WORLD METEOROLOGICAL ORGANIZATION

WMO AMDAR PANEL WORKSHOP ON AIRCRAFT OBSERVING SYSTEM DATA MANAGEMENT

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AIRCRAFT OBSERVING SYSTEM DATA MANAGEMENT - CURRENT STATUS AND CONSIDERATIONS

Definition of the Current AO DM Framework and Issues

Title

(Submitted by Jitze van der Meulen, KNMI)

SUMMARY AND PURPOSE OF DOCUMENT

Gives an overview and status of current Data Management recommendations and practices

ACTION PROPOSED

1. The Workshop is invited to note the information contained in the document.

References:

1. WMO regulatory material
2. AMDAR Reference Manual

Data Management (DM) should be regarded as the management practice related to all (usually numerical) data, generated fore services to provide data based information. Assuming the national hydro-meteorological and climatological services as information services, DM can be recognized as part of an information service. In practice, however, DM and the information services (the portals to the user) are organized as separate activities with the national organizations. Nevertheless DM should be organized based on requirements, stated by users (or the information services). But in practice data generation and delivery is a world apart with rather autonomous procedures, inclusive quality management.

During the last decades however, the wish to improve the quality of the overall management structure of the national services resulted in a more integrated management structure, such as described by the ISO-9000 standards concept. For WMO this evolution has triggered the development of the WMO Quality Management Framework (QMF). Moreover, a new volume to be incorporated in the WMO Technical Regulations (WMO-No. 49) is drafted. A simple overview of QMF is given in Annex I. Details can be found in WMO/QMF - TD No. 1268, "WMO Quality Management Framework (QMF), First WMO Technical Report", February 2005.

As a result DM, inclusive AMDAR Data Management (AMDAR/DM), requires a well defined position within the QMF structure. Relevant will be the interaction between the [1] data requesting partners (generally the national meteo services and the regional bodies, not typically the end users), [2] the data delivery partners (the airliners; for AMDAR data is regarded as 3rd party observational data) and [3] the co-operative national and regional DM bodies. Especially the interaction with the AMDAR data users is important because the provision of AMDAR data is highly flexible. Because aircraft are 'moving observing stations' and frequency or intensity of reported observations can be easily set on forehand, AMDAR observations can be made available on request. In fact only budgetary constraints and the restriction to specific airline routes will limit the availability of data. It is experienced that the performance of the AMDAR system and the data quality can easily meet stated requirements.

The operational delivery of AMDAR reports should be regarded today as an activity within the World Weather Watch programme (WWW), rather than within the Aeronautical Meteorology Programme (AeMP), a component of the WMO Applications of Meteorology Programme (AMP). For WWW, the Open Programme Area Group (OPAG) on Information System and Services (ISS) is tasked in the past with WWW Data Management (WWW/DM). Although in the past actions were started to integrate data management activities between WMO Programmes[1], currently, however attention is given to *data representation* and *metadata*. So, it is typically not the development of a WWW/DM framework, as described in the Guide on WWW/DM (WMO-No. 788; 1993)[2]. Nevertheless WWW/DM also covers *Monitoring*, split up into quantity monitoring and quality monitoring. Data quality monitoring is in fact a well organized activity, carried out by a number of Lead Centres, each with their own specific responsibility (data type, area). For aircraft data (global) the nominated Lead Centre is WMC Washington, for upper air data RSMC ECMWF is nominated. Apart from these nominated centres also other centres provide monthly monitoring of data quality. Note however that although this monitoring activity is welll organized, it does not provide real-time checking, nor any evaluation of the quality of data (as described in the AMDAR Reference Manual, see ANNEX II).

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[1] an ISS/Data Management activity, see http://www.wmo.int/pages/prog/www/documents.html#WDM (document: "Study on Integration of Data Management Activities between WMO Programmes", see http://www.wmo.int/pages/prog/www/WDM/Documentation/WMODM-integration-study-V2.pdf)

[2] see http://www.wmo.int/pages/prog/www/WDM/Guides/Guide-on-DataMgt-1.htm

CURRENT STATUS OF AMDAR DATA MANAGEMENT

Although DM can be regarded as a part of an overall ISO-9001 based quality management system (QMS), DM will deal with the quality assurance (QA) of the data itself. Here, quality assurance, inclusive of data quality control (QC) and data quality evaluation (QEv) should be regarded as an integral part of DM. Discussing QA should therefore be part of a DM discussion in the first place and not typically part of a QMS discussion.

AMDAR Data Management (AMDAR/DM) is currently best described in the AMDAR Reference Manual (WMO-No. 958) inclusive QA. Excerpts from this Manual related to AMDAR/DM are given in Annex II. WMO Manual and Guide containing general standards or recommendations related to DM inclusive of quality assurance are:

1. Manual on the Global Data-processing and Forecasting System (Man. GDPFS, WMO-No. 485)
2. Guide to the Global Observing System (Guide to the GOS, WMO-No. 488)
3. Guide to Meteorological Instruments and Methods of Observation (CIMO Guide, WMO-No. 8)
4. Guide on World Weather Watch Data Management (WWW/DM Guide, WMO-No. 788, 1993) [3]

Ad 1.

The Man. GDPFS focuses largely on the organization of data-processing, but is most detailed is terms of requirements and quality control. Three major issues are covered with this Manual:

(1) Procedures for the elaboration of observational data requirements (Attachment I.2 of this Manual). The structure of these procedures is visualized in figure 1.

(2) Quality control of observational data and their reception at GDPFS centres in real- and non-real time (II.1 and II.2). Relevant parts are Checking of collected information, Quality control, Requirements for observational data and Timeliness. Here, "*Checking of collected information*" is stated in terms of the responsibility of a designated National Meteorological Centre to be responsible to check data before transmission on the GTS, inclusive of the definition of 'data levels'. Statements, referring to this responsibility are of high relevance for real-time data and in particular for 3rd party data, like AMDAR data. The paragraph with "*Requirements for observational data*" refers to an appendix containing these requirements, like for three-dimensional fields, relevant for upper-air observations (see Table 1). Note that within ET-EGOS a database is developed containing and extended overview of observational data requirements, to replace this table in future[4]. Also procedures for the exchange of monitoring results are stated (Attachment II.9 of this Manual), inclusive AMDAR and criteria for suspect temperatures and winds (see Table 2). In Annex III of this document some relevant standards and recommendations are presented.

(3) Data management aspects, typically related to the storage (archive) of data and its quality control (Part III).

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[3] see http://www.wmo.int/pages/prog/www/WDM/Guides/Guide-on-DataMgt-1.htm

[4] see: http://www.wmo.int/pages/prog/www/OSY/RRR-DB.html

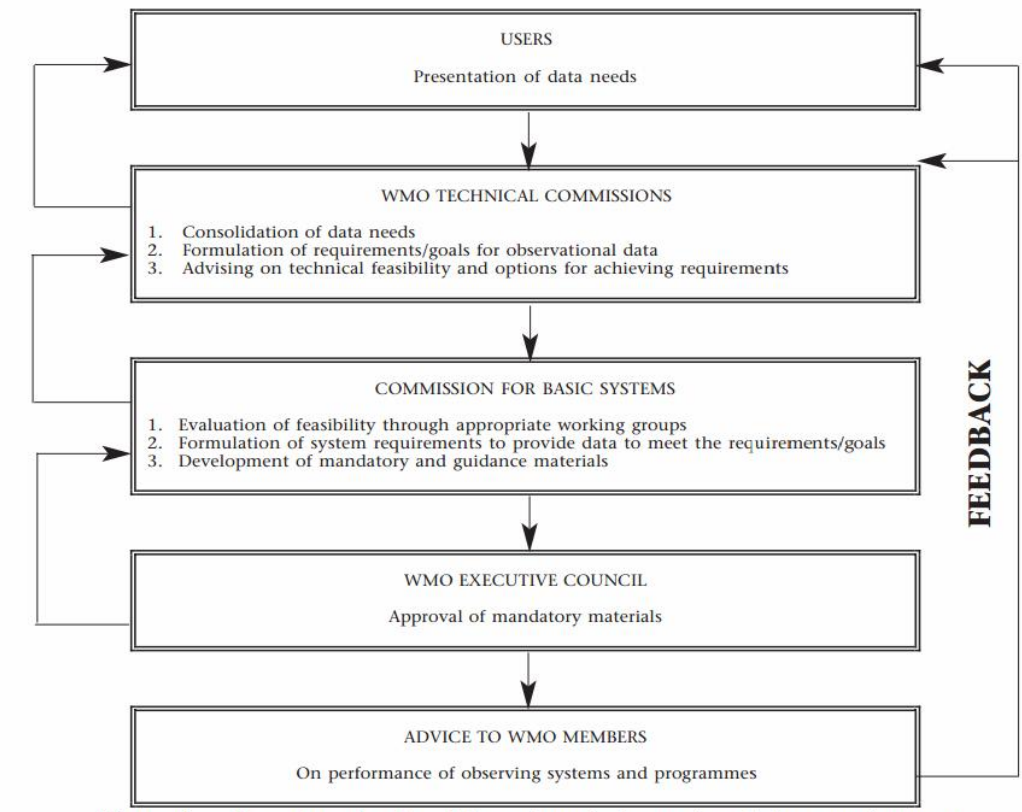


Figure 1 — Procedure for the elaboration of observational data requirements

TABLE 1

Three-dimensional fields

	Horizontal resolution (km)	*Vertical resolution (km)*	*Temporal resolution (hours)*	*Accuracy (RMS error)*	*Notes*
Wind (horizontal)	100	.1 up to 2 km .5 up to 16 2 up to 30	3	2 m s^{-1} in the troposphere 3 m s^{-1} in the stratosphere	(1) (2)
Temperature	100	.1 up to 2 km .5 up to 16 2 up to 30	3	.5 K in the troposphere 1K in the stratosphere	(3)
Relative humidity (RH)	100	.1 up to 2 km .5 up to tropopause	3	5% (RH)	
Turbulence	100	.3	1	–	

[*notice: only AMDAR observational variables are shown in this table]

NOTES:

(1) Accuracy specified as RMS vector error.

(2) Hourly wind data from geostationary satellites and from wind profilers are also required. Tropospheric horizontal and vertical resolution and accuracy can be met by a space-based Doppler wind lidar in a Sun-synchronous orbit.

(3) Geopotential height can be retrieved from specified T and RH with sufficient accuracy.

Table 2
Suspect automated aircraft temperatures and winds observations criteria
(low: surface to 701 hPa, mid: 700 to 301 hPa, high: above 300 hPa)

Variable	*Low*	*Mid*	*High*
Gross temperature (K)	15.0	10.0	10.0
Temperature bias (K)	3.0	2.0	2.0
Temperature RMS (K)	4.0	3.0	3.0
Minimum count	20	50	50
Gross wind (m s^{-1})	30.0	30.0	40.0
Wind speed bias (m s^{-1})	3.0	2.5	2.5
Wind RMS (m s^{-1})	10.0	8.0	10.0
Minimum count	20	50	50

Ad 2.

In the Guide to the GOS much attention is given to Data Quality Control (see Part VI of this Guide) and in particular to real-time data quality control. Relevant is the description of the leveles of aplicatin of quality control procedures (par. 6.1.1). It is stated that:

> *The levels of quality control procedures are as follows:*
> *(a) The observing site, starting with data acquisition by manual or automatic meteorological stations;*
> *(b) Data collection centres, prior to the transmission of observational data over the Global Telecommunication System;*
> *(c) GTS centres (standard telecommunication procedures, for example, control of timeliness and data format);*
> *(d) GDPFS centres and other available facilities.*

Checking the quality of real-time observational data two levels are stated:

> *(a) Quality control of raw data (Level I data)—basic quality control performed at the observing site. This quality control level is relevant during acquisition of Level I data and should eliminate errors of technical devices, including sensors, systematic or random measurement errors and errors inherent in measurement procedures and methods. Quality control at this stage includes the following tasks: a gross error checks, basic time checks and basic internal consistency checks.*
> *(b) Quality control of processed data—extended quality control, partly performed at an observing site, but mainly at a National Meteorological Centre. This level is relevant during the reduction and conversion of Level I data into Level II data and Level II data themselves. It deals with comprehensive checking of temporal and internal consistency, evaluation of biases and long-term drifts of sensors and modules, malfunction of sensors and the like.*

Furthermore the Guide to the GOS refers to the Guide on the Global Data-processing System (WMO-No. 305), published in 1993. However, because of the date of issue of this Guide the typical AMDAR data issues are missing.

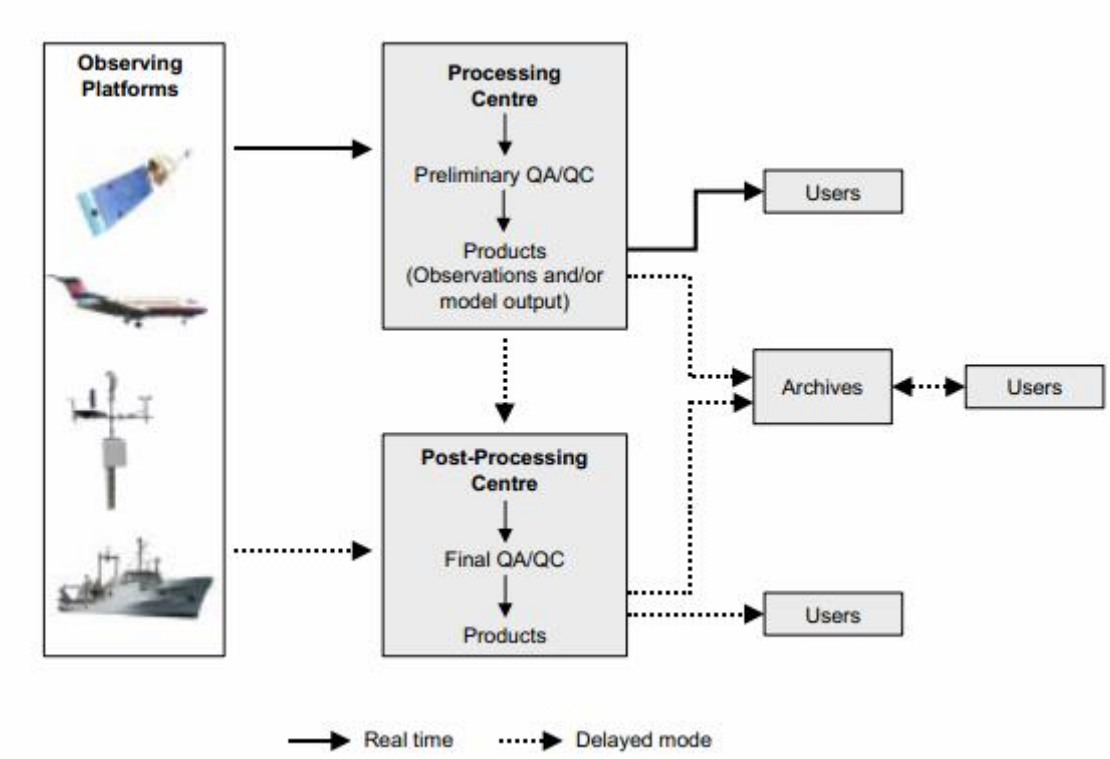
Ad 3.

In Part III, Chapter 1 of the CIMO Guide ("Quality Management") an extended overview is presented on quality assessment in line with QMF and based on the ISO 9000 standards concept. The

description of quality management is to a high extent applicable for data management, to be interpreted as an integral part of quality management. Moreover details are presented on the management of quality control and metadata.

Ad 4.

The WWW/DM Guide (last update: April 1992) gives an view of DM related to the overall management of WWW data and products and is based on the Open System Interconnection (OSI) 7 layer reference model, which is a pure technical approach and not a management or organizational approach. Although long-term objectives and strategy are well defined, it focuses largely on data representation and visualization (so, not typically on data needs and requirements). Moreover, because of its age (published 20 years ago), this Guide needs a serious upgrade (responsibility for CBS/ISS; **Recommendation to CBS**). An interesting publication, issued by OPAG ISS for data management issues is "Study on Integration of Data Management Activities between WMO Programmes". This document presents an interesting approach on how Data Management can be further developed for WWW and the other WMO Programme. In the report attention is given to real-time data stream, related to the JCOMM/IODE Data Flow, and represented in a simplified form, like:



CONCLUSIONS AND RECOMMENDATIONS

In practice AMDAR/DM is reasonable well documented in the AMDAR Reference Manual. The documentation is in line with the standard documents, even with the rather outdated WWW/DM documentation. Of interest is that the scheme on a DM structure published in this Manual and shown in ANNEX II of this document has a higher level of detailness than all other documents published within WWW/DM. Relevant for AMDAR/DM is quality assurance of observational data. Because data is generated by the airliners (*i.e.* so-called 3rd party data) and not by the meteo services themselves, quality assurance, especially with regards to the delivery of real-time data is a relevant issue for the

AMDAR system. As shown in the AMDAR/DM scheme, a structure can be introduced related to national, regional and global programmes. For the national programmes (and in some cases for regional programmes, as for E-AMDAR), data management shall contain strong interactive links with participating centres and the airliners, inclusive a quality evaluation centre (QEvC), to assure an appropriate performance for the real-time distribution of data. Quality control issues related to off-line data and to the tracking of the general performance of AMDAR data can be covered by monitoring Lead Centres (global data). Within this framework however, the typical aspects of evaluation of data quality based on detailed analyses and in-depth studies is not well recognized. Such studies are essential for feed-back practices to improve the performance of the AMDAR system (**recommendation).**

Although indicated in a number of documents, quality indicators (or flags) should be transmitted together with the data as metadata. Such identifiers can be helpful to assess (or filter) data on forehand by the users (like a NWP centre or for applications like generating profiles). For such practice a simplified structure is most welcome. Examples of classification of data quality is provided in the Guide to the GOS (for land stations). Such a service can be a reasonable solution because evaluation and filtering of single level data (like described in the Manual on the GDPFS, see *e.g.* table 2 above) may be time consuming and causing unacceptable timeliness. A simple scheme (with an appropriate algorithm) should be developed (**recommendation**). For this practice not only the observational variables (like air temperature and the wind vector), but also positional and time information has to be taken into account.

AMDAR/DM and WWW/DM still lack a well-defined structure. Although QMF has introduced a ISO 9000 standards approach, a more detailed framework should be introduced. The introduction of such a structure doesn't have to be a serious bottleneck, because within the ICT community a number of such frameworks a developed already. Nevertheless, relevant here is the point of view chosen. In the past this point was typically at the site of the data-system developer, providing well described ITIL and ASL frameworks. Nowadays this point is at the users' site. A typical and reasonable simple example is defined by BiSL (Business Information Services Library) with a focus on ICT demand management (to describe the transition phase between Demand and Supply). A short overview of this BiSL concept is provided in ANNEX IV. The introduction of such a structure for the further development of the AMDAR/DM framework will be welcome (**recommendation**).

ANNEX I

QMF: QUALITY MANAGEMENT APPROACH TO IN SITU OBSERVING SYSTEMS (QMF documentation, April 2004, published in WMO/QMF - TD No. 1268)

[excerpt]

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2 QUALITY MANAGEMENT FRAMEWORK IN THE AREA OF IN SITU COMPONENTS OF THE GLOBAL OBSERVING SYSTEM

2.1 Existing WMO Quality Management Procedures in the Global Observing System

Even superficial analysis of the WMO publications show that there is already in place rather extensive Quality Management Framework in respect of the different components of the Global Observing Systems (GOS) as well as in respect of the other WWW sub-systems. This fact is reflected in the different reports of the meetings devoted to the consideration of the problem. The structure of the existing QMF corresponds to the following basic purposes of the WMO:

- To ensure adequate uniformity and standardization in the practices and procedures used by National Meteorological Services (NMSs);
- To ensure quality of observational data since the effectiveness of any NMS depends on the quality of data and products exchanged through the WMO Systems;
- To ensure overall availability of observational data for all purposes, especially for the numerical weather prediction.

As regards the GOS these purposes are realized through:

(a) Extensive system of documented standards and recommended practices and procedures which shall, or should, be followed by Members. These are described in the Manual on the GOS, in the Guide on the GOS and in some other publications;

(b) Different levels of quality-control procedures of meteorological observations (the observational site, collecting centers, prior to transmission over CTS, GTS centers, GDPS centers);

(c) Variety of systems for monitoring of the av ailability of observational data (statistics concerning the availability of observational reports on a non-real-time basis, real-time monitoring on a global basis in leading centers, etc.);

(d) Activities for training of personal operating different elements of the GOS (training courses, regional meteorological training centers, etc.).

Naturally, the existing GOS QMF have deficiencies and shortcomings. The main shortcomings are given in Table 1. One can see from the table that most of these shortcomings are caused by the international nature of the WMO and, to a large degree, by inadequate funds in many countries to rehabilitate and operate observational equipment and also to control the quality of the performance of the observational systems. Nevertheless, the i dea to work towards the improvement of existing QMF is quite relevant and challenging.

2. 2 Concept of the ISO Quality Management System

In general the ISO 9000 family of standards has been developed to assist organizations, of all types and sizes, to implement and operate effective quality management systems. However, the detailed consideration of the standards permits to conclude that such kind of Quality Management System (ISO QMS) is most suitable system for a business organization, which is seeking advantage through its implementation in an competitive environment.

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TABLE 1
Shortcoming of the Existing QMF GOS and their Sources

Shortcomings	Sources
(1) Predominance of the recommended practices over standard (obligatory) practices	Voluntarily acceptance of the responsibilities by Members
(2) Slight reaction in respect of the deviations from standard practices	International nature of the WMO
(3) Slow feedback of data-monitoring results to the data procedures	Number of the error sources, complicated, multinational infrastructure of the GOS
(4) Insufficient control of many observing systems integrated in the GOS	Great number of observing systems of different degree of the complexity
(5) Lack of real-time interaction with the working personnel of observing systems	International nature of the WMO
(6) Insufficient effectiveness of the system	Financial difficulties in some countries, lack of equipment and trained staff

The ISO QMS helps a manager of an organization to direct and to control this organization in a systematic and transparent manner. The key word in this QMS is management. Through leadership and actions, top management can create an environment where staff are fully involved, and in which a quality management system can operat e effectively. That is why, unlike the WMO QMF, the ISO QMS standards have not established requirements for products (which are specified in the WMO regulations) but requirements for the QMS and promoted the adoption of the process approach to manage an organization. Such an approach emphasizes the systematic identification and management of the numerous interrelated proces ses employed within an organization and particularly the interactions between such processes.

The clauses of the ISO 9001 include a number of specific requirements for the QMS concerning:

- Types of documents used in QMS (quality manual, quality plans, documents stating requirements and guidelines, instructions how to perform activities and processes, documents to provide objective evidence of performed activities or results achieved);
- Management responsibility (management commitment to a quality policy, quality objectives);
- Resource management (provision of resources, including human resources, infrastructure, work environment);
- Product realization (planning, determination and review of requirements related to product, design and development of product, purchasing);
- Measurement, analysis and improvement (monitoring and measurement of processes and product, internal audit, control of nonconforming product, analysis of data and improvement).

It is also normal for an organization that subjects itself to the discipline of ISO 9001 to seek formal certification from an accredited certifying body, which itself, must comply with the standard and other

requirements (e. g. ISO Guide 62: 1996/EN 45012: 1998). The certifying body conducts an audit of the operation of the quality system and, when satisfied, will issue the ISO 9001 certificate. Subsequently, it conducts six-monthly audits on a sampling basis, and may require actions to correct non-conformities with the standard. The regular audit also produces recommendations that will help to improve the effectiveness of the quality system. The value of a certification is that it helps to drive the continuous improvement process and demonstrates by an independent audit that the ISO standards are being met.

ANNEX II

Excerpts from the AMDAR Reference Manual (WMO-No. 958) on Data Management

5. AMDAR data management (AMDARDM).

5.1 AMDARDM can be viewed within the context of the WMO World Weather Watch Data Management (WWWDM) programme. The concept of WWWDM is one of carrying out those activities required to optimise the integration of the Global Observing System (GOS), Global Telecommunications System (GTS) and Global Data Processing System (GDPS). WWWDM functions include:

a) Providing specifications for data representation, including codes and exchange formats, guidelines for the design of databases and storage of observational data and processed information.
b) Defining and designing proper procedures and interfaces, particularly in the area of data processing and telecommunications, to allow Members to obtain the coherent and appropriate sets of data and products required, despite the disparity in the levels of sophistication of technology and techniques of various WWW centres.
c) Monitoring of AMDAR operations and the quality of basic data and output products.

5.4 AMDARDM is discussed in detail in Appendix IV.

Appendix IV

AMDAR DATA MANAGEMENT

1. Introduction.

1.1 AMDAR Data Management (AMDARDM) can be viewed within the context of the WMO World Weather Watch Data Management (WWWDM) programme. The concept of WWWDM is one of carrying out those activities required to optimise the integration of the Global Observing System (GOS), Global Telecommunications System (GTS) and Global Data Processing System (GDPS). WWWDM functions include:

a) providing specifications for data representation, including codes and exchange formats, guidelines for the design of databases and storage of observational data and processed information.
b) Defining and designing proper procedures and interfaces, particularly in the area of data processing and telecommunications, to allow Members to obtain the coherent and appropriate sets of data and products required, despite the disparity in the levels of sophistication of technology and techniques of various WWW centres.
c) Monitoring of AMDAR operations and the quality of basic data and output products.

1.2 AMDARDM applies to all the processes in the AMDAR operational system. This is shown schematically in figure 1 below. It will be noted that the global system consists of several national or regional programmes with overall co-ordination facilitated by the WMO AMDAR Panel through its Technical Co-ordinator. In this appendix each function is described with special

attention to quality management. In addition, detailed information is provided on recommended GTS codes that are subject to WMO technical regulations.

2. Data Management Functions (see figure 1).

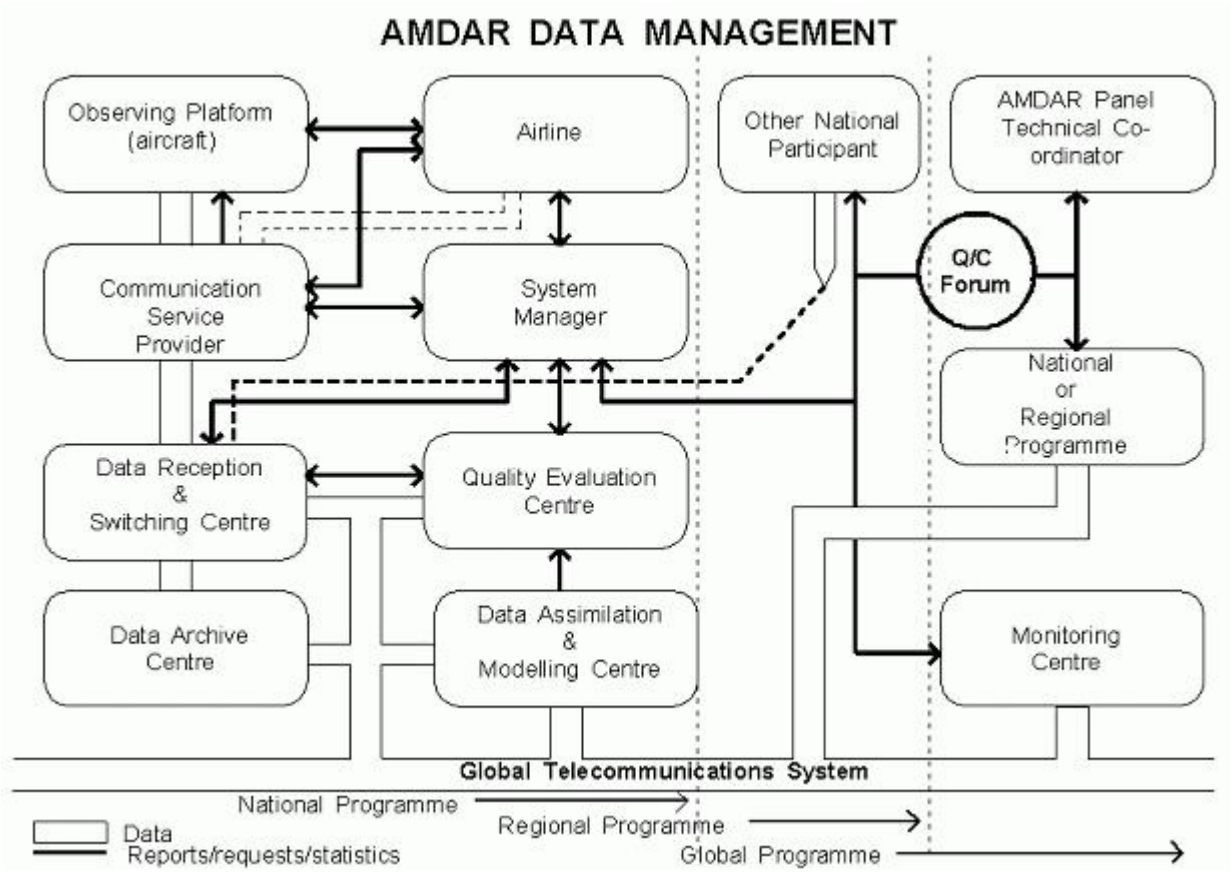

FIGURE 1

2.1 *Observing platform (aircraft)*:
Compute and assemble observational data;
Perform basic quality control (Q/C);
Transmit to ground in approved code.

2.2 *Communications Service Provider*:
Relay observations to ground network (to airline or DRSC);
Maintain error free transmission;
Process uplink commands;
Ensure timely delivery of data.

2.3 *Data reception and switching centre* (DRSC):
Ingest real-time data including data from co-operating programmes;
Perform real-time Q/C;
Assemble rejected data;
Assemble bulletin:
Eliminate duplicates;

Pass all data (except duplicates) to QEV centre;
Pass all data (except duplicates) to Archive centre;
Eliminate additional rejects from QEV list;
Pass accepted data bulletins to GTS and to Numerical Processing Centre;
Assemble and forward reports to System manager.

2.4 *Data Assimilation and Numerical Modelling Centre*:
Assimilate data with other real time information from numerical model and GTS.
Send reject list and other monitoring information to QEV centre (includes external data from GTS)
Put processed products on GTS.

2.5 *Quality Evaluation (QEV) Centre*:
Perform near-real-time QEV on all data including rejects;
Determine reasons for rejected data;
Update reject list, pass to DRSC;
Report to System Manager;

2.6 *System Manager*:
Focal point for AMDAR programme;
Analyse system status;
Initiate Q/C actions internally through airline or communications service provider (as appropriate), notify appropriate airline of consistent bad data;
Programme management including data optimisation and targeting schemes;
Pass status reports, quality statistics and quality notifications to external parties;
Liaise with external programmes and monitoring centres.

2.7 *Airline*:
Implement and manage on-board observing programme;
Action external commands, directly or through up-link control;
Forward AMDAR messages to DRSC (as appropriate);
Rectify problems with aircraft reporting bad data;
Report status to System manager.

2.8 *Regional programme participant*:
Pass data to DRSC;
Action Q/C reports from System manager and external sources;
Provide status reports to System Manager.

2.9 *External Programme*:
Insert data on GTS;
Disseminate Q/C reports and statistics.

2.10 *Monitoring centres*:
Publish quality statistics;
Provide regular platform reject lists to interested parties.

2.11 *AMDAR Panel Technical Co-ordinator*:
Maintain and publish contact list for AMDAR programmes.
Monitor data flow statistics;
Co-ordinate quality reporting activity;
Advise programme managers and users on quality and data optimisation issues.

Co-ordinate AMDARDM activity within the AMDAR Panel.

2.12 *Data Archiving Centre*:
Access all AMDAR GTS data plus rejects from DASC;
Eliminate duplicates;
Q/C and flag data;
Archive by individual aircraft (time series);
Archive by month and area;
Publish data catalogue at regular intervals.

2.13 *Q/C Forum*:
Provide network for interchange and discussion of data management issues, problems, reports, actions and initiatives.

ANNEX III

Excerpts form Manual on the Global Data-processing and Forecasting System (Man. GDPFS, WMO-No. 485) on checking and quality control of data

Part II - DATA-PROCESSING AND FORECASTING ASPECTS

1.5.2 Checking of collected information

Each Member shall designate a National Meteorological Centre, or other appropriate centre, to be responsible for meteorological checking of information collected before transmission on the Global Telecommunication System.

NOTES:

(1) It is for each Member to decide, in the light of its own capabilities and needs, the extent to which it wishes to receive and use products of WMCs and RSMCs.

(2) The telecommunication functions of World Meteorological Centres and National Meteorological Centres are specified in the Manual on the GTS .

(3) Definition of data levels. In discussing the operation of the GDPFS it is convenient to use the following classification of data levels, which was introduced in connection with the data-processing system for the Global Atmospheric Research Programme (GARP):

Level I: Primary data. In general these are instrument readings expressed in appropriate physical units and referred to Earth coordinates. Examples are: radiances or positions of constant-level balloons, etc. but not raw telemetry signals. Level I data still require conversion to the meteorological parameters specified in the data requirements.

Level II: Meteorological parameters. These are obtained directly from many kinds of simple instruments, or derived from the Level I data (e.g. average winds from subsequent positions of constant-level balloons).

Level III: Initial state parameters. These are internally consistent data sets, in grid-point form obtained from Level II data by applying established initialization procedures. At those centres where manual techniques are employed, Level III data sets will consist of a set of manually-produced initial analyses.

2.1.2 Responsibility for real-time quality control

2.1.2.1 The primary responsibility for quality control of all observational (Level II) data should rest with the national Meteorological Service from which the observation originated ensuring that when these observations enter the GTS they are as free from error as possible.

2.1.2.2 Quality control of observational data needed for real-time uses shall not introduce any significant delay in the onward transmission of the data over the GTS.

2.1.2.3 To detect errors which may escape the national quality-control system and errors introduced subsequently, RSMCs, WMCs and other GDPFS centres should also carry out appropriate quality monitoring of the observational data they receive.

ANNEX IV

Business Information Services Library

Business Information Services Library (BiSL), previously known as Business Information Service Management Library, is a framework used for information management. BiSL is a public domain standard since 2005, governed by the ASL BiSL foundation[5] (previously ASL Foundation).

The framework describes a standard for processes within business information management at the strategy, management and operations level. BiSL is closely related to the ITIL and ASL framework, yet the main difference between these frameworks is that ITIL and ASL focus on the supply side of information (the purpose of an IT organization), whereas BiSL focuses on the demand side (arising from the end-user organization).

BiSL in ICT demand management

Information management, or ICT demand management, can be split in three major areas:

• Technical / Infrastructure Management (framed by ITIL)

Technical management is the group of processes focusing on the management of the IT infrastructure itself and is supported by the ITIL standard. The IT infrastructure is the underlying layer made of computer systems, network connectivity and end-user devices allowing to operate the application layer and provide them with application functionalities. Technical management is owned by the IT organization.

• Application Management (framed by ASL)

Application management is the group of processes that takes care of the implementation of the evolutions in the applications required to comply with technical or functional requirements. These changes may be required either because the application doesn't work like expected (corrective application maintenance) or because the expectations have changed (what the application needs to deliver has changed). Application management focuses on incremental changes on existing applications, not on the development of new applications, and is supported by the ASL standard, which is subsequent to and partially inspired by the ITIL standard.

• Information Management (framed by BiSL)

Information management is the group of processes that frames the provisioning and control of the functional requirements that the applications have to deliver to the end-users. :Information management is owned by end-user organisations and enables them to control that the required functionalities are implemented in the applications that the end-users use, or that changes to the applications comply to the expectations. Information management is supported by the most recent BiSL standard.

Three layer cluster concept

Within this structure, all these management areas should be organized based on a three-layer concept:

- a Strategic cluster, inclusive of general business policies and portfolios (Information strategy cluster dealing with long term policies)
- a Tactical cluster, inclusive data services (the Management process)

[5] see http://www.aslbislfoundation.org/

- an Operational cluster, inclusive daily maintenance, research and development

For all of these layers relationships (accounts) will exist with other partners (data deliverers, data users), *i.e.* a use management cluster and a functionality management cluster, typically related to the daily practices.

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