WORLD METEOROLOGICAL ORGANIZATION
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COMMISSION FOR BASIC SYSTEMS
OPEN PROGRAMME AREA GROUP ON INTEGRATED OBSERVING SYSTEMS
IMPLEMENTATION/COORDINATION TEAM ON
THE GLOBAL OBSERVING SYSTEM

FIRST SESSION

GENEVA, SWITZERLAND

11-15 SEPTEMBER 2000

FINAL REPORT

1. ORGANIZATION OF THE SESSION

The first session of the Implementation/Coordination Team on the Global Observing System was held in Geneva from 11 to 15 September 2000, under the chairmanship of Mr H. Daan (Netherlands). The list of participants is given in Annex I.

1.1 Opening of the session

1.1.1 The Assistant Secretary-General of WMO, Dr A. Zaitsev welcomed participants to Geneva and to the new WMO Building. He recalled the CBS decision to reorganize its working structure and briefly reviewed the meetings held over the past two years to monitor and evaluate various aspects of the operation of the GOS. The present meeting had a number of important issues to resolve and would benefit from the regional representation of its membership. He wished the meeting a constructive and successful session which would contribute in no small way to the overall review of the GOS to be carried out by the forthcoming session of CBS.

1.2 Adoption of the agenda

1.2.1 The agenda for the meeting was adopted and is reproduced in Annex II.

1.3 Working arrangements for the session

1.3.1 The meeting agreed on working arrangements and adopted a tentative work plan for consideration of the various agenda items.

2. REVIEW OF THE GOS IN THE REGIONS

2.1 Regional Association I (Africa)

2.1.1 Mr M. Saloum, Rapporteur on the GOS for Region I informed the meeting on implementation in this Region.

2.1.2 As in other Regions, the RBSN in Region I had been designed by the Working Group on Planning and Implementation using the Network programme for the determination of the horizontal resolution for both surface (250 km) and upper air (500 km) stations.

2.1.3 As of July 2000, the Regional Basic Synoptic Network (RBSN) surface component comprised 593 stations. 155 stations were silent. 94% of the silent stations belonged to countries suffering serious civil disruption or war situations such as Angola, Somalia, Liberia and Sierra Leone. In fact, such stations were simply not operational.

2.1.4 The number of the upper air stations was 93, of which 49 were silent. The major problems of the RBSN in Region I stem from the difficulties of operating upper air stations due mainly to the economic and financial restrictions. Other difficulties, in addition to operating the RAOB stations, are related to the functioning of the GTS during night time (19UTC-06UTC).

2.1.5 Many stations producing Pilot messages faced difficulties in obtaining consumables (balloons, hydrogen, etc).

2.1.6 Only a few countries like Niger and Algeria collected AIREP observations from aircraft flying over the FIR under their responsibility.

2.1.7 With regard to marine activities many African countries were involved in the management of a number of buoys.

2.1.8 AMDAR data were not received in a great number of African countries.

2.2 Regional Association II (Asia)

2.2.1 Mr Chen Yongqing, Rapporteur on the GOS for Region II, informed the meeting on implementation in this Region.

RBSN in Region II

2.2.2 In accordance with the ECMWF Monitoring Report, the levels of implementation of RBSN surface and upper-air stations in Region II were at 97% and 89% respectively in 1999. The percentage of SYNOP reports actually received at MTN Centres increased from 77% in 1998 to 82% in 1999. However, the percentage of the upper-air reports received at MTN Centres actually decreased noticeably from 65% in 1998 to 52% in 1999. The results also show the deterioration of upper-air networks in certain areas of Region II, in particular in Central Asia and its near-polar region.

2.2.3 The deterioration of upper-air networks appeared to be due to two main reasons: The first is the financial problems in certain areas. The second is the effect of the closure of the Omega-based systems in 1997. Though many Omega-based upper-air systems were replaced by GPS-based system, the results of a survey conducted by CBS in the first half of 1999 among members operating GPS-based sondes, showed that about 20% of launches of GPS sondes were unreliable.

2.2.4 In order to improve the rate of implementation of the RBSN, the RBSN list was revised by the Rapporteur on GOS. When revising the RBSN, the following principles were applied:

- The revised RBSN should have a spatial resolution of 150 Km for surface and 250 Km for upper-air stations.
- If a RBSN station was "silent" according to monitoring results and another RBSN station located nearby (less than 100 Km) had regularly reported its observation, the "silent" station should be removed from the RBSN list and be replaced by the neighbouring station. If there was no regularly reporting RBSN station nearby, the "silent" station should remain on the list.
- In data sparse areas, gaps should be filled by existing stations (according to Vol. A publication No.9) although these may not have been previously included in the RBSN.

AMDAR issues

2.2.5 It was estimated that globally there were about 55,000 AMDAR observations per day in 1999, rising to some 150,000 per day over the next five years. However, in Region II, the availability of AMDAR reports was very low. In some countries, difficulties existed in communicating AMDAR data to the Meteorological Department. In these cases data are only for real time display on the aircraft, and are not stored in any media. It is suggested that WMO develop some policies in cooperation with ICAO, on this project. More detailed guidance materials should be developed and sent to the Member countries by WMO, in order to increase AMDAR reports in Region II.

The CLIMAT and CLIMAT TEMP as well as GCOS issue

2.2.6 The reporting rate of CLIMAT and CLIMAT TEMP reports in Region II is small for many reasons. One reason could be the change of format of the code. Staff responsible for the management of the code do not receive the information in real time and cannot prepare for the modifications to the format and the relative software. It was suggested that special advisory documents be issued when any changes are made.

2.2.7 As far as GCOS is concerned, it was also suggested that more detailed guidance material should be provided to Member countries by WMO, to assist in understanding the real targets of GCOS.

Space-based subsystem

2.2.8 As far as the space-based subsystem was concerned, the valuable inputs to NMS operations of Region II provided by polar-orbiting and geostationary satellites operated by China, EUMETSAT, Japan, Russian Federation and USA was appreciated. A EUMETSAT polar system programme with three satellites to be launched in 2003, 2007 and 2012 would also be an essential contribution to the implementation of current polar-orbiting satellite programmes.

2.3 Regional Association III (South America)

2.3.1 Mr L. Farias Briceño, Rapporteur on the GOS for Region III informed the meeting on implementation in this Region.

2.3.2 Most surface meteorological stations were concentrated in the coastal regions, where the greatest population density and socio-economic activity of RA III Member countries are found. The grid length in these areas was between 50 km and 100 km, and in some cases even less. However, in some areas of Central Amazonia it ranges from 1500 km to 2000km and in other areas, such as the southern zone, from 300 km to 400 km.

2.3.3 In general, surface and upper-air stations currently have limited observation programmes, which comprise mainly daytime surface observations and upper-air observations at 12 GMT. Some stations are not in use due to budgetary problems.

2.3.4 The National Meteorological and Hydrological Service of Bolivia will implement a network of upper-wind observing stations, with pilot balloons, in La Paz, Trinidad, Cobija, Viru Viru, Roboré and Uyuni, through an agreement between the PACS-SONET project of NOAA and Bolivia.

Observation systems used in the RBSN

2.3.5 RA III Members carry out upper-air observations using mainly GPS.

2.3.6 Surface observations are carried out using mainly conventional stations, even though various RA III Members have considered automatic stations.

2.3.7 In the Region, various Members have Automatic Weather Stations operating through Data Collection Platforms, which are not integrated into the RBSN.

2.3.8 Wind profilers are not used in the Region. Nor are data collected from AMDAR systems.

2.3.9 Some Members use weather radar data.

2.3.10 Only two Members reported that they receive ship and buoy data.

2.3.11 Most meteorological offices receive aircraft reports (AIREP), transmitted from predetermined geographical points.

Theoretical design of the RBSN

2.3.12 An optimal RBSN would have a grid length of 250 km for surface stations, and 500 km for upper-air stations. On the basis of a selection of proposed stations, a homogenous network consisting of 296 surface stations and 58 upper-air stations was organized. This left an area of approximately 10% to be covered by surface stations and around 20% to be covered by upper-air stations.

2.3.13 An ideal RBSN would have a grid length of 150 km for surface stations and 250 km for upper-air stations. The network consisted of 507 surface stations and 58 upper-air stations. This left approximately between 20% and 30% to be covered by surface stations and more than 50% to be covered by upper-air stations.

2.3.14 When redesigning of the RBSN of RA III, the following matters should be taken into account.

- Definition of regional and global observation requirements.
- Specific and frequent requirements of observations and station density to be met.
- Means to finance regional installations.

Conclusions

2.3.15 The overall performance of the RSBN in the Region could be summarized as follows:

- The RBSN is supported by an observing programme that is limited by a lack of personnel, consumables and maintenance.
- The theoretical grid length considered to be optimal (250 km for surface stations and 500 km for upper-air stations) could be implemented, provided that the required installations are in keeping with the funding from outside the Region.
- Members of the Region still have a national concept of a network instead of a regional concept.
- Weather radar, wind profilers, AMDAR, ship and buoy data are practically not used in the Region.

2.4 Regional Association IV (Central and North America)

2.4.1 Mr G. Vega, Rapporteur on the GOS for Region IV informed the meeting on the implementation in this Region.

2.4.2 In accordance with the decision of the twelfth session of RA IV (Nassau, 1997), the RBSN in Region IV comprised 514 surface stations, 143 upper-air stations and 25 automatic marine stations. Following standing WWW observational procedures, RBSN surface stations should make observations at four main and at four intermediate standard times from 0000 GMT to 2100 GMT, while RBSN upper-air stations should make radiowind and radiosonde observations at 0000 GMT and 1200 GMT.

2.4.3 WWW monitoring indicated that 440 stations, i.e. 85,6% out of the total number of RBSN surface stations, were providing more than 50% of expected SYNOP reports. Also there was still a noticeable number of stations (48) providing less than 50% of expected reports. The number of "silent" stations remained practically unchanged - 26 stations or 5% of the total number of RBSN surface stations (27 stations were registered in 1998). Gaps in the SYNOP data coverage exist over certain areas in the southern part of the Region.

2.4.4 The availability of upper-air data from the RBSN stations indicated that 119 stations or 84% of the total of RBSN upper-air stations were providing at least 50% of expected reports. The number of stations providing less than 50% of expected TEMP reports continued to be noticeably high, constituting 11 stations or almost 8% of the total number of RBSN stations. The number of "silent" stations, i.e. 11 stations remained unchanged. There were gaps in TEMP data coverage to be provided by certain RBSN stations in Canada, Cuba, Guatemala, Honduras and Mexico. The major difficulties experienced especially by developing countries in maintaining reliable implementation of RBSN stations were due to the high cost of consumables and spare parts, and negative consequences caused by hurricane Mitch in Guatemala, Nicaragua and Honduras. Several Services were experiencing serious difficulties and delays in the provision of spare parts and consumables for maintaining radiosonde stations, including for hydrogen generators. Concern with respect to the reliability of the radiosondes based on Global Positioning System (GPS) technology was being addressed by the manufacturer and problems were being overcome.

2.5 Regional Association V (South West Pacific)

2.5.1 Mr T. Hart, Rapporteur on the GOS for Region V informed the meeting on the implementation in this Region.

General

2.5.2 As in other regions the Year 2000 transition passed relatively smoothly and there was no detectable reduction in the number of observations from RA-V distributed on the GTS. The Y2K arrangements established within WMO functioned. ECMWF established a very useful Web site to report on data monitoring and this site continues as an ongoing service.

The Regional Basic Synoptic Network (RBSN)

2.5.3 As expected, the GTS monitoring in October 1999 showed an increase in the number of observations received from RA-V, due to the commencement of the Australian standard hour bulletins based on AWS observations. Changes are still to be made to Vol. A of WMO Publication No.9, to reflect these changed arrangements. Observation at non-standard hours also reduces the number of reports counted from New Zealand and Papua New Guinea. The number of SYNOP reports during the monitoring period increased from 857 per day in 1998 to 1008 in 1999. The number of TEMP reports also showed a slight increase from 101 per day in 1998 to 106 in 1999.

2.5.4 At 1 August 1999 there were 398 stations in the RA V RBSN, a drop of 13 from the previous total of 411 (1998). The 13 stations dropped were mostly from American Micronesia.

2.5.5 One of the tasks recommended by the Twelfth Session of RA V in 1998 was to investigate all meteorological data acquisition systems in the region operated by an agency other than the NMS of the country concerned, with a view to obtaining supplemental observations to the RBSN and NMS networks. The Session recognized the potential of non-NMS data to contribute to the GOS, particularly in data sparse parts of the region. The Session also acknowledged that such data may not meet WMO standards on exposure, calibration and operating procedures. There has been little progress so far in exploring the potential of such supplemental data in RA V. The session was also interested in enhancing the measurement of ocean swell to assist in short-term forecasting of damaging swells, particularly for Pacific Island countries.

Other issues in RA V

2.5.6 A useful document with comments on RA-V needs for observations is the "Strategic Action Plan for the Development of Meteorology in the Pacific Region 2000-2009" published by the WMO, South Pacific Regional Environment Programme and the Bureau of Meteorology, Australia. This plan was developed as an outcome of a meeting of Regional Meteorological Services Directors. The report considers the advantages and disadvantages of AWS as opposed to manual observations, and suggests that manual observations may be the preferred option for surface synoptic observations. The report also notes the problem of the high consumable costs for GPS sondes. It suggests that a centralised agency could bulk purchase supplies and distribute them to users. Funding could be a mix of aid assistance and funds from NMSs.

2.5.7 The plan also notes the importance of weather watch radars, but recognizes the complexity and expense of acquisition, operation and maintenance. It suggests having centres of expertise serving the needs of installations in several countries. It also recommends standardising a single radar type or at least the data distribution formats.

Space-based sub-system

2.5.8 The space-based sub-system of the Global Observing System has continued to provide valuable products to WMO Members in RA-V. The relocation of Meteosat-5 at 63°E for the INDOEX experiment has enhanced the coverage over the Indian Ocean region and provided very useful imagery for operational use for those countries in the west of Region V. The launch of Feng-yun 2B in June 2000 offers the prospect both of enhancement and support of the coverage of meteorological satellites over Indian Ocean longitudes.

2.5.9 The availability of data from the Advanced TOVS instrument (ATOVS) on NOAA-15 is providing microwave temperature soundings under cloudy conditions with comparable accuracy to that available from infrared measurements for clear conditions. The microwave instrument also has an extended range of frequencies which can provide information on parameters such as rain rate and liquid water content. Some of these new parameters are particularly relevant for tropical regions.

2.5.10 New satellite measurements of surface wind speed and direction over the ocean became operationally available from NOAA/NESDIS in February 2000 from the QuikSCAT instrument complementing the measurements which have been available for several years from the ERS scatterometer.

2.5.11 In February 2000 the Japan Meteorological Agency organized an Asia-Pacific Satellite Data Exchange and Utilization Meeting. This considered means of enhancing and utilizing a broad range of satellite data. Greater involvement of RA V countries in future fora of this nature may be a useful means of encouraging improved access to and use of a broader range of satellite data.

2.6 Regional Association VI (Europe)

2.6.1 Mr H. Daan, Rapporteur on the GOS for Region VI informed the meeting on the implementation in this Region.

2.6.2 In 1994 the composition of the RBSN underwent major changes in an attempt to attain a more homogeneous network. Only smaller changes have been made since, mainly to replace stations that had to be closed for some reason.

2.6.3 The performance of the surface network has recently improved. In some countries, in the south eastern part of the region, where observing routines were interrupted for some time, routines have been re-implemented. Only one country in the Region was still silent in 1999.

2.6.4 For the upper-air system, there are more persistent problems, mainly in the eastern part of the Region. Although some stations here have restored a full observing programme, other stations still fall silent now and then as the availability of consumables is not reliable.

2.6.5 The Regional Association at its 12th session in 1998, established an Advisory Group to identify a sound basis for effective multilateral support. A report is expected at the forthcoming meeting of the Regional Planning Group in May 2001.

2.6.6 The situation with regard to the VOS observations is a source of concern. Although the number of selected ships is not increasing, the availability of observations is growing and the quality of the messages is improving. The application of specific computer software on board and the use of INMARSAT are the main reasons. However, the communication costs are also rising, and relatively few countries can afford to accept all observations offered to their related receiving station.

2.6.7 In some centres, only reports from nearby areas are accepted. This practice could undermine the availability of observations from data sparse areas. A system for a more fair sharing of costs would be very welcome.

2.6.8 AMDAR activities are carried out mainly within the framework of EUCOS, a co-operation programme for observations that is carried out with a view to a more efficient and effective use of networks. The programme is in a phase of investigation, and no proposals for operational changes are expected in the short term.

2.7 Conclusions

2.7.1 The meeting noted and discussed the above information provided by the Rapporteurs. It recognized that the problems encountered in the implementation of the GOS varied from Region to Region. It recorded its views and suggestions on specific difficulties under item 6 of the agenda.

3 REVIEW OF THE RBSN

3.1 Current status of the RBSNs performance

3.1.1 The meeting was informed on the status of the land station networks.

Coverage and availability in 1999

3.1.2 In respect of SYNOP observations, the main gaps (apart from ocean areas) are found in Antarctica, the Sahara desert, areas in Equatorial Africa, the Northern part of South America and the North-Eastern part of Canada and Greenland. Smaller gaps are spread all over the globe. Comparison of maps for different observing times makes clear that local midnight observations were often lacking e.g. Africa at 00 UTC, South America at 06 UTC. Apart from these insufficiencies, the network seems to meet requirements.

3.1.3 For TEMP, the picture was completely different. Except for relatively very small areas in the Northern Hemisphere, requirements were not observed at all. Many stations provided only one observation per day. There was some preference to make these observations during day-time (see Australia versus South America). This may have been the obvious choice, but the drawbacks were in a slightly lower quality. The quality of night-time observations in terms of observation error was about 15 % better than for day-time observations.

3.1.4 A redefinition of the requirement for upper air observations might be considered. A spacing of about 500 km seems to be a more realistic approach.

Numbers and trends

3.1.5 The meeting also considered graphs prepared for the number of available observations per observing hour for the years 1995 to 1999[1]. In all regions, the number of SYNOP reports had increased steadily. For TEMP reports, there was no clear global trend, and for PILOT reports (including wind information from TEMP reports) most regions showed a decrease. The effects of the termination of the Omega system were most clear in Regions I and V.

3.1.6 Some information was also provided on the performance of stations. A surface station should provide 4 observations per day at 00-06-12-18 UTC. Stations providing observations delivered on average, 3.2 obs/day. This number had increased steadily over the last five years which was considered a satisfactory feature. For TEMP observations, the target number was 2 obs/day, but the situation is more complicated as the requirement for the tropics is lower. For this type of observations no clear trend could be detected.

3.1.7 The annual trends for each Region (mean decreases or increases) indicated that only in Region III, did the number of SYNOP stations decrease, but this effect was surpassed by a significant increase in performance, by station.

3.1.8 For TEMP reports, a significant increase of observations was determined only in Region III. For upper wind reports, the available numbers were not adequate to meet to the WMO requirements (4 obs per day, versus only 2 for TEMP observations).

3.1.9 The meeting noted the above information and agreed on the following:

- The availability of SYNOP observations is rising steadily on a global scale. Nevertheless, some areas show major gaps. Also an extension to midnight observations is required in some areas.

- The availability of TEMP observations shows no clear trends. The global coverage is far below the formal WMO requirements, which are unlikely ever to be reached. A redefinition of the spacing requirement should be considered.

- The availability of PILOT/TEMP observations decreased sharply after the termination of the Omega system. Currently, Regions I and V still suffer the consequences. In Region III, the effects have been compensated.

3.1.10 The meeting noted that the Regional Rapporteurs on the GOS were not always being fully informed on the status of performance of the RBSNs. It therefore, invited Members, possibly through designated focal points within each NMS, and the WMO Secretariat to advise the Regional Rapporteurs of any changes in the status of the RBSN within their respective Regions.

3.2 Basic Principles regarding the Composition of the RBSNs

Introduction

3.2.1 The meeting noted that in the Manual on the Global Observing System, the rules for the establishment of Regional Basic Synoptic Networks are determined by:

[1] The numbers were recorded at the European Centre for Medium-range Weather Forecasts. According to the location of this Centre, the availability of data from Region VI may be relatively higher than from other regions.

- The decision on the composition of the Network by the Regional Association concerned;
- The requirements for stations in the Network in terms of performance: parameters, times of observations, etc.

3.2.2 Also, the four-yearly decision on the rules is generally based on a proposal prepared by the Regional Working Group on Planning and Implementation of WWW. To this end the need for more objective criteria for inclusion of stations has been felt necessary. This relates to, inter alia, spatial distribution and the availability of data according to monitoring results. Also, the requirements for the observing programme in the Manual are more an example of perfect performance than criteria for including or excluding stations.

3.2.3 The meeting discussed two types of requirement:

- Target requirements (TRQ's) refer to desired characteristics of network stations. The TRQ's are defined in accordance with the requirements of the Manual on the Global Observing System. These could be regarded as the level of performance that should be aimed at for all stations.

- Minimum requirements (MRQ's) refer to threshold characteristics which are decisive for the inclusion or exclusion of a station.

3.2.4 In the following table, examples of TRQ's and MRQ's for RBSN stations are indicated.

	TRQ surface stations	MRQ surface stations	TRQ upper air stations	MRQ upper air stations
Parameters	Pressure Temperature Wind Humidity Present Weather Visibility Cloud cover Cloud base	Pressure Temperature Wind (not for buoys) Humidity (not for buoys)	Pressure/Geopotential Temperature Wind Humidity	Pressure/Geopotential Temperature Wind Humidity
Level	Surface	Surface	Up to 10 hPa	Up to 100 hPa
Observations at main hours	4	3	2 (at 00 and 12)	1 (at 00 or 12)
Observations at main and intermediate hours (3-hourly)	8	5	-	-
Availability of data	100%	50%	100%	50%

3.2.5 Stations could be classified according to their performance with reference to the above requirements:

- OK classification is assigned to stations meeting all TRQ's.
- IP classification (incomplete programme) is assigned to other stations meeting all MRQ's, but not TRQs.
- BC classification (below criteria) is assigned operational stations not meeting MRQs.

- NO classification (not operating) is assigned to silent stations.

3.2.6 Spatial distribution could be considered as follows:

- OK stations are acceptable if at a distance of at least 60 km from the nearest network station.
- IP stations are acceptable if at a distance of at least 90 km from the nearest network station.
- BC stations and NO stations are not acceptable as network stations.

Conclusions

3.2.7 The meeting noted that the above criteria were only preliminary and had been drawn up in the context of the composition of the RBSN for Region VI. Nevertheless, it felt that such or similar criteria could be useful in each Region. It invited CBS to consider conveying this concept to the Regional Associations with a view to developing criteria for the selection of RSBN stations within each Region.

4. REVIEW OF OTHER IN-SITU SYSTEMS (MARINE, AIRCRAFT, etc)

4.1 Aircraft systems

4.1.1 The meeting had before it the Status Report of the WMO AMDAR Panel.

4.1.2 Following on from the successful WMO Aircraft to Satellite Data Relay (ASDAR) programme, the Aircraft Meteorological Data Relay (AMDAR) Panel was formed in November 1997 to enhance the upper air component of the Global Observing System of the World Weather Watch Programme through cooperation among Members in the acquisition, exchange and quality control of meteorological observations from aircraft using automated reporting systems.

4.1.3 At that time, the ASDAR operational programme was reaching its peak and three regions were operating AMDAR programmes, Australasia, the US and Europe. The Australasian and US programmes were mature and have undergone only minor expansion and improvement since then. The European programme has expanded from a group of three countries (the Netherlands, the UK and France) operating independent national programmes to a fully operational joint programme throughout Europe and beyond with Germany joining in the latter part of 1999, as a major component of EUCOS. This programme is being extended to include Spain, Portugal and possibly Finland and Ireland in the near future.

4.1.4 With the view to focussing the work programme on items which were of a high priority and could be undertaken in the near term, four sub-groups were established to deal with the following projects:

(i) Coordination of national and regional programmes, including the promotion of standardisation in formats, reporting intervals, etc.;
(ii) Improvement of data exchange and quality control;
(iii) The development of a pilot project in Southern Africa; and
(iv) The development of a pilot project in the Middle East.

4.1.5 The Southern African project is being led by the South African Weather Bureau and has reached the stage where a five-month evaluation trial is about to commence in cooperation with South African Airways. A new small programme has already commenced in neighboring Namibia. Additional observations for the trial will be provided by existing ASDAR aircraft and targeted AMDAR observations from BA and KLM aircraft operating in to Southern Africa will also assist.

Impact studies will be undertaken by the SA Weather Bureau and other interested groups such as members of the Coordinating Group on the COSNA. On conclusion of the evaluation trial, it is anticipated SAA will expand the programme by equipping its regional aircraft fleets. It is also likely that additional neighboring countries will be encouraged to join the project to establish a complete regional operational programme.

4.1.6 The Middle East project is being led by Saudi Arabia. Agreement has been reached with Saudia airlines for an evaluation trial on one aircraft that is expected to occur by the end of 2000. Once proven successful, the system will be extended to other aircraft in the fleet. The development of the ground-based supporting infrastructure to receive, process and distribute data will occur during 2001. Targeted observations will also be contributed from visiting aircraft, mostly from Europe. The programme is likely to be extended to other countries in the region that have extensive regional and international coverage.

4.1.7 Canada is also developing an extensive national programme involving regional airlines that will operate smaller aircraft flying at lower altitudes than is normally the case with existing larger aircraft. This programme is anticipated to commence in the first half of 2001 and will provide profiles from some airports in the arctic regions of Canada. It will be extended to the national carriers later in the year to serve national needs and eventually beyond Canada's borders to other areas such as the north Pacific and north Atlantic oceans and over the far northern parts of the country.

4.1.8 A number of countries in the Asia/West Pacific region have also indicated an interest in developing AMDAR programmes, initially to serve national requirements but hopefully later on through co-operative arrangements in a regional programme. Japan is already running a small local programme and Hong Kong, China has recently indicated it wishes to establish a system to support aviation services.

4.1.9 The ICAO Automatic Dependence Surveillance (ADS) system also includes automated reporting of meteorological observations in support of international air navigation and safety. Observations are provided primarily for use by the two ICAO World Area Forecast Centres in Washington and London. However data are placed on the GTS for global distribution.

4.1.10 A key element of AMDAR is that it is not essential for a member country to establish its own programme to benefit from AMDAR observations in its area of interest. The Panel is encouraging members and regions who are either already running programmes or are planning to do so in the near future, to assist other members, particularly in data sparse areas who do not have their own programmes, to develop joint cooperative arrangements using targeted observations. Here, the Member contributes to the programmes of countries operating AMDAR aircraft into its airports. In return the visiting aircraft provide AMDAR observations to that country while operating in its area of interest. Cooperative arrangements such as these already exist between Australia and New Zealand and within the European community. It may be necessary for the development of a substantial cooperative funding system to support some of these potentially very useful programmes.

4.1.11 AMDAR reports the basic elements of time, location in 3-dimensional space, dry bulb temperature plus wind speed and direction. Some aircraft are also reporting a measure of turbulence. Work is proceeding to extend this observation to many more aircraft. Substantial effort is being focussed on the development of a reliable operational water vapour sensor although it is anticipated a fully operational system may not be available for several more years.

4.1.12 The meeting noted that the Panel wished to develop closer links with CBS groups. The Panel appreciated the direct involvement of the President of CBS, but it needed also to establish direct working relationships with various Expert Teams and benefit from participation of representatives of CBS groups at Panel meetings.

4.1.13 Members wishing to establish new AMDAR programmes are invited to seek assistance from the WMO AMDAR Panel through the WMO Secretariat.

4.2 Status of Marine Systems

4.2.1 The meeting recognized that *in situ* marine observing networks are, in general, coordinated and managed globally by specialist, platform-based groups. These include the Data Buoy Cooperation Panel (DBCP) and its regional and specialized Action Groups (drifting and moored surface platforms); the Ship-of-Opportunity Programme Implementation Panel (SOOPIP) (XBT networks); the ASAP Panel (ASAPP) (ship-based upper air soundings); and the VOS Subgroup (surface meteorology and oceanography). All these bodies fall within the responsibility of the Joint Commission on Oceanography and Marine Meteorology (JCOMM), which is developing overall coordination and integration of the individual *in situ* systems into a fully integrated operational ocean observing system, to include also satellite and other remote sensing observations. In addition, the developing Argo project of profiling sub-surface floats is being coordinated by an international science team, with strengthening links to JCOMM. At a practical level, global coordination is being achieved through a newly-established JCOMM Observing System Operations and Services Centre (JCOMMOPS), staffed by specialist technical coordinators (the JCOMMOPS website is at: http://www.jcommops.org/).

4.2.2 The meeting noted with interest reports on the current status of marine observations from these *in situ* networks. Tables and charts summarising this status, for buoys, VOS, SOOP and ASAP, were available to the meeting. In addition, diagnostic charts of network status for specific key meteorological and oceanographic variables were noted. The meeting noted that, for virtually all marine networks, the numbers and quality of marine reports had improved steadily in recent years. It expressed its appreciation to JCOMM and to the individual implementation bodies for their work in maintaining such a high level of implementation in support of the WWW and other programmes, in particular in the light of generally decreasing budgets for observing systems.

4.2.3 At the same time, however, the meeting noted that there were large ocean areas, in particular in the southern hemisphere, where the WWW data requirements were far from being met. It recognized that marine observing platforms were, in general, expensive to deploy, maintain and collect data from, and that it was largely only developed countries which had the resources to operate deep ocean observing networks. The meeting therefore proposed that all such Members should, where possible, make additional efforts to maintain marine observing platforms in the identified data sparse ocean areas, in view of the critical importance of such data to the WWW and other WMO programmes. In addition, it suggested that developing countries could also contribute in a number of relatively inexpensive but important ways. These included in particular participation in the VOS, and the provision of deployment opportunities for platforms such as drifting buoys, Argo floats and XBTs (Expendable Bathy Thermographs). Further information on this latter topic is available through the JCOMMOPS Web site referenced above.

4.2.4 The meeting recognized that the advent of JCOMM represented a major step forward in the international coordination, integration and management of operational marine observing systems, with JCOMM eventually assuming a role for the oceans somewhat analogous to that of CBS for the WWW. This would clearly necessitate very close interaction in the future between CBS and JCOMM, and the meeting recommended to CBS to give close attention to the ways in which this interaction could be effected. In particular, and in view of the importance given by both CBS and JCOMM to programme implementation at the regional/ocean basin level, the meeting

recommended much closer interaction and coordination between the regional rapporteurs on the GOS and on the marine meteorological services.

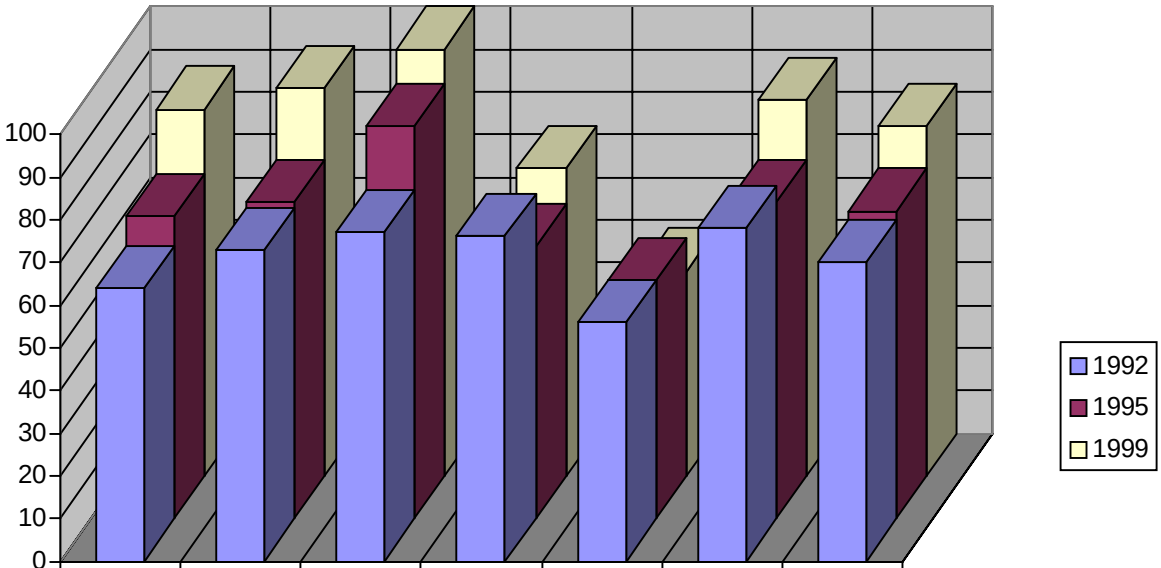
4.2.5 The meeting supported the efforts of the DBCP and the Secretariat to increase the number of buoys with atmospheric pressure sensors. The meeting also recognized the value in the proposed establishment of the JCOMM OPS.

5. REVIEW OF THE SPACE-BASED COMPONENT OF THE GOS

5.1 The meeting noted with appreciation the contribution made by satellite operators during the past two years in providing the valuable data, products and services in support of the space-based GOS. The overall implementation of space-based GOS had shown an increase in coverage and reliability with the positioning of a EUMETSAT satellite over the data-sparse Indian Ocean and the recent launch and commissioning of the People's Republic of China's geostationary satellite,FY-2B.

5.2 In particular, the meeting noted that the present geostationary constellation of satellites consisted of Meteosat-7 at 0° longitude and Meteosat-5 at 63°E (operated by the EUMETSAT), GOMS-1 at 76°E (operated by the Russian Federation), FY-2B at 105°E (operated by the People's Republic of China), GMS-5 at 140°E (operated by Japan), and GOES-10 at 135°W and GOES-8 at 75°W (operated by the USA). The polar-orbiting constellation consisted of METEOR-2 and 3 series satellites operated by the Russian Federation, NOAA-14 and -15 operated by NOAA/NESDIS and FY-1C operated by the People's Republic of China.

WWW Implementation Goals
Percentage of Members with at least one polar-orbiting and one geostationary receiver



	I	II	III	IV	V	VI	All
1992	64	73	77	76	56	78	70
1995	71	74	92	64	56	74	72
1999	86	91	100	72	48	88	82

Region

Fig. 5.1

5.3 The meeting recalled that the goals for the percentage of implementation for WMO Members equipped with satellite receiving equipment were 100% for polar-orbiting satellite data receivers (either APT or HRPT) and 100% for geostationary satellite data receivers (either WEFAX or HR). This meant that each WMO Member should be equipped with at least one polar-orbiting satellite data receiver and one geostationary satellite data receiver. The meeting also noted that WMO Regions have achieved an overall implementation of 82%. With regard to each category of receivers, WMO Regions have achieved an overall implementation of 84% and 87% for polar-orbiting and geostationary satellite receivers respectively. The meeting further noted the present regional implementation of the goals for satellite receiving stations and changes since 1992 as shown in Figure 5.1 above. The meeting was pleased with the increase in implementation while noting that the apparent decrease in Region V was due to the increase of new Members in that region.

6. REDESIGN OF THE GOS AND ITS IMPACT ON DEVELOPING COUNTRIES

6.1 The meeting largely agreed with the findings of the second session of the CBS/OPAG-IOS Expert Team on Observational Data Requirements and Redesign of the Global Observing System (Annex III). The meetings' views regarding these findings are given in the following paragraphs.

6.2 The meeting agreed that most of the matters raised by the ET-ODRRGOS were relevant to the impact of the redesign of the GOS in many developing countries in most Regions. Not all matters, however, were of the same importance in all countries. Current difficulties included the following.

Deficiencies

6.3 Many stations of the RBSN network did not report complete programmes of observations for a variety of reasons. Many stations, for example did not report during the night. The reasons ranged from financial considerations to difficult telecommunication conditions. In some instances the lack of observational data is due to civil unrest and even war in some countries. Any redesign of the GOS is unlikely to eliminate these difficulties, but they certainly have to be taken into account.

6.4 One of the main problems in some developing areas is the sparse network of upper-air stations which is often compounded by the unreliability of the observations. Again, the main reason is often financial but accessibility can also be a major factor, whether because of the social, terrain or climate reasons. Africa with its Tropical Convergence Zone (TCZ) is particularly anxious to see improvements in this area.

6.5 It was noted that some AMDAR observations are available on the GTS, from parts of Africa, South America, Asia and West Pacific, Central America and Caribbean which should be brought to the attention of National Meteorological Services in these areas.

6.6 Many countries lack the expertise to construct, operate and maintain observing stations and the ET-ODRRGOS is correct to stress the need for capacity building. It also suggested the possibility of countries sharing the creation and operation of stations. Such a situation already exists in RA I where ASECNA operates a number of stations both surface and upper-air, on behalf of its Members.

Existing arrangements

6.7 In making the above comments the meeting assumed that any redesign of GOS would use the existing RBSNs as a basis. It also took note of measures already taken in some Regions which could be usefully employed in other Regions. These included:

- Arrangements such as ASECNA in Region I.
- The future Satellite Data Acquisition Systems to be established in Costa Rica with assistance from the USA. Costa Rica retransmits available satellite data to Central American countries.
- An Instruments Maintenance Team which sends appropriate technicians to assist cooperating countries. Such a team already operates in Region IV.
- The setting up of networks of weather radars as is currently being implemented in Region IV with assistance from Japan.
- Rainfall Auto-Estimator Products facility, currently being installed in Central America could be used more widely to assist forecasting of flash floods and river levels, and in providing agricultural advisories.
- AMDAR programmes such as those already existing in USA, Europe and Australasia.

New technology

6.8 The meeting agreed that AMDAR showed great promise in meeting some of the needs for upper-air observations during aircraft ascent and descent. The possibility of RAOB data supplemented by a AMDAR was offered. The meeting also noted that in some countries, although AMDAR data was available, it could not be accessed by the NMS. It expressed the hope that Members would ensure and facilitate the availability of AMDAR data between government departments and the NMS.

6.9 Current satellite data are proving to be very useful even though it is unlikely that it will ever replace completely the traditional *in situ* observations. However, the meeting noted the fact, reported by the Expert Team on Satellite Systems Utilization and Products at its 3rd Session in July 2000, that on average 50% or more of WMO Members reported data availability problems in satellite data reception. The meeting encourages the Expert Team to explore, preferably with the operators, alternative telecommunications options for distribution of satellite data and products to improve accessibility especially for developing countries.

6.10 The meeting also suggested that centres such as RSMCs with geographical specialization consider making available satellite imagery and derived products for their area of responsibility, (e.g. on a Web site), to assist Members who are experiencing difficulties in accessing satellite information. An example of such a procedure is the transmission of imagery through the WAFS as part of the RMTN over the Region IV.

6.11 The meeting also noted the valuable products available from satellites classed as non-operational or research status. For instance, QuikSCAT was proving to be useful in many countries and its availability and use could be extended. Capacity building in the use of satellite data should include such products from the 'research' satellites. However, some members may have difficulty accessing and utilising such newly developed products. The meeting was encouraged by the initiatives of the Executive Council to consolidate the contribution of such non-operational systems to the GOS

6.12 Automatic Weather Stations (AWS) and Buoys could be useful in inaccessible areas where the limited observational package could provide significant inputs to weather models to produce improved forecasts. The fact that countries hosting such stations would most probably require external funding and maintenance support was not forgotten.

Funding

6.13 The meeting agreed that the concept of multilateral commitments of Member States for providing observation data is of major importance for international cooperation. Such national commitments as made for land-based observations (SYNOP, TEMP), should be continued also in a redesign of the GOS.

6.14 However, funding costs should not exceed the possibilities for individual Member States. This should be particularly so when observations are of substantial value for international use (e.g. in unpopulated areas).

6.15 In this context some funding mechanism aiming at a better balance between funding costs and national budgets could be beneficial for observing performance.

6.16 The meeting underlined that the basis for a funding mechanism should aim at covering the running costs taking into account performance. Such a basis may provide a better incentive for NMSs than refunding capital cost.

6.17 The meeting agreed that some form of joint funding or cost-sharing mechanism (possibly involving the private sector) would be a promising way forward to overcome this problem. Ultimately all Members would benefit from a comprehensive and reliable network of land-based, marine, aircraft and satellite observations. The meeting recommended that CBS initiates a study, in collaboration with other groups that are considering this issue, in order to understand better the pros and cons of such an approach and the many implications.

6.18 Finally, the ICT expressed the wish to remain informed of developments relating to the redesign of the GOS.

7. CLIMATOLOGICAL OBSERVATIONS

7.1 CLIMAT and CLIMAT TEMP reporting

7.1.1 The meeting was informed on the deficiencies in CLIMAT and CLIMAT TEMP reporting.

7.1.2 For climate description and climate research, WMO Members have agreed to arrange for the provision of monthly figures on averages, amounts, and extreme values or events for a defined set of meteorological parameters. This information should be disseminated globally in reports in CLIMAT code for surface parameters and in CLIMAT TEMP code for upper-air observations by means of radiosonde balloons. The reports should be available on the 4th day (ultimately the 8th day) of the next month.

7.1.3 The number of stations for which these reports are required is defined as 1 to 10 per 250,000 square kilometres for CLIMAT reports; the range allows for differentiation between unpopulated areas (deserts, polar regions) and more inhabited regions. For CLIMAT TEMP reports, it is understood that these should be provided for all upper air stations, unless such stations are at very close distance.

7.1.4 In practice, the network density requirement is of the same magnitude as that for the Regional Basic Synoptic Networks (RBSN's). The latter networks are defined by each WMO Regional Association as lists of stations that should provide actual weather information in SYNOP code (surface observations) and in TEMP code (upper air observations). Therefore, it seemed logical to define the CLIMAT and CLIMAT TEMP station lists as identical to the RBSN lists.

7.1.5 From routine monitoring programmes, the reception of CLIMAT and CLIMAT TEMP reports appears to be far below the target. A study was carried out to provide more extensive information on the current status of availability of these reports, together with recommendations for improvement.

7.1.6 As a basis for the study, the following possible causes for non-availability were determined.

- The reports are not generated.

- The reports are generated, but for a different (nearby) station.
- The reports are generated, but not (properly) communicated to the associated Regional Telecommunication Hub (RTH).
- The reports are communicated, but not according to the formatting and coding prescriptions.
- The reports are in good order, but the transmission between RTH's fails.
- The monitoring procedures between centres may be different, causing different results of the availability.

7.1.7 From the 219 countries, operating in 6 Regions and in Antarctica, 80 produced no CLIMAT reports at all (20 of these are also silent with respect to actual SYNOP reports). Reports of non-RBSN stations were received from 86 of the remaining 139 countries.

7.1.8 The basic information was not adequate to distinguish whether reports were generated and not transmitted, or not generated. It is probable that the countries where no SYNOP reports are provided also do not generate CLIMAT reports. This refers to 20 Member states, together responsible for 139 RBSN stations. The assumption is valid only if SYNOP reports are unavailable because of non-generation. It is possible, however, that this unavailability is a result of telecommunication problems. The cause of these problems may be in the national communication or at the associated RTH. In this respect, it may be noted that two RTH's appeared to be completely silent with respect to CLIMAT/CLIMAT TEMP reports.

7.1.9 If SYNOP/TEMP reports were received, but no CLIMAT/CLIMAT TEMP data, the cause points more specifically to problems at a national level. This situation applies to 60 Members, responsible for 516 RBSN stations. In such cases, the meeting recommended that Members concerned be invited to provide information on the prospects of providing CLIMAT and CLIMAT TEMP reports in the future.

Adherence to formatting and coding procedures

7.1.10 From the examination of the raw data files, many types of errors in the formatting and coding were detected. In particular those errors, most commonly introduced by several Members, are worthy of close consideration. The number of reports transmitted in an erroneous (or at least irregular) way is much higher than for SYNOP reports. Three possible causes may be mentioned here:

- SYNOP reports are more often prepared in a fully automatic process.
- The discipline in applying the rules in reports that are transmitted only once a month may be lower than for 6- or 3-hourly reports.
- For real-time data, an error may lead to a direct call from the receiver for a correction; this mechanism is not implemented for CLIMAT data.

7.1.11 Only the latter cause may be a handle to correct the situation. The meeting recommended therefore, that the centres involved in the monitoring of CLIMAT and CLIMAT TEMP reports should request corrections on a routine real-time basis in case of failing encoding and formatting.

7.1.12 Some improvement could also be made by a re-editing of the procedures in the Manual on Codes. There is some ambiguity in the text for the (new) CLIMAT code when compared with the CLIMAT TEMP code. Also, the layout of the symbolic form of the codes could be improved. To this end, the meeting recommended that the definition of the CLIMAT and CLIMAT TEMP code in the Manual on Codes should be amended.

Transmission between RTHs and monitoring procedures

7.1.13 There are major differences in the reception of CLIMAT and CLIMAT TEMP data between RTHs. This may be partly a result of different interpretation by Centres, but it is quite clear that a substantial amount of data is not received at some RTHs.

7.1.14 The meeting recommended that more clear procedures for WWW Monitoring Centres should be defined. This could be a task of the OPAG on ISS in close co-operation with the Centres concerned. It was noted that the monitoring of CLIMAT and CLIMAT TEMP reports probably needs a more sophisticated approach than for real-time reports, as a consequence for the poor adherence to the coding procedures up to now.

7.2 PROPOSAL FOR REGIONAL BASIC CLIMATOLOGICAL NETWORKS (RBCNs)

7.2.1 The meeting noted that, following the request of the sixth session of the CCl Advisory Working Group, the CBS-Ext (1985) recommended that Technical Regulation (B.1) 3.1.1.2 by which Members have been requested to provide CLIMAT messages from one synoptic station per 250 000 km^2 be amended as follows:

> "The distribution of stations from which monthly surface climatological data are transmitted should be such that every 250 000 km^2 is represented by at least one station and up to 10 stations where the density of the regional basic synoptic network permits."

7.2.2 This recommendation was approved by EC-XXXVIII in June 1988. Later, noting this change in Technical Regulations, the CBS-IX (1988) as well as the Regional Associations at their sessions, concluded that this regulation meant that the target network of CLIMAT (and CLIMAT TEMP) reporting stations should be the same as the Regional Basic Synoptic Network (RBSN). As a result, almost all Regional Associations (excluding RA IV) had agreed that it was no longer necessary to formally adopt a separate fixed network of CLIMAT and CLIMAT TEMP reporting stations by specific resolution. Regional Association IV at its tenth session (1989), reconfirmed the need for a formal resolution specifying the network of CLIMAT and CLIMAT TEMP reporting stations with a view that such a resolution provided a valuable justification for maintaining a minimum number of such stations. Resolution 3 (X-RA IV) concerning the regional network of CLIMAT and CLIMAT TEMP reporting stations was therefore adopted and kept in force by the following sessions.

7.2.3 According to the results of the Annual Global Monitoring (AGM) of the operations of WWW the number of CLIMAT and CLIMAT TEMP reporting stations increased slightly after the change in the Technical Regulations and action taken by Regional Associations. Nevertheless it is still far from an "ideal" network. In recent years the number of CLIMAT reporting stations reached only 36-37% of the total number of RBSN stations, in spite of the establishment of the GCOS Surface and Upper-Air Networks (GSN and GUAN) and of the request to Members to provide CLIMAT and CLIMAT TEMP messages from the GSN and GUAN stations as high priority.

7.2.4 To improve the situation the meeting recommended several actions related to CBS areas of responsibility. In addition it reviewed the definition of the CLIMAT and CLIMAT TEMP networks and concluded that although the basic idea to have the CLIMAT networks identical to the RBSNs may have been defendable, practice showed that it did not work (see agenda item 7.1 above). More than 25% of the current CLIMAT reporting stations are non-RBSN stations. Furthermore, about 20% of the stations selected for the GSN were not in the RBSN and cannot meet the RBSN requirements (consequently they are not monitored during the Annual Global Monitoring exercises).

7.2.5 The meeting felt that it seemed better to define the network of CLIMAT and CLIMAT TEMP reporting stations separately and to call such a network a Regional Basic Climatological Network (RBCN). It also noted that the list of stations for RBCN could be prepared by the Rapporteur on Regional Aspects of the GOS. This list should include GSN and GUAN stations within the Region and be supplemented by other CLIMAT and CLIMAT TEMP reporting stations needed for description of regional climate features and selected through the same criteria that were used for the selection of GSN stations.

7.2.6 Where possible non-RBSN stations reporting CLIMAT messages should be taken into consideration, particularly those with a long records, as well as Reference Climatological Stations (RCS). The proposed list of RBCN stations should be approved by Regional Association through specific resolution, then published in the report of the session and monitored through AGM as a separate network. Intermediate changes could be decided by the President of an Association upon proposal by the Rapporteur.

7.2.7 The meeting strongly supported the concept of separate RBCNs and recommended that CBS invite other Regional Associations to consider establishing Regional Basic Climatological Networks in their Regions, based on the stations for which Members offer to provide monthly CLIMAT and CLIMAT TEMP reports.

7.3 Status of GCOS initial networks (GSN and GUAN)

7.3.1 The meeting noted that, in the years from 1994 to 1999, the initial networks of the Global Climate Observing System (GCOS) were developed. The definition of the characteristics and the size of the GCOS Surface Network (GSN) and the GCOS Upper Air Network (GUAN) were finalised in September 1999. In the letter to Members issued by the WMO Secretariat on 20 September 1999, the final composition of the GSN and the requirements related to its implementation were included. According to this letter the main commitments for network stations are the transfer of historical data to the World Data Centres and the regular transmission of CLIMAT and CLIMAT TEMP reports.

7.3.2 As from 1 January 2000, the monitoring of CLIMAT and CLIMAT TEMP reports from stations in the GSN and the GUAN started as an operational routine. Over the year 1999, however, the monitoring centres already carried out a regular monitoring as a test for the procedures. The monitoring results given in the GSN Report No 1 cover the period from January to June 1999 and the GUAN Report issued in February 2000 the period from July to December 1999.

7.3.3 At present the GSN is composed of 989 stations. CLIMAT reports were received from 647 stations, or 65% of total number of the GSN stations. However not all station reports were received regularly. On average, the reports from less than 55% of the stations were received in a month. Less than 40% of the stations appeared to produce CLIMAT reports regularly.

7.3.4 The number of reports that were received in time was even less. Less than half (49%) were received within 8 days, and only 34% within 5 days (the "normal" receiving date is the 4th day of the month, with another 4 days for corrections and late messages).

7.3.5 The meeting noted that 266 stations, for which no CLIMAT reports were received, are nevertheless operational: SYNOP reports are received regularly. Another 75 stations, however, are completely silent. For some of these, the reason may be in the assignment of a different WMO index number.

7.3.6 The meeting further noted that the GUAN was established some years ago and is composed of 150 stations. In contrast with the GSN, the basic material that is used in climate research is not the CLIMAT TEMP reports, but the original TEMP reports. The distribution of CLIMAT TEMP reports, however, is also a basic requirement.

7.3.7 The reception of CLIMAT TEMP reports is about 74%. It should be noted that some stations provide these reports without providing TEMP reports regularly. In particular, stations that observe upper winds only can provide CLIMAT TEMP reports. Only 3 GUAN stations were completely silent in 1999.

7.3.8 The meeting recalled that CBS Ext 1998 had agreed that the monitoring of operations of GSN and GUAN stations in each Region would be carried out by CBS in collaboration with regional working groups on the WWW. It felt that implementation of this task would be appropriate for Rapporteurs on Regional Aspects of the GOS assuming that results of monitoring in the form of six monthly reports issued by Monitoring Centres could be available to Rapporteurs via Internet or by mail. These results, in particular with reference to individual stations, would be helpful to the Rapporteurs in carrying out a survey concerning so-called "silent" stations or stations providing insufficient numbers of CLIMAT or CLIMAT TEMP reports, to identify existing problems and propose remedial actions.

8. OTHER MATTERS

8.1 Updating Volume A of WMO Publication 9.

8.1.1 The meeting held a discussion concerning Pub. No.9 Vol. A, its content and the procedures for updating the information contained therein, and considered various means for improvement. The meeting agreed that in order to make this publication of more value and use to Members, a full re-examination was necessary. It recommended that this task be undertaken without delay with the full involvement of relevant experts and the Secretariat. Based on its close involvement with this publication, the group strongly expressed its willingness to contribute to this work.

8.1.2 The meeting agreed that the specific needs of climatology should be identified in this framework. This refers in particular to:

- The re-use of index numbers and the limitations of the index numbering system.
- Changes in coordinates which may be the result of either corrections or station moves.
- History of stations changes.

The meeting also agreed that for RBSN stations elevations should be recorded.

8.1.3 The meeting concluded that the updating of Volume A by WMO Members was not always adequate and timely. It advised that Members designate focal points in NMSs who are authorized to inform the Secretariat directly on changes.

8.1.4 The meeting noted a proposal made for submission to RA IV to prepare a catalogue of observing stations based on Volume A with an extension to monitoring data to be provided by lead monitoring centres. It agreed that this additional information could be very useful.

9. CLOSURE OF THE MEETING

9.1 The meeting closed at 11.30 on Friday 15 September 2000.

Annex I

LIST OF PARTICIPANTS

CBS IMPLEMENTATION/COORDINATION TEAM ON THE GLOBAL OBSERVING SYSTEM
FIRST SESSION
GENEVA, 11-15 SEPTEMBER 2000

Mr CHEN YONGQING
China Meteorological Administration
46 Baishiqiau Road
Beijing
China
Tel.: (8610) 684 064 21
Fax: (8610) 621 742 41
Email: ChenYQ@Rays.cma.gov.cn

Mr DAAN Harald (Chair)
Groenekanseweg 82-2
3732 AH DE BILT
NETHERLANDS
Tel: (31 30) 220 3921
Fax: (31 30) 221 1195
Email: hdaan@knoware.nl

Mr FARIAS BRICEÑO Luis
Direccion Meteorologica de Chile
Casilla 717
Santiago
Chile
Tel.: (562) 676 3433
Fax: (562) 601 9590
Email: dimetch@meteochile.cl

Mr HART Terry
Bureau of Meteorology
GPO Box 1289K
Melbourne, Victoria 3001
Australia
Tel.: (613) 9669 4030
Fax: (613) 9662 1222
Email: t.hart@bom.gov.au

Mr M. RIFANGI
The Indonesian Meteorological & Geophysical Agency
Jl. Angkasa 1 No. 2 Kemayoran
Jakarta 10720
Indonesia
Tel.: 62 21 424 6321
Fax:62 21 424 6703
Email: m_rifangi@hotmail.com

Mr SALOUM Mahaman.
Service météorologique du Niger
B.P. 218
NIAMEY
Niger
Tel: (227) 732 517/18; 732.381/83
Fax: (227) 735.512;733.837
Email:sd@acmad.ne or saloum@acmad.ne

Mr STICKLAND Jeff
AMDAR Technical Coordinator
The Met. Office
Met. O (OLA) 2
Beaufort Park
South Road Easthampstead
Wokingham, Berkshire RG40 3DN
United Kingdom
Tel.: 44- 1344 855 018
Fax: 44- 1344 855 897
Email: jstickland@meto.gov.uk

Mr VEGA Guillermo
Instituto Meteorologico Nacional
Apartado 7-3350-1000
San Jose
Costa Rica
Tel.: (506) 222 56 16 ext. 105
Fax: (506) 223 18 37
Email: gvega@meteoro.imn.ac.cr

Dr WILLIAMS David
EUMETSAT
Am Kavalleriesand 31
D-64295 Darmstadt
Tel.: 49 6151 807 603/633
Fax: 49 6151 807 830
Email: dwilliams@eumetsat.de

SECRETARIAT

Mr SCHIESSL Dieter
Director, World Weather Watch
Basic Systems Department
WMO
8bis Avenue de la Paix
Case Postale No. 2300
CH-1211 GENEVA 2
Switzerland
Tel.: 0041 22 730 8369
Fax: 0041 22 730 8021
Email: schiessl@www.wmo.ch

Dr SARUKHANIAN Eduard
Acting Director, World Weather Watch
Applications Department
WMO
8bis Avenue de la Paix
Case Postale No. 2300
CH-1211 GENEVA 2
Switzerland
Tel: 0041 22 730 8227
Fax: 0041 22 730 8021
Email: Sarukhanian_E@gateway.wmo.ch

Dr KARPOV Alexander
Acting Chief, Observing Systems Division
World Weather Watch, Basic Systems Department
WMO
8bis Avenue de la Paix
Case Postale No. 2300
CH-1211 GENEVA 2
Switzerland
Tel.: 0041 22 730 8222
Fax: 0041 22 730 8021
Email: Karpov_A@gateway.wmo.ch

Mr DIALLO N.T.
Chief Aeronautical Meteorology Unit
WMO
8bis Avenue de la Paix
Case Postale No. 2300
CH-1211 GENEVA 2
Switzerland
Tel.: 0041 22 730 8283
Fax: 0041 22 730 8181
Email: Diallo_N@gateway.wmo.ch

Dr HINSMAN D.
Senior Scientific Officer
WMO
8bis Avenue de la Paix
Case Postale No. 2300
CH-1211 GENEVA 2
Switzerland
Tel.: 0041 22 730 8285
Fax: 0041 22 730 8181
Email: hinsman@www.wmo.ch

Mr. BRESLIN L.
WWW-B Consultant
WMO
8bis Avenue de la Paix
Case Postale No. 2300
CH-1211 GENEVA 2
Switzerland
Tel.: 0041 22 730 8004
Fax: 0041 22 730 8181
Email: Breslin_L@gateway.wmo.ch

AGENDA

1. ORGANIZATION OF THE MEETING

   1.1 Opening of the meeting
   1.2 Adoption of the agenda
   1.3 Working arrangements

2. REVIEW OF THE GOS IN THE REGIONS

3. REVIEW OF THE RBSNs

   3.1 Current status of RBSNs performance
   3.2 Basic principles regarding the composition of RBSNs

4. REVIEW OF OTHER IN-SITU SYSTEMS (MARINE, AIRCRAFT, etc.)

5. REVIEW OF SPACE-BASED COMPONENT OF THE GOS

6. REDESIGN OF THE GOS AND ITS IMPACT IN DEVELOPING COUNTRIES

7. CLIMATOLOGICAL OBSERVATIONS

   7.1 CLIMAT and CLIMAT TEMP reporting
   7.2 Proposal for Regional Basic Climatological Networks (RBCNs)
   7.3 Status of GCOS initial networks (GSN and GUAN)

8. OTHER MATTERS

9. CLOSURE OF THE MEETING

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Annex III

EXTRACT FROM THE REPORT OF THE SECOND SESSION OF THE OPAG-IOS EXPERT TEAM ON OBSERVATIONAL REQUIREMENTS AND REDESIGN OF THE GLOBAL OBSERVING SYSTEM (Geneva, December 1999)

10. REDESIGNING THE GOS IN DEVELOPING COUNTRIES **(*Agenda item 10*)**

10.1. It was noted that redesign of the GOS included several issues that involve developing countries. In some areas, the current GOS system simply does not exist, whereas in other areas it could be improved. When looking at candidate observing systems, consideration must be given not only to NWP but also to human forecasting. These issues were discussed in a working group focussed on redesigning the GOS in developing countries; their deliberations are summarized below.

10.2. Issues that need to be addressed fall under three categories: (a) lack of public infrastructure such as electricity, telecommunication, transport facilities, etc., (b) lack of expertise from people to do the job, training, etc., and (c) funding for equipment, consumables, spare parts, manpower, etc. The lack of infrastructure and expertise may be the result of a lack of funding. This is resulting in deficiencies mainly in certain parts of Regions I, II, and III in particular in tropical areas (between 25N and 25S).

10.3. It was noted that the quality of RAOBS from blocks 42 and 43 in Region II remained a problem. Past efforts to improve their quality have not produced results. It was noted that another approach is being explored and the Secretariat will report on these endeavors.

10.4. In some areas observations have been taken but not disseminated. Attention must therefore be given to improve the current telecommunication facilities in those countries. In addition, in several countries, it is very difficult to get the data from the observing site to the NMS, whereas the communication from there to other centres is less problematic. Sometimes, the data at night were not distributed because it used HF transmission and this did not work at night.

10.5. The redesign may result in upgrading, restoring, substitution and capacity building. Two aspects need to be considered: the use of the data and the production of the data. It is possible that some countries do not and will not be able to produce data and will therefore only be users of data. To help developing countries produce data for international exchange, due consideration must be given to the three issues previously identified i.e. public infrastructure, expertise and funding.

10.6. Possible approaches towards the redesign were discussed. A first step should be to identify observing systems that were less dependent on infrastructure, expertise, and funding. These are satellite and AMDAR. However a minimum set of reliable RAOBs would be required to validate the satellite observations with enough height and accuracy. Where possible these should be located in the vicinity of or in capital city to ensure public infrastructure, and minimize costs. It should be noted that with this approach, some developing countries become users of the data not producers of data.

10.7. It was indicated that there are some disadvantages in organizing new systems outside the scope of National Meteorological Services as it did not stimulate their involvement/contribution and does not stimulate improving the synoptic observing system. It is recommended to find a solution where NMSs are involved and active. It was suggested that sub-regional meteorological arrangements for basic systems needed to be put in place. They would have to work together to find a source of funding and determine priorities for how the funding would be spent.

10.8. There is a need to have a backbone network of RAOBs. However, replacing RAOBs by AMDAR in some places is worth testing. It must be recognised that AMDAR ascent/descent and enroute data will provide little stratospheric information and no humidity data (for the time being).

10.9. It was felt that capacity building in some countries needed further attention. Some countries have satellite receiving stations or receive satellite data through the GTS, but lack the expertise to utilise the information to their benefit. Some countries are acquiring Doppler radar but need training on how to retrieve the information.

10.10. It was noted that good networks were needed to assess rainfall. This requires a much denser network than temperature, the latter being more homogeneous. Also, the weather in Africa is sensitive to position of convergence belt, hence upper air wind.

10.11. A possible funding approach, would be to have an international foundation to which interested participating members including (commercial organizations (aviation, oil/gas/electricity companies, transport companies, insurance companies, vendors of meteorological systems, media) would contribute funding to maintain the core global network. The resources should be distributed in a way that it creates incentives for NMSs to operate and maintain the systems under their responsibility.

10.12. If funding was available, the highest priority should go to (a) maintaining the RBSN, noting that GUAN stations are part of the RBSN, and (b) to rehabilitate observing sites using even distribution.

10.13. Finally, the ET-ODRRGOS suggested that the following recommendations should be taken into account when addressing the issue on redesign of the GOS in developing countries:

- Define geographical areas using advanced technique to help identify where priority should be if additional funding was available;

- Define trial field experiments over data sparse areas, for a limited time, to evaluate how additional data would contribute to improve performance at the regional and global scale. A clearly demonstrated impact might make it easier to agree on some coordinated funding mechanism for areas concerned including funding from GEF (Global Environmental Facilities) for climate stations;

- Encourage neighboring countries to establish sub-regional meteorological arrangements to operate station jointly;

- Examine whether automated stations could become a viable, cost effective alternative to manned stations for the surface network in the future;

- In data-sparse areas of the world, it may be more cost-effective to make full use of aircraft ascent/descent data instead of establishing RAOBs stations (e.g. South America, parts of Africa);

- When changes are made to the climate observing systems, the Karl principles should be followed;
- The telecommunication problem should be referred to the OPAG on ISS and looked at as a priority;
- Prioritise where the needs are most pressing for VCP or other funding.

10.14. ET-ODRRGOS encouraged the chairman of the ICT for IOS to present these recommendations for consideration at their upcoming meeting in March 2000.