the strategy for the future progressing of each task:

### **Recommendation 1:** Strategy for Development of a BUFR Template for AMDAR

- a. The AMDAR Panel and ET-AIR should continue to coordinate the validation of the AMDAR Panel Template Version 7 by ECMWF and the UK MetOffice.
- b. The AMDAR Panel and ET-AIR should seek to ensure that the validation process is completed in time to submit the proposal for approval of the template through the procedure for the adoption of amendments between CBS sessions and submission to Chair of the IPET-DRC and Mr Atsushi Shimazaki of WMO Secretariat by the end of November 2011.

### **Recommendation 2:** Strategy for Application of WMO Metadata relevant to AMDAR

- a. The Metadata sets that have been compiled and tabled at WIGOS-PP-AMDAR-5 should undergo a review and refinement process coordinated by the Panel;
- b. The AMDAR Panel and ET-AIR, perhaps through the Project Leader Improvement in Data Exchange and Quality Control, should consider the definition and specification of categories of metadata including:
  - 1) AMDAR metadata set for Global AMDAR Data Management;
  - 2) Complete AMDAR metadata set for Programme Management; and,
  - 3) Minimum AMDAR metadata set for Programme Management.
- c. The AMDAR Panel and ET-AIR to incorporate the final metadata set definitions into appropriate regulatory material.
- d. The AMDAR Panel and ET-AIR to develop a strategy, in consultation with WMO Information Systems, for the collection and maintenance of the metadata set for Global AMDAR Data Management as a component of the AMDAR Quality Management Framework.

### **Recommendation 3:** Development of standardised procedure for Quality Management of AMDAR data

- a. Data quality management should be considered as one component of the Quality Management System for the AMDAR Programme;
- b. The AMDAR Panel and ET-AIR may consider hosting an expert meeting of global AMDAR data managers with a view to developing a strategy and procedures for the management of AMDAR and other Aircraft data, including ADS at the global level that might include:
  - i. Data archival;
  - ii. Metadata management;
  - iii. Data quality control before dissemination on the GTS;
  - iv. Data monitoring and reporting.

**Recommendation 4:** Validation and preparation for inter-comparison of available Water Vapour sensor performance

- a. The Panel and ET-AIR to consider all the work that has been completed to date, including the latest comparisons made on the FAAM research aircraft and make a statement regarding the suitability of the WVSS-II sensor for operational implementation;
- b. The Panel and ET-AIR to consider the compilation of a paper, perhaps by the STSG, that outlines the scientific case for the WVSS-II sensor meeting WMO requirements as an operational sensor for implementation as a component of the AMDAR Programme;
- c. The Panel and ET-AIR to recommend through appropriate representatives that water vapour measurement is incorporated into the CIMO Guide (WMO No. 8);
- d. The Panel and ET-AIR to recommend to CBS that water vapour measurement should now be approved as an operational component of the AMDAR Programme and incorporated into relevant guides and manuals;
- e. The Panel and ET-AIR to develop a Statement of Support (or similar) for the implementation of a water vapour measurement capability by NMHSs.

**Recommendation 5:** Update of the AMDAR Reference Manual, WMO-No.958:

- a. The Joint Meeting to consider the compilation of a Description of Work for a contract to undertake the following tasks:
  - i. A review of WMO regulatory material and AMDAR Panel documentation, including the AMDAR Reference Manual, WMO-No.958, with the presentation of a strategy for migrating AMDAR Panel material into WMO regulatory material;
  - ii. Undertake the process of updating WMO regulatory material based on AMDAR Panel regulatory material including the addition of new material and review of existing material as required;
  - iii. Conduct a regulatory material review process as necessary to finalise item ii.
  - iv. Draft of a short document describing in general terms the (implementation of an) AMDAR Programme

**Recommendation 6:** Development of the framework for generic software specification for AMDAR:

- a. The Panel and ET-AIR to approve the compilation and awarding of a WMO Special Services Agreement to undertake the work as per the DoW (Document Plan 4.1.6, Appendix 1), with the selection of the contractor as approved by the AMDAR Panel Management Group.

## **APPENDIX 1**

### **Implementation Plan for the WIGOS Pilot Project for AMDAR**

#### **BACKGROUND**

Assisted by the WMO fifteenth Congress (Cg-XV), the high-level WIGOS / WIS goal is to establish a comprehensive, coordinated, and sustainable system of observing systems with assured access to data and products from the component observing systems by interoperability arrangements. WIGOS is the system of observing systems and the WMO Information System (WIS) provides the access through interoperability arrangements. The WIGOS / WIS will address all WMO Programme requirements through its Rolling Review of Requirements (RRR) to ensure availability of required information, meet data quality standards, and facilitate access to real-time data as well as to archived information.

This Project will focus on the practices impacting AMDAR data collection, processing, archiving and dissemination. The standard practices used in observing the atmosphere need to be well documented to ensure sufficient detail accompany the observations so that users can interpret measurements correctly. In addition new methods and procedures will be required in preparation for the deployment of new operational instruments, such WVSSII water vapour sensor.

The Ad-Hoc Steering Group Meeting on the WIGOS Pilot Project for AMDAR held its first session at the WMO Headquarters in Geneva, Switzerland, from 2 to 3 July 2008. The Ad-Hoc Steering Group reviewed the guidance and outcomes of the first session of Executive Council Working Group on the WMO Integrated Global Observing Systems (WIGOS) and the WMO Information System (WIS), which was held in Geneva, Switzerland, from 4 to 7 December 2007.

The Implementation Plan for the WIGOS Pilot Project for AMDAR has six deliverables:

1. Development of a standardised BUFR Template for AMDAR;
2. Application of WMO Metadata relevant to AMDAR;
3. Development of a standardised Quality Management Framework for AMDAR data;
4. Validation and preparation for intercomparison of available Water Vapour sensor performance;
5. Update of the AMDAR Reference Manual WMO-No.958; and
6. Development of the framework for generic software specification for AMDAR.

#### **OVERALL BUDGET AND CONTRIBUTIONS BY EACH PROJECT PARTNER (CHF)**

The estimated costs for the implementation and coordination of the WIGOS Pilot Project for AMDAR were first developed by the Ad-Hoc Steering Group Meeting on the WIGOS Pilot Project for AMDAR and can be found in the final report of that meeting. It should be noted that the actual cost of implementation will be borne by the stakeholders in the project.



<b>Partners / Participants:</b>	AMDAR Panel E-AMDAR and USA AMDAR Programmes WMO Technical Commissions
<b>Project Cost:</b>	Estimated costs for meetings, consultants and publication CHF 125K
<b>Funding Source(s):</b>	This project will make optimum use of the expertise available from the AMDAR Panel and its WIGOS partners. Financial support shall be required through the WMO AMDAR Panel Trust Fund and WIGOS-WIS Trust Fund.
<b>Project Timescale:</b>	Will all be done in parallel and foreseen to be completed by December 2011
<b>Deliverables:</b>	(1) Agreed BUFR Template for AMDAR; (2) Published best metadata practice for AMDAR; (3) Published best practice for Quality Management procedures for AMDAR; (4) Published results from the validation of the available Water Vapour sensors; (5) Updated AMDAR Reference Manual WMO-No. 958; and (6) Agreed framework for generic software specification for AMDAR. <i>Note: In case of lack of resources provided towards the WIGOS-PP-AMDAR, Deliverables will be prioritized accordingly.</i>
<b>Project Summary:</b>	With the completion of the project aims, AMDAR will be better integrated into WIGOS by adhering to WMO standards for instrumentation, data exchange and for end products.

## WIGOS PILOT PROJECT CONCEPT OF OPERATIONS

This Pilot Project is the contribution of AMDAR to the WIGOS / WIS developments of WMO. The WIGOS has developed a Concept of Operations (CONOPS) document that provides the umbrella principles and objectives of WIGOS / WIS.

CONOPS recognizes the need for a comprehensive, coordinated and sustainable global observing system. The WIGOS is a comprehensive, coordinated and sustainable system of observing systems based on all WMO Programmes' observational requirements. It ensures availability of required data and information and facilitates access through the WMO Information System (WIS) according to identified temporal, geographical and organizational requirements, including those for real-time, near-real time and delayed-modes to all required information and in doing so it respects data sharing policies. Additionally, it helps ensure high data quality standards and benefits from archival and technological innovations.

WIGOS development and implementation proceeds in parallel with the planning and implementation of the WMO Information System. The combination of both efforts allows for an integrated WMO end-to-end system of systems designed to improve Member's capability to effectively provide a wide range of services and to better serve research programme requirements.

The WIGOS integration objective will be accomplished at three levels:

- Standardization of instruments and methods of observation;
- WIS information infrastructure;
- End-product quality assurance.

## SECOND SESSION WIGOS PILOT PROJECT FOR AMDAR

The second session for the WMO Integrated Observing System (WIGOS) Pilot Project for

AMDAR was held at KNMI Headquarters in De Bilt, The Netherlands from 10-12 February 2009.

For WIGOS Pilot Project for AMDAR objective 1, Development of a BUFR Template for AMDAR, the meeting agreed on the format of a new Standardized BUFR Template for AMDAR, 3 11 010 version 2. It also agreed on the inclusion of a number of new elements, including a new AMDAR quality element. It was agreed that the newly proposed Standardized BUFR Template for AMDAR would be provided to the AMDAR Community and major NWP Centres for review and comment. Following the review and comments of the AMDAR Community and NWP Centres the final version, version 3 of the Standardized AMDAR BUFR Template was made available to the Inter-Programme Expert Team on Data Representation and Codes (IPET-DRC) for approval. IPET-DRC-1 (15-18 September 2009) discussed this template, in particular the representation of quality information, and finally approved 3 11 010 version 4 and the new descriptors, provided that the proposed usage of an additional descriptor is found feasible to the AMDAR users. Next step after the approval from IPET-DRC the new Standardized BUFR Template for AMDAR is being validated using independent processing centres. The validation procedure being completed, the template would then be again submitted to IPET-DRC. Following the approval of the chairperson of the IPET-DRC, chairperson of the OPAG-ISS and the president of the CBS, the Template will be declared preoperational (this is expected to be accomplished by April 2011)..

The meeting also discussed the WIGOS Pilot Project for AMDAR objective 3, the development of standardized procedure for Quality Management of AMDAR data. It noted that with the ever increasing amount of AMDAR data on the GTS there is now a real need to improve the overall quality of AMDAR data disseminated on the GTS. In order to achieve this, a better coordinated response to quality control of AMDAR data is required. The meeting agreed that a set of minimum standards, including evaluation criteria and procedures, for AMDAR data monitoring need to be developed. The meeting agreed that it would evaluate the current criteria and procedures used by all national and regional AMDAR programmes and would develop a set of minimum quality standards for AMDAR data.**THIRD SESSION WIGOS PILOT PROJECT FOR AMDAR**

The third session for the WMO Integrated Observing System (WIGOS) Pilot Project for AMDAR was held at KNMI Headquarters in De Bilt, The Netherlands from 1-2 July 2009.

This meeting worked on the initial classification of components of metadata associated with AMDAR. In particular, it endeavoured to identify metadata needed for describing data and products, metadata needed for usage of data and metadata needed for the operation of the AMDAR observing system. The classification will initially focus on one fleet within the E-AMDAR Programme to gauge the level of support from that airline before embarking on all operational airlines in the E-AMDAR Programme and finally all operational AMDAR Programmes.

## **NEXT STEPS**

A next meeting of experts will be held 28 February 4 March 2011 at KNMI Headquarters in De Bilt. At that meeting the status of the deliverables will be reviewed and final proposals will be made and decisions will be taken in order to complete the short term project aims.

**ACTION ITEMS AND RELATED SUB-TASKS OF THE WIGOS PILOT PROJECT FOR AMDAR**

	<b>Objective</b>	<b>Responsibility</b>	<b>Action</b>	<b>Status</b>	<b>Due Date</b>
1.	Development of a BUFR Template for AMDAR	<b>(E-AMDAR and USA AMDAR Programme representatives)</b> in collaboration with the ET-DR&C Validation Centres (to be nominated)	<ol style="list-style-type: none"> <li>1. Investigate the various versions of BUFR templates for AMDAR and their elements currently in use by national and regional AMDAR Programs. Provide specification to ET DR&amp;C;</li> <li>2. Develop a standardised BUFR Template for AMDAR that includes all the new extensions supporting parameters for AMDAR;</li> <li>3. Validation of the AMDAR BUFR Template; and</li> <li>4. Approval of the AMDAR BUFR Template.</li> </ol>	<ul style="list-style-type: none"> <li>• 1<sup>st</sup> meeting BUFR Template for AMDAR has been held.</li> <li>• Components of a proposed new Standardized BUFR Template for AMDAR, 3 11 010 version 2 has been approved by the AMDAR community.</li> <li>• AMDAR Panel Chairman to forward the new Standardized BUFR Template for AMDAR to the next meeting of ET-DR&amp;C</li> </ul>	<ol style="list-style-type: none"> <li>1 &amp; 2. Q3 2008</li> <li>3. Q1 2009</li> <li>4. Q2 2011</li> </ol>
2.	Application of WMO Metadata relevant to AMDAR	<b>(Chairman of the AMDAR Panel)</b> Contractor TBD under the guidance of the AMDAR Panel Chairperson, ad-hoc support from WIS Project Office, IPET-MI	<ol style="list-style-type: none"> <li>1. Classify components of metadata associated with AMDAR. In particular, identify metadata needed for describing data and products, metadata needed for usage of data and metadata needed for the operation of the AMDAR observing system;</li> <li>2. Identify metadata for quality control and administration. Also identify relevant policies for the sharing and usage of the metadata, data and products;</li> <li>3. Describe the metadata utilising WMO profile of ISO 19115 to ensure appropriate compatibility with WIS and WIGOS; and</li> <li>4. Create examples and best practice guides for inclusion in the AMDAR Reference Manual and relevant CIMO documents.</li> </ol>	<ul style="list-style-type: none"> <li>• 1<sup>st</sup> meeting on Metadata relevant to AMDAR has been held.</li> <li>• Classification of components of metadata associated with AMDAR for one airline in the E-AMDAR Programme completed.</li> </ul>	<ol style="list-style-type: none"> <li>1. &amp; 2. Q3 2009</li> <li>3. Q2 2011</li> <li>4. Q4 2011</li> </ol>
3.	Development standardised procedure for Quality Management of AMDAR data	<b>(E-AMDAR Programme Quality Monitoring Centre)</b> in coordination with the AMDAR Technical and Science Sub Group, other AMDAR Data Monitoring Centres	<ol style="list-style-type: none"> <li>1. Examine the requirements for Quality Monitoring and Quality Assurance of AMDAR Data;</li> <li>2. Develop a Quality Framework and procedure in support of high quality AMDAR Data to users; and</li> <li>3. Identify potential AMDAR archive centres (DCPCs for WIS).</li> </ol>	Evaluation e the current criteria and procedures used by all national and regional AMDAR programmes and would develop a set of minimum quality standards for AMDAR data.	<ol style="list-style-type: none"> <li>1. Q12009</li> <li>2. Q1 2011</li> <li>3. Q4 2011</li> </ol>
4.	Validation and preparation for intercomparison of available Water Vapour sensor performance	<b>USA AMDAR Programme Representative</b> E-AMDAR Programme in coordination with CIMO ET-UASI	<ol style="list-style-type: none"> <li>1. Perform calibration and flight test and report; and,</li> <li>2. Organize preparatory meeting to define the rules and procedures for the intercomparison of AMDAR and other upper-air data.</li> <li>3. Take part in the WMO Radiosonde Intercomparison, China, 2010</li> </ol>	<ul style="list-style-type: none"> <li>• The current version of WVSSIIv3 water vapour sensor is still undergoing laboratory testing in the USA and Germany.</li> <li>• Initial contact has been made with</li> </ul>	<ol style="list-style-type: none"> <li>1. Q2 2009</li> <li>2. Q3 2009</li> <li>3. Q2 2010</li> </ol>

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				<p>the CIMO President to formulate a plan for an intercomparison.</p> <ul style="list-style-type: none"> <li>Organize preparatory meeting to define the rules and procedures for the intercomparison of AMDAR and other upper-air data. (Pending on results of testing in the USA and Germany)</li> </ul>	
5.	Update of the AMDAR Reference Manual, WMO-No.958	<p><b>(Chairman of the AMDAR Panel)</b> Contractor TBD under the guidance of the AMDAR Technical and Science Sub Group, CIMO Rapporteur.</p>	<ol style="list-style-type: none"> <li>Review those sections of the AMDAR Reference Manual as identified (ensure the full suite of water vapour sensors and their measurements are included, turbulence and icing and future requirements for AMDAR;</li> <li>Update to both technical and scientific components of the AMDAR Reference Manual and propose changes to the <i>CIMO Guide</i>; and</li> <li>Incorporate input from other sub projects.</li> <li>Draft new version of AMDAR Reference Manual</li> </ol>	Pending	<ol style="list-style-type: none"> <li>Q4 2008</li> <li>&amp; 3. Q3 2009</li> <li>Q4 2011</li> </ol>
6.	Development of the framework for generic software specification for AMDAR	<p><b>(Chairman of the AMDAR Panel)</b> Contractor TBD under the supervision of E-AMDAR Representative in coordination with AMDAR Panel Technical and Science Sub-Group, Aviation Industry Groups.</p>	<ol style="list-style-type: none"> <li>Review all versions of current software specifications currently in use by operational AMDAR Programs; and</li> <li>Provide framework for the development of the generic software solution for AMDAR.</li> </ol>	Pending	<ol style="list-style-type: none"> <li>Q1 2009</li> <li>Q4 2011</li> </ol>

**APPENDIX 2**  
**WIGOS Project Progress Report**  
**Integration of AMDAR Into WIGOS**  
**January 2011**

<b>1. Introduction</b>	<p>This Project is focused on:</p> <ul style="list-style-type: none"> <li>• Developing the practices impacting AMDAR data collection, processing, archiving and dissemination.</li> <li>• The practices used by AMDAR in observing the atmosphere need to be well documented to ensure sufficient detail accompany the observations so that users can properly interpret measurements.</li> <li>• Develop new methods and procedures in preparation for the deployment of new operational instruments, such WVSSII water vapour sensor.</li> </ul>
<b>2. Implementation Progress</b>	<ul style="list-style-type: none"> <li>• IPET-DRC approved the new Standardized BUFR Template for AMDAR. Validation of the AMDAR BUFR Template 3 11 010 version 4 in progress.</li> <li>• A set of minimum standards, including evaluation criteria and procedures, for AMDAR data monitoring need to be developed. A number of operational AMDAR Programmes have provided their current criteria and procedures used for quality monitoring of AMDAR data. These criteria and procedures will be evaluated in order to develop a minimum set of general standards that any operational AMDAR Programme can implement.</li> <li>• The 3<sup>rd</sup> WIGOS PP for AMDAR meeting, using WMO profile of ISO 19115 to ensure appropriate compatibility with WIS and WIGOS, developed metadata that would cover both the aircraft and airport. The meeting also agreed that this particular objective would be tested on a single airline in the E-AMDAR Programme before finally being distributed to other operational AMDAR Programmes.</li> <li>• The AMDAR Panel has also had initial discussions with the WMO Secretariat and the CIMO President regarding Object 4, Validation and Preparation for Intercomparison of Available Water Vapour Sensor Performance. It was agreed that before a preparatory meeting between the AMDAR Panel and CIMO takes place to define the rules and procedures for the Intercomparison of AMDAR and other upper-air data, the WVSS-II water vapour sensor would have to complete USA and European trials and to answer pre-defined quality requirements. It is expected that these field trials are due to conclude in the 1<sup>st</sup> half of 2011.</li> </ul>
<b>3. Implementation Constrains</b>	<ul style="list-style-type: none"> <li>• Level of available resources, both experienced personnel and financial, to implement all activities and objectives under the WIGOS PP for AMDAR are insufficient to implement all objectives</li> </ul>

	in time.
<b>4. Action Plan</b>	<ul style="list-style-type: none"> <li>• Each WIGOS PP for AMDAR meeting covered a number of objectives to maximize the available resources.</li> <li>• Objectives were given an order of priority as well as classifying all the objectives as short or long term.</li> </ul>
<b>5. Lessons Learned</b>	<ul style="list-style-type: none"> <li>• The AMDAR community is lacking sufficient resources (e.g. experienced personnel and time) that could actively contribute to complete all the objectives of the Pilot Project within the original deadline.</li> <li>• The level of funds available has reduced the support to the Pilot Project such that only personnel from the E-AMDAR or the USA AMDAR Programmes have been included in the Pilot Project, where participation from other regions would have provided wider acceptance of the concept and given the Pilot Project a more global perspective.</li> <li>• Support to the Pilot Project from the NMHSs is suffering from a low priority; most members have very active AMDAR Programme(s) and therefore members find it difficult to secure the appropriate amount of time to work on the Pilot Project objectives.</li> <li>• Due to required upgrades to the water vapour sensing system, the availability of a reliable aircraft based water vapour sensor has been delayed, causing the need for additional development, certification and (expensive) laboratory testing and flight trials (scheduled first half 2011).</li> </ul>
<b>6. Challenges</b>	<ul style="list-style-type: none"> <li>• Managing the resources to effectively cover all short and long term objectives for the WIGOS PP for AMDAR.</li> </ul>
<b>7. Implementation Priorities for the next period</b>	<p>The Main priorities are:</p> <ul style="list-style-type: none"> <li>• Completion of the validation of the IPET-DRC approved Standardised BUFR Template for AMDAR (3 11 010 version 4);</li> <li>• Further development of AMDAR requirements for the application of WMO Metadata relevant to AMDAR (Expert Meeting, 28 February-4 March 2011);</li> <li>• Further development of a standardised Quality Management Framework for AMDAR data (Expert Meeting, 28 February-4 March 2011); and</li> <li>• Organize meeting between the AMDAR partners and CIMO for the Validation and preparation for intercomparison of available Water Vapour sensor performance.</li> </ul>
<b>8. Resources Status</b>	This project will make optimum use of the expertise available from the AMDAR Panel and its WIGOS partners. Financial support was requested to support WIGOS PP AMDAR activities from the WMO AMDAR Panel

	Trust Fund and WIGOS-WIS Trust Fund.
<b>9. Project Focal Point</b>	Contact Person: Frank Grooters Position: AMDAR Panel Chairman Organization: KNMI Phone: +31 30 2206691 E-mail: frank.grooters@knmi.nl
<b>10. Place and Date</b>	De Bilt, 6 February 2011