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

REGIONAL ASSOCIATION II (ASIA)

IMPLEMENTATION CO-ORDINATION MEETING ON THE GTS IN REGION II (SOUTHERN PART)

NEW DELHI, 7 - 10 JANUARY 2002

FINAL REPORT

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1. ORGANIZATION OF THE MEETING

1.1 Opening of the meeting

1.1.1 The Implementation Co-ordination Meeting on the GTS in Region II (Southern part) was opened at 10.00 a.m. on Monday 7 January 2002 by Dr. R.R. Kelkar, Director General of Meteorology, India Meteorological Department and Permanent Representative of India with WMO. Dr Kelkar extended a warm welcome to all the participants at the session. He stressed the importance of the exchange of meteorological data and the crucial role of the Regional Meteorological Telecommunication Network (RMTN) in the overall GTS of the WWW. Dr S. K. Srivastav, Additional Director General of Meteorology and president of CIMO delivered an opening address and Mr P. Rajesh Rao, chairman of the RA II Working Group on the Planning and Implementation of the WWW, made opening remarks.

1.1.2 On behalf of the Secretary-General of WMO, Mr. J.-M. Rainer welcomed all participants at the meeting. He thanked the Government of India and the India Meteorological Department for hosting this Implementation Co-ordination Meeting on the GTS in Region II, for the excellent facilities provided and for the warm hospitality. The meeting was expected to review the actual implementation and develop improvements of the elements of the RMTN in the Southern part of Region II and to pay particular attention to deficiencies. The outcome of the meeting would be an important contribution to the activities of the Working Group on Planning and Implementation of the WWW in Region II, and he noted with appreciation the presence of its chairman, Mr. P.Rajesh Rao. He invited participants to actively contribute to frank and open discussions, wished the meeting every success, and wished the participants a pleasant stay in New Delhi.

1.1.3 There were 23 participants from 11 RA II Members, including 13 participants from India Meteorological Department. The list of participants is included in the Appendix.

1.2 Election of the chairperson

Dr T. K. Ray (India) was elected chairman of the meeting.

1.3 Adoption of the agenda

The meeting adopted its agenda as reproduced at the beginning of the report.

1.4 Working arrangements

The meeting agreed on its working hours and its work schedule. The meeting focused its work on the Southern part of Region II, i.e. the zones of responsibility of RTHs New Delhi, Bangkok, Beijing, Jeddah, Tehran and Tokyo. The meeting considered 22 working documents. A visit of RTH New Delhi facilities was organized on 9th January (p.m.).

2. REVIEW OF THE STATUS OF IMPLEMENTATION AND OPERATION OF THE REGIONAL METEOROLOGICAL TELECOMMUNICATION NETWORK

2.1 Status of implementation of RTHs and NMCs

The meeting noted with much interest the information presented by the participants on the implementation of GTS facilities at their respective RTH and NMC.

2.2 MTN, inter-regional and regional links

2.2.1 The meeting took note that Regional Association II, at its twelfth session (Seoul, September 2000) decided the following changes to the circuits of the Regional Meteorological Telecommunication Network (RMTN) in Region II:

- to include the circuit Bangkok-Beijing;
- to delete the circuits Bangkok-Hong Kong and Bangkok-New Delhi.

2.2.2 A diagram on the status of implementation is included in Annex I. The meeting noted that the implementation of RMTN circuits in the southern part of Region II had made significant progress, but that there were still a number of shortcomings:

(a) All RTHs have at least one connection to another RTH operating at a speed higher than 2400 bits/s (at least 9600 bits/s for most of them);

(b) Six NMCs have at least one GTS connection operating at a speed of 9.6 kbit/s or higher: Hong-Kong, Macao, Muscat, Pyong Yang, Seoul and Vientiane; and five NMCs have at least one GTS connection operating at 1.2 or 2.4 kbit/s: Bahrain, Dhaka, Doha, United Arab Emirates and Hanoi;

(c) There were 14 regional circuits operating at speeds in the range 9.6 to 64 kbit/s; four circuits connected to RTH Tokyo, including the MTN circuit Beijing-Tokyo, are implemented via Frame Relay services (Network-to-Network Interconnection);

(d) Seven NMCs have connections to the GTS operating at low speeds (50, 75 or 100 Bauds): Colombo, Kathmandu, Kabul, Karachi, Kuwait, Male and Yangon;

(e) Three NMCs have no connection to the GTS: Baghdad, Phnom Penh and Sanaa.

(f) The inter-regional circuit New Delhi-Melbourne, that used to operate at 75 Bauds, leased circuit, had been replaced and upgraded by an Internet connection using the TCP/IP socket procedure.

2.2.3 The meeting underlined that the low-speed circuits (50-200 bit/s) for connecting NMCs had a very low cost-effectiveness, were frequently unreliable and required receiving terminal equipment that was no longer available nor easy to maintain. The meeting recommended that adequate plans for upgrading the low-speed NMC connections and the NMC facilities should be developed and implemented with high priority (see item 3.3).

2.2.4 The meeting also noted with interest that two additional circuits had been implemented: Beijing-New Delhi (9.6 kbit/s, satellite circuit, X.25) and New Delhi-Muscat, via Internet. It noted that the circuit Bangkok-New Delhi continued to be effectively in operation. It also noted the circuit Bangkok-Singapore that XII-RA V agreed to include as an inter-regional circuit, pending the endorsement of RA II. The meeting developed recommendations on these matters under item 3.3.

Internet

2.2.5 The meeting was informed that RTH Tehran had recently set up a Web server, and it noted with appreciation that all the RTHs were operating a Web server. Almost all NMCs have access to the Internet, at least for E-mail services, and a number of NMCs are also maintaining a Web site. RTHs' Web servers are used as an efficient complementary mean for providing data and products to the NMCs, in particular for those NMCs with low-speed or no connection to the GTS. It was noted that RTH New Delhi could automatically transfer data to NMCs by E-mail and provide access to authorized NMCs via FTP for downloading data and products.

2.3 Other telecommunication systems and services, including satellite-based systems, radio-broadcasts and use of the Internet

2.3.1 Region II is covered by the following satellite systems: ISCS (primarily ISCS (Pacific)), METEOSAT/MDD, MTSAT (planned for 2003), TV-Inform-meteo (Russia), VSAT systems operated by China, India and Thailand, and the UKSF/WWW. The satellite system operated by China and METEOSAT/MDD were integrated into the RMTN. The UKSF/WWW covers most of Region II. The INSAT satellite operated by India includes a Meteorological Data Distribution

channel (INSAT/MDD) which can be received at some NMCs associated to RTH New Delhi and located within the footprint of the satellite.

2.3.2 The meeting noted that, in accordance with the information available, Bahrain, Iran, Kuwait, Oman, Pakistan, Qatar, Republic of Yemen and United Arab Emirates were equipped to receive METEOSAT/MDD. Democratic People's Republic of Korea and Mongolia were equipped to receive the VSAT satellite distribution system operated by China. Bangladesh, Maldives and Sri Lanka were equipped with INSAT receiver, including INSAT/MDD channel. It was also noted that, due to limitations of the satellite footprint, the reception might not be of high quality at some centres.

2.3.3 The meeting underlined that the VSAT receiving stations of satellite data-distribution systems were providing a large set of data and products, and were particularly important for the NMCs that are only connected via low-speed GTS circuits. In this regard, the meeting noted that NMCs Kabul, Phnom Penh and Yangoon were not equipped to receive any satellite data-distribution system.

2.3.4 The largest part of Region II is covered by the Data Collection System (DCS) of GMS operated by Japan, and its Western part is covered by the METEOSAT DCS.

ICAO/WAFS satellite-based telecommunication system (SADIS)

2.3.5 In the framework of the ICAO World Area Forecast System (WAFS), 33 VSAT receiving stations of SADIS, operated by the UK, were implemented in 22 RA II countries.

Radio broadcasts

2.3.6 RTH Tokyo was operating a radio facsimile broadcast and all the other RTHs were operating RTT and radio facsimile broadcasts. All the RTHs stressed the very high recurrent costs, associated to the difficulty or even impossibility of the procurement of spare parts, since these systems were replaced already a long time ago by more efficient telecommunication techniques for almost all other users and were no longer in production (see item 3.4).

2.4 Review of the exchange of observational data and products, including review of monitoring results

2.4.1 The meeting reviewed the analysis, carried out by the Secretariat, of the availability of SYNOP and TEMP reports from the RBSN stations at MTN centres during the last exercises of the Annual Global Monitoring (AGM) and the Special MTN Monitoring (SMM). It was recalled that all percentages of availability are calculated using the Regional Basic Synoptic Network (RBSN) lists as the reference, with four observations per day for SYNOP stations, and two observations per day for TEMP stations.

SYNOP reports

2.4.2 The average availability of SYNOP reports during the October 2000 AGM and the 2001 SMM exercises is 82 per cent. The availability of SYNOP reports during the period 1992-2001 oscillated around 80 per cent with a minimum of 77 per cent and a maximum of 83 per cent.

2.4.3 The meeting noted that during the October 2000 AGM and the 2001 SMM exercises:

- No SYNOP reports were received from Afghanistan, Islamic Republic of, Cambodia, Iraq and Lao People's Democratic Republic
- Less than 50 per cent of the SYNOP reports were received from Kuwait (22%), Myanmar (44%), Nepal (48%), Yemen (28%) and Tajikistan (28%).

No SYNOP reports were received from 107 RBSN stations. These silent stations are listed in Annex II.

2.4.4 During the October 2000 AGM, 77 per cent of the SYNOP reports were received within one hour after the observation time, 79 per cent within two hours and 81 per cent within six hours.

TEMP reports

2.4.5 The average availability of TEMP reports during the October 2000 AGM and the 2001 SMM exercises is 61 per cent. Table II shows a decrease in the availability of TEMP reports from 75 per cent to 52 per cent during the period 1992-1999 and in increase from 52 to 62 per cent during the period 1999-2001. These variations were mainly due to the evolution of the operation of the upper-air observation network in the northern part of Region II.

2.4.6 The meeting noted that during the October 2000 AGM and the 2001 SMM exercises:

- No TEMP reports were received from Afghanistan, Islamic Republic of, Cambodia, Iraq, Lao People's Democratic Republic, Myanmar, Nepal, Tajikistan, Turkmenistan, Qatar and Yemen,
- Less than 50 per cent of the TEMP reports were received from Bangladesh (17%), Democratic People's Republic of Korea (20%), Iran, Islamic Republic of (40%), Kazakhstan (20%), Mongolia (47%), Oman (34%), Pakistan (3%), Russian Federation (40%), Thailand (50%) and Uzbekistan (13%).

No TEMP reports were received from 47 RBSN stations. These silent stations are listed in Annex II.

2.4.7 During the October 2000 AGM, 52 per cent of the TEMP reports were received within two hours after the observation time and 59 per cent within 12 hours.

2.4.8 The comparison of the monitoring results provided by the NMCs, the associated RTHs and the MTN centres showed some differences in the availability of the reports at those centres. Those differences could be due to differences in the implementation of monitoring procedures or to discrepancies in the distribution of data on the GTS. The meeting recommended to RTHs to further consider this matter in co-ordination with their associated NMCs and to arrange for the most effective routeing of the relevant bulletins between RTHs to ensure an even availability of data.

2.4.9 The meeting noted with concern a steady decrease in the number of SHIP reports collected in the Region. The closure of a number of coastal radio stations might have had a detrimental impact in this respect, but it was not compensated by a comparable increase in the collection via Inmarsat Coastal Earth Stations. It was particularly underlined that the Coastal Earth Station operated by India, which provides since 1999 a free service for the collection of SHIP reports, was collecting a rather limited number of reports (6-7 per day). The meeting invited JCOMM to consider the issue, to urge voluntary observing ships' operators to spare no effort in contributing reports, to draw their attention on the stations available for their collection and to urge them to use these arrangements.

3. IMPLEMENTATION PLAN FOR THE FURTHER DEVELOPMENT OF THE REGIONAL METEOROLOGICAL TELECOMMUNICATION NETWORK

3.1 Data communication techniques and procedures

3.1.1 The meeting took note that CBS-XII agreed upon the revised Attachment II -15, Use of TCP/IP on the GTS, to the Manual on the GTS, Volume I, Part II. The revision includes refinement of TCP sockets procedures to mitigate possible loss of data, guidance for the migration and transition from X.25 to TCP/IP, as well as procedures for IP addressing and routing. The revised Attachment II -15 is included in the final report of CBS-XII, is posted on the WMO Web server under: http://www.wmo.ch/web/www/TEM/attII15rev.doc and will be distributed as an amendment to the Manual on the GTS.

3.1.2 The use of TCP/IP has considerable benefits for the development of the GTS. It had equated to direct savings in financial and human resource to NMHSs by reduced costs for

communications equipment, reduced software development work through use of industry standard software systems and also facilitated the use of a larger panel of cost-effective telecommunication services. The migration towards TCP/IP on GTS circuits was progressing quickly. Fifteen circuits, i.e. about 20 percent of all circuits in the Region including inter-regional and MTN circuits, were operating pure TCP/IP.

3.1.3 The meeting noted the mechanism for the transmission of 'normal' GTS messages (with Abbreviated Heading Line) batched in files exchanged via FTP, as described in Attachment II-15, was adopted for operational use by many centres worldwide, including on the MTN. The meeting noted, however, that this procedure had not yet been introduced in Region II. It also noted that fine-tuning of the procedure was under consideration by the CBS Expert Team on Enhanced Utilization of Data Communication Systems (ET-EUDCS).

3.1.4 With respect to the access to the Internet, that all WWW centres would or had already implemented for an increasing use, CBS-XII emphasized the critical importance of adequate security measures to ensure efficient and safe operations for the GTS. Further guidance in this respect was included in Attachment II-15, with a view to ensuring a reasonable and affordable level of security and protection of GTS systems and centres to prevent the proliferation of possible problems on the whole GTS. It urged all GTS centres to pay due attention to this important matter. The development of relevant guidance was pursued.

3.1.5 The meeting noted that on-line DCST information resources were included on the WMO Web server for making available to all Members practical information and guidance on the actual implementation of data communication systems and techniques, under:
http://www.wmo.ch/web/www/TEM/gts_online_resources.htm
It invited RA II WWW centres to contribute to and make use of these information resources.

3.1.6 The meeting noted the WMO Guide on Internet Practices had been developed and made available on the WMO Internet server (http://www.wmo.ch/web/www/reports/Internet-Guide.html). Extracts of the guide were distributed in paper form to NMHSs that are not yet connected to the Internet. The Secretariat should also make printed copies of the guide available to any NMHS that requests it.

3.1.7 The meeting took also note of the work programme of the CBS/ ET-EUDCS, as well as the outcome of the Implementation Coordination Meeting on the MTN (June 2001). It noted in particular the proposed change of the transmission sequence number for re-transmission of messages.

3.1.8 The meeting stressed the need for a tight technical coordination between an RTH and its associated NMCs for the implementation, operation and further improvement of data communication techniques and procedures for the GTS. The meeting underlined the considerable benefits of sharing experience and advice between the data-communication experts of the RTH and of the NMCs, in particular in the present context of the introduction of TCP/IP. It recommended that RTHs should plan roving missions of one or two RTH experts to the NMCs to coordinate and guide implementation and upgrades. It also invited the Secretariat to facilitate and support these roving missions.

3.2 Operational procedures and information

3.2.1 The meeting considered in details the outcome and recommendations of the Implementation Co-ordination Meeting on the Main Telecommunication Network (Geneva, June 2001) as regard GTS operational matters. The respective follow-up actions are included in Annex III. The meeting also noted the Plan on Migration to Table Driven Code Forms being developed by the relevant CBS Expert Team and the various issues associated with the migration.

3.2.2 The meeting also noted that several NMCs were experiencing difficulties in complying to the recommended practices and procedures on operational matters, and to keep their operational staff adequately informed and experienced. RTHs' experts would also bring a

considerable experience to NMCs on these matters. The meeting recommended that the roving missions (ref. 3.1.8) should also include an RTH expert on GTS operation, who would provide guidance to the GTS operational staff of NMCs.

3.2.3 The meeting reviewed the status of monitoring of the WWW, including the Annual Global Monitoring (AGM) and the Special MTN Monitoring (SMM). Detailed information on the pre-analysis of SMM, in particular the formats of the pre-analysis files, is given in the WMO FTP server in the file pre-anal.doc under the sub-directory GTS_monitoring\SMM. The meeting invited the centres, and in particular RTHs to make full use of this information with a view to identifying deficiencies and taking remedial action.

Operational information service

3.2.4 The meeting noted with appreciation the developments that were currently made towards the further improvement of WMO Publication No. 9, Volumes. A, C1, C2 and D, WMO Publication No. 47 and RBSN lists, as well as METNO messages and the Operational Newsletter.

3.2.5 With respect to Volume C1 - Catalogue of meteorological bulletins, the meeting noted that eight MTN centres (Bracknell, Melbourne, Moscow, Nairobi, Offenbach, Sofia, Tokyo and Toulouse) had implemented the procedures for the comprehensive catalogue of meteorological bulletins (Volume C1). This implementation had already resulted in significant improvements of the information on actual GTS bulletins. Three MTN RTHs located in Region II (Beijing, Jeddah and New Delhi) have not yet implemented these procedures. The experts from RTH Beijing and New Delhi informed the meeting of their plans to implement these procedures in the near future. In this regard, they expressed their appreciation for the PC-based application developed by the Secretariat to maintain and update the comprehensive catalogue of meteorological bulletins, that was made available to MTN centres.

3.2.6 The meeting noted the plan for the production and dispatch of WMO Publications No. 9 and No. 47 on CD-ROMs, which would be much more cost-effective than the paper format. It also noted with appreciation that the WMO Members, who still prefer to receive the paper format, could be provided with the paper copy upon individual request. The meeting agreed upon the the following plan:

- Distributing the WMO Publications No. 9 (excluding Volume B) and No. 47 on a CD-ROM as from 2002. Those WMO Members, who still prefer to receive the paper format, could request the paper copy;
- Continuing developing the presentation of the WMO Publications No. 9 and No. 47 on the WMO server, and ;
- Discontinuing the diskette service.

3.2.7 The meeting also expressed its appreciation on the plan for publishing the Manuals on the GDPS, GOS and GTS and Manual on Codes in pdf formats, posting them on the WMO Server and making them available on CD-ROM. It noted in this respect that electronic formats should facilitate the use of colour that would be highly beneficial for the clarity of a number of technical diagrams.

3.2.8 The meeting recalled that XII-RA II urged all RTHs to complete the implementation of the routeing catalogues in accordance with the procedures given in Attachment II-7 to the Manual on the GTS. Four of the six RTHs located in the southern part of Region II (Bangkok, Beijing, New Delhi and Tokyo) are posting their routeing catalogues on servers. The expert from RTH Tehran informed the meeting of the plan to make available the RTH routeing catalogues on the recently implemented Web server in the very near future.

3.3 RMTN development planning, including the improved RMTN project

RMTN plan

3.3.1 The meeting expressed serious concern with regard to the deletion from the RMTN plan of the circuit Bangkok-New Delhi, as decided by XII-RA II. The meeting underlined the requirement for a direct circuit between the two RTHs, including in the framework of the Tropical Cyclone Programme, but also noted that the current low-speed circuit (200 bit/s) was not adequate. The meeting recommended that, in the framework of the upgrade of the GTS circuits linking RTHs Tokyo, Bangkok and New Delhi via Frame Relay services and the resulting improvement in cost-effectiveness, the Bangkok-New Delhi connection be also upgraded and re-included into the RMTN.

3.3.2 The meeting recommended that the additional circuit Beijing-New Delhi, operating at 9.6 kbit/s be included in the RMTN plan as a circuit interconnecting two major RTHs in the Region and ensuring a higher reliability and capacity of the whole RMTN. It also recommended that the circuit Bangkok-Singapore be endorsed as an inter-regional circuit, noting the plans of RTH Bangkok to upgrade both inter-regional circuits Bangkok-Kuala Lumpur and Bangkok-Singapore to Frame Relay, 16 kbit/s (CIR).

High priority implementation projects

3.3.3 The meeting recalled that XII-RA II agreed that highest priority should be given to efforts to establish GTS connections for those NMCs that are still not connected. The meeting was informed and noted with appreciation that RTH Tehran had initiated discussions with NMCs Baghdad and Sana'a with a view to implementing the respective GTS circuits. The meeting invited RTH Tehran and the two NMCs to proceed with the development of an implementation plan, and determine possible assistance that could be required. It noted with concern that the implementation plan for the connection of NMC Phnom Penh was not implemented, and it recommended that Members concerned, and in particular potential donor countries, support the GTS connection of NMC Phnom Penh.

Improved RMTN project

3.3.4 The meeting recalled that XII-RA II (Seoul, 19-27 September 2000) endorsed the concept of an Improved RMTN using modern cost-effective data-communication network services. In view of the geographical extension of the Region, it agreed that the design of the Improved RMTN could be based on the implementation of several networks grouping RTHs and NMCs as appropriate. Considering that cost-effective data network services such as Frame Relay and IP-VPN (Internet Protocol - Virtual Private Network) services were available in parts of the Region and that the administrative mechanisms for implementation would not be developed shortly, XII-RA II agreed upon a practical step by step approach for the implementation.

3.3.5 The meeting noted with interest and appreciation the report and recommendations from the co-ordinator on the Improved RMTN project, Mr H. Ichijo. The meeting fully endorsed the general strategy and recommendations for the further development and gradual implementation of the Improved RMTN. The meeting also considered with interest a document submitted by India proposing a mixed approach to the improvement of South Asian Segment of RMTN using Frame Relay, the Internet and Commercial Satellite Broadcast. It agreed with the general concept of upgrading circuits using Frame Relay services and of the use of Internet, including E-mail services and applications for facilitating the initial automation of NMCs and data exchange with their RTH. The meeting underlined nevertheless the inherent security risks of the Internet (see section 3.1).

3.3.6 The meeting particularly emphasized the following recommendations:

- Each RTH should survey the technical status, capabilities and opportunities of its associated NMCs, as well as the data-communication network services that are commercially available and cost-effective in their respective zone;

- RTHs should assist their associated NMCs in developing implementation plans, including target implementation dates; this plans should include the migration to TCP/IP, which is a key factor for enabling the use of cost-effective systems and communications;
- As an initial step, current circuits should be upgraded as soon as possible using data-communication services that are considerably more cost-effective than conventional leased circuits, such as Frame Relay services. In this regard, the meeting noted that the circuit New Delhi-Tokyo was planned to be upgraded to Frame Relay in mid-2002;
- Financial assistance is expected to be required for a number of NMCs for the implementation of the Improved RMTN. In addition to the development of individual VCP projects on the basis of the NMC/RTH plans mentioned above, the Secretariat was invited to establish a co-ordinated cooperation project for the implementation of the IRMTN in Region II. This project would facilitate the management and a focused use of funds contributed by donors.

3.3.7 The meeting particularly stressed the need for an adequate training of the technical staff in NMCs on the relevant Information and Communication Technologies that are required for the Improved RMTN scheme. The meeting invited RTHs to consider the possibility of organizing seminars for NMCs on ICTs for the Improved RMTN, and invited the Secretariat to assist and support these events. The meeting also recommended that NMHSs should take the necessary measures for ensuring an adequate basic training on information technology (computer and data-communications) to their relevant staff. This basic training is not specialized for meteorology, and can be provided by a number of educational institutions.

3.3.8 The meeting noted that focal points on the feasibility study of an improved RMTN in Region II had been designated, in particular by RTHs (see Annex IV). The meeting invited the focal point experts to take an active role in the actions identified in paragraph 3.3.6, in coordination and cooperation with the coordinator, Mr H. Ichijo. The RTHs were also invited to confirm their respective IRMTN focal point expert, as necessary.

3.4 Satellite-based data distribution systems and radio-broadcasts

METEOSAT/MDD

3.4.1 XII-RA II (2000) agreed that, in accordance with CBS guidelines, a co-ordination mechanism should be developed to ensure that requirements of the user WWW centres of METEOSAT-MDD in Region II were met to the largest extent possible. It requested its Working Group on Planning and Implementation of the WWW (WG-PIW) to establish the necessary arrangements, to prepare the relevant amendments to the Manual on the GTS – Volume II – Regional Aspects – Region II (Asia) – in co-operation with the operator of the MDD and to submit them to the president of the Association for approval.

3.4.2 The meeting noted that the WG-PIW chairman had established an MDD group of experts entrusted with the tasks allocated by RA-II. The work plan of this ad-hoc group is attached in Annex V. The meeting also noted that with METEOSAT Second Generation (MSG) that would replace the current METEOSAT in the near future (2002-2003), the MDD programme will be embedded in the LRIT digital transmission that would be uplinked by the primary EUMETSAT Earth station.

UKSF/WWW

3.4.3 The meeting noted the information document submitted by the U.K. Met. Office on the status and plans for the UKSF/WWW (see Annex VI). The pilot project in Region II includes Macao, Nepal and Sri Lanka who had volunteered to take part in this trial. Bangladesh, Iran, Yemen and Myanmar also expressed their keen interest in participating in this pilot project, and the U.K. Met. Office was invited to consider these additional candidates.

3.4.4 The meeting recommended that a UKSF/WWW user group be established, with the task of compiling data and products requirements of the WWW centres receiving MDD in Region II, and developing proposals for changes to the UKSF/WWW transmission programmes. Proposals would be co-ordinated by the Working Group on Planning and Implementation of the WWW in Region II, and then submitted to RTH Bracknell. The meeting invited the WG-PIW Chairman to consider this recommendation.

Discontinuation of HF radio broadcasts

3.4.5 CBS noted that the operation of HF broadcasts had high recurrent operational costs and a limited efficiency, but that there might still be requirements to continue HF broadcasts in some areas. It stressed the importance of assessing at the regional level the remaining requirements and the importance of considering alternative means to satisfy these requirements. It noted that the maritime community (ships) have still requirements to receive products by HF broadcasts. CBS felt that the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM)) was in the best position to determine the requirements of the maritime community in this respect, and to identify the most appropriate systems to meet them.

3.4.6 XII-RA II (Seoul, 2000) also underlined the high financial burden of the operation of HF radio broadcasts for the RTHs concerned, and the limited efficiency. The Association noted that the survey on the requirements for HF broadcasts and alternative means showed that only a few RA II Members expressed remaining requirements for HF broadcasts. The Association agreed that the discontinuation of the HF radio broadcasts should be planned for the near future. It noted that there were still some requirements for HF broadcasts from the marine community, and invited the JCOMM to determine the relevant requirements of the maritime community and to identify the most appropriate systems to meet them.

3.4.7 The meeting was informed that the first session of JCOMM (Akureyri, Iceland, June 2001) recognized that the implementation of the project for the transmission of graphical information to shipping through Inmarsat-C, as a part of SafetyNET and a component of the GMDSS, would largely eliminate the requirement for HF radiofacsimile broadcasts. It therefore urged that this project should be completed as soon as possible. At the same time, JCOMM requested the Expert Team on Maritime Safety Services to ascertain the remaining requirements of the maritime community regarding the continuance of HF radio broadcasts and to provide this information, through the WMO Secretariat, to future sessions of both CBS and RA II.

3.4.8 RTH Tokyo presented a detailed analysis of the status of its JMH facsimile broadcast, its very high recurrent costs and the current results of the survey of user requirements. The meeting invited RTHs to pursue the survey of requirements and, at the same time, propose actual potential solution that would extremely effectively replace radio broadcasts.

3.4.9 The meeting noted with particular interest satellite-based digital audio broadcast systems, which provide also commercial "datacasting" services, from companies such as World Space. The data should be provided to the nearest uplink site and is distributed via the satellite at scheduled broadcast hours at a nominal cost of approximately US$10 per MB supported by the provider RTH. Data is received by the end user via a commercial radio receiver with a small L band antenna and a PC card adapter, which is manufactured by several companies at an approximate cost of US$150. The service has the additional advantage of reception at any mobile platform such as ship.

3.4.10 The meeting was informed that RTH New Delhi was seriously considering the implementation of this system for serving users, including marine vessels. RTHs were invited to consider this very attractive technical system as a potential solution for a very cost-effective replacement of HF radio broadcasts.

3.5 National GTS components (national centres and networks)

3.5.1 The Meeting stressed the importance of National Meteorological Telecommunication Networks (NMTNs) for the collection of observational data and distribution of meteorological

information on a national level. It agreed that the general strategy for implementing NMTNs is the use of public/commercial telecommunication services (e.g. Public Data Networks and Public Switched Telephone Networks), which are generally cost-effective and efficient in areas where the public telecommunication infrastructure is available. Several Members have implemented very efficient NMTNs based on public telecommunication services. Through the use of these services, NMHSs can focus their own resources on more specific meteorological activities. NMHSs should make the necessary commitments, at the national level, to establish, secure and increase, as appropriate, the necessary budget provisions for NMTN operation through telecommunication services.

3.5.2 NMHSs may have, however, difficulties to afford the recurrent costs, depending upon funding arrangements, the national telecommunication tariff policies and the status of the public telecommunication infrastructure. Radio-telecommunication Systems, Data Collection Platforms (DCPs) are appropriate for NMTN operation, and should be considered on a case by case basis, depending on the national or sub-national conditions. Robust and reliable terminal equipment should be associated to radio-communication systems or DCPs to enable the insertion and transmission of observational data by observers, in accordance with their national practices and WWW procedures.

Radio-telecommunication Systems (HF, VHF)

3.5.3 Modern HF and VHF digital radio-communication systems, providing both voice and data communications, could be efficient for supporting both data exchange and administrative communications between meteorological stations and the NMC. Recurrent costs are limited, but adequate maintenance arrangements should be undertaken by the NMHS, although the technical reliability is very satisfactory. Sparse areas may be potential candidates for these digital radio-communication systems, as well as in replacement of former SSB equipment, where appropriate. These systems can be integrated into modern PC-based data networks for data collection and exchange.

Data Collection Platforms (DCPs)

3.5.4 DCPs via meteorological satellites (METEOSAT, GMS) have the potential to dramatically improve national data collection, in particular in areas where the public telecommunication infrastructure is not available. DCPs have now the required reliability for operation, taking into account the experience gained and the further technical progress made. Functional and operational specifications for DCPs with a view to facilitating their effective and successful integration in WMO Programmes, including guidelines for the procurement of DCPs, factory acceptance tests, and for training of operating and technical staff, were developed taking in particular into account requirements. DCPs are particularly adequate for automatic and semi-automatic stations; they should be complemented by other communication systems in manned stations for administrative communications.

3.5.5 In this regard, the meeting noted with interest a flood forecasting project for the Kosi River Basin in Nepal using DCPs for the collection of meteorological and hydrological data from 22 remote stations. The project is part of Himalayan-HYCOS within the framework of WHYCOS and would eventually involve Bangladesh, Bhutan, China, India, Nepal and Pakistan. The Data Collection System of the GMS satellite (GMS/DCS) operated by Japan would be used to collect data from the remote stations in Nepal. The data in CREX code collected via GMS/DCS would be compiled into bulletins by RTH Tokyo and then forwarded to RTH New Delhi on the GTS circuit New Delhi - Tokyo. RTH New Delhi would make the bulletins available to NMC Kathmandu via the Internet by E-mail and/or by FTP for downloading the data.

Systems at NMCs and RTHs

3.5.6 The considerable development of information and communication technologies, with respect to both hardware and software, with the adoption of industry standards for the GTS, such as TCP/IP communication procedures, was providing better opportunities for a sustainable introduction of computer-based GTS/GDPS systems in many National Meteorological Centres.

RTHs should implement TCP/IP and related protocols, with the view to facilitating the use and connection of standard computer-based systems at their associated NMCs.

3.5.7 All the components for the automation of NMCs should be integrated and interconnected through LAN interfaces to facilitate various operational applications. These components include satellite-receiving equipment (MDD, SADIS, SDUS or PDUS), message switching and telecommunications system, workstations, database servers, data-processing systems and possibly national observing systems (e.g. radars).

3.5.8 Particular attention should be given to the sustainable introduction of information and communication technology at small NMCs. First steps for a sustainable automation of small NMCs are made feasible by using available, affordable and maintainable technologies based on PCs and Internet types of protocols (TCP/IP, FTP), using off-the-shelf hardware and software components. Procurement should be carried out locally to the largest extent feasible to facilitate the maintainability of the systems. Basic application software for GTS and GDPS functions should be initially implemented to facilitate the progressive adaptation of operational and technical NMC staff, leading to a subsequent upgrades and enhancement of systems and operations.

3.5.9 These projects for the sustainable introduction of information and communication technology at small NMCs rely upon the international support and assistance. Their implementation at an affordable cost is only feasible through the increased support and assistance from seconded experts from more developed NMHSs. NMHSs should also be encouraged to facilitate the provision of basic application software packages for GTS/GDPS operations running on off-the-shelves PCs and operating systems, by sharing and possibly adapting their own developments.

The Internet

3.5.10 The implementation and capacity of the Internet is uneven, but there are rapid developments and changes that the meteorological community should take up as an opportunity for progress. The current Internet could not generally guarantee the quality of service (reliability and committed information rate) for the operational real-time exchange, and the GTS would continue to be dedicated to the exchange of real-time and critical data and products. The Internet is however playing an increasingly important role for the exchange of less time-critical information, for the supply of data and products to other users as well as for the active participation of NMHSs in WMO and related coordination activities. In some cases, the Internet may be the only telecommunication means that is available and affordable for providing a connection of an NMC with the GTS.

3.5.11 To efficiently support GTS and WWW operations, all RTHs should implement a full access (E-mail and WEB) to the Internet, including the operation of a server for facilitating the exchange of relevant information with other WWW centres, and in particular with its associated NMCs. RTHs should be capable of capturing meteorological data from e-mail with a view to its insertion into the GTS. NMCs should as well implement an Internet access and develop Internet functionality, as an integrated component of the upgrade of WWW systems. Adequate security measures should be taken, along the guidelines developed by CBS to ensure an efficient use in a secure data-communication environment.

4. IMPLEMENTATION COORDINATION AND SUPPORT ACTIVITIES

4.1 The meeting reviewed the priorities in the technical co-operation activities related to the GTS in Region II, and agreed on the following priorities, in particular for projects of the Voluntary Cooperation Programme (VCP):

(a) The highest priority should be given to the activities related to:

(i) Establishment of GTS connection of NMCs not yet implemented;

(ii) Upgrading national data collection where monitoring results had revealed deficiencies.

(b) High priority should be given to the activities related to:

(i) Upgrade to medium speed of the low-speed GTS connections of NMCs to their associated RTHs, in association with automation of GTS/GDPS facilities at NMCs;

(ii) Co-ordinated project for the implementation of the Improved RMTN.

(iii) Training activities on the operation and implementation of the GTS, and in particular on modern ICTs for enhancing Information Systems and Services of the WWW system.

4.2 The meeting reviewed the status of the requests for assistance and the projects developed within the framework of the Voluntary Co-operation Programme (VCP), which are related to telecommunication systems in Region II. It noted with appreciation that the VCP project supported by Japan had enabled the establishment of the connection of NMC Vientiane to RTH Bangkok, as well as a computer-based GTS/GDPS system at the NMC. Nine VCP projects still needed support, and two of these projects addressed the GTS connection of NMC Phnom Penh (Cambodia) and NMC Sana'a (Yemen) respectively. The meeting made a strong plea to donors for supporting these projects with a view to overcoming the most severe shortcomings of the GTS in Region II.

4.3 Noting that several NMCs needed to upgrade their GTS connections and GTS/GDPS facilities and would mainly rely upon cooperation assistance, the meeting stressed the importance of adequate technical coordination between the NMC and its associated RTH when developing the related project for a VCP request in order to ensure its feasibility and effectiveness. It invited NMCs concerned and their associated RTH to interact as appropriate in this respect (see also paragraph 3.1.8).

4.4 The meeting stressed the importance of the evaluation of the impact on the operation of the WWW at regional and national level of the VCP projects that are supported and implemented, in particular for the donor countries when deciding further cooperation support. The meeting urged NMHSs benefiting from VCP assistance to carry out an evaluation of the impact of the implementation of the respective VCP projects on the WWW system, and to report it to the WMO Secretariat and the donor country concerned.

5. RADIO-FREQUENCIES FOR METEOROLOGICAL ACTIVITIES

5.1 The allocation and availability of suitable of radio frequencies is of prime importance for meteorological operations and research and are crucial for the WWW for radio-sondes, meteorological satellites, weather radars, wind-profilers and spaceborne passive remote sensing, not mentioning wireless meteorological telecommunications. There is a continuous threat on the full range of radio frequency bands with the increasing development and expansion of new commercial radiocommunication systems. World Radiocommunication Conferences, which decide upon the global allocations of and regulations for radio frequency bands, have had so far a favourable outcome as regards the several items of concern for meteorology.

5.2 The agenda for the next World Radiocommunication Conference in 2003 (WRC-2003) includes again items of importance for meteorology. An issue of particular concern addresses possible Mobile Satellite Service allocations (for portable mobile terminals) in portions of the band 1670–1690 MHz, which is crucial for MetAids and MetSat operations; such an MSS allocation may in particular hamper the development of GOES/GVAR and GMS/S-VISSR stations. The meeting noted the activities of the CBS/Steering Group on Radio-Frequency Coordination (SG-RFC) and the Secretariat in preparing WRC-2003 issues.

5.3 The meeting noted that WMO's position and guidance on all WRC-2003 issues will be provided to all WMO Members in order to make their respective national radiocommunication

authorities aware of the importance of meteorological issues. The importance and impact of the preparatory activities on WRC issues conducted by regional radio frequency management organizations was also emphasized. With regard to countries in WMO Region II, the Asia-Pacific Telecommunity (APT) is the Regional Telecommunication Organization, established by an Inter-governmental agreement, which, inter alia, addresses the coordination of national radio-communication authorities' position in the Asia-Pacific area.

5.4 The meeting was also informed that *The Handbook on use of radio frequency spectrum for meteorology*, which was developed in cooperation between WMO and ITU, would be issued by mid-2002 as a joint WMO/ITU publication.

APPENDIX

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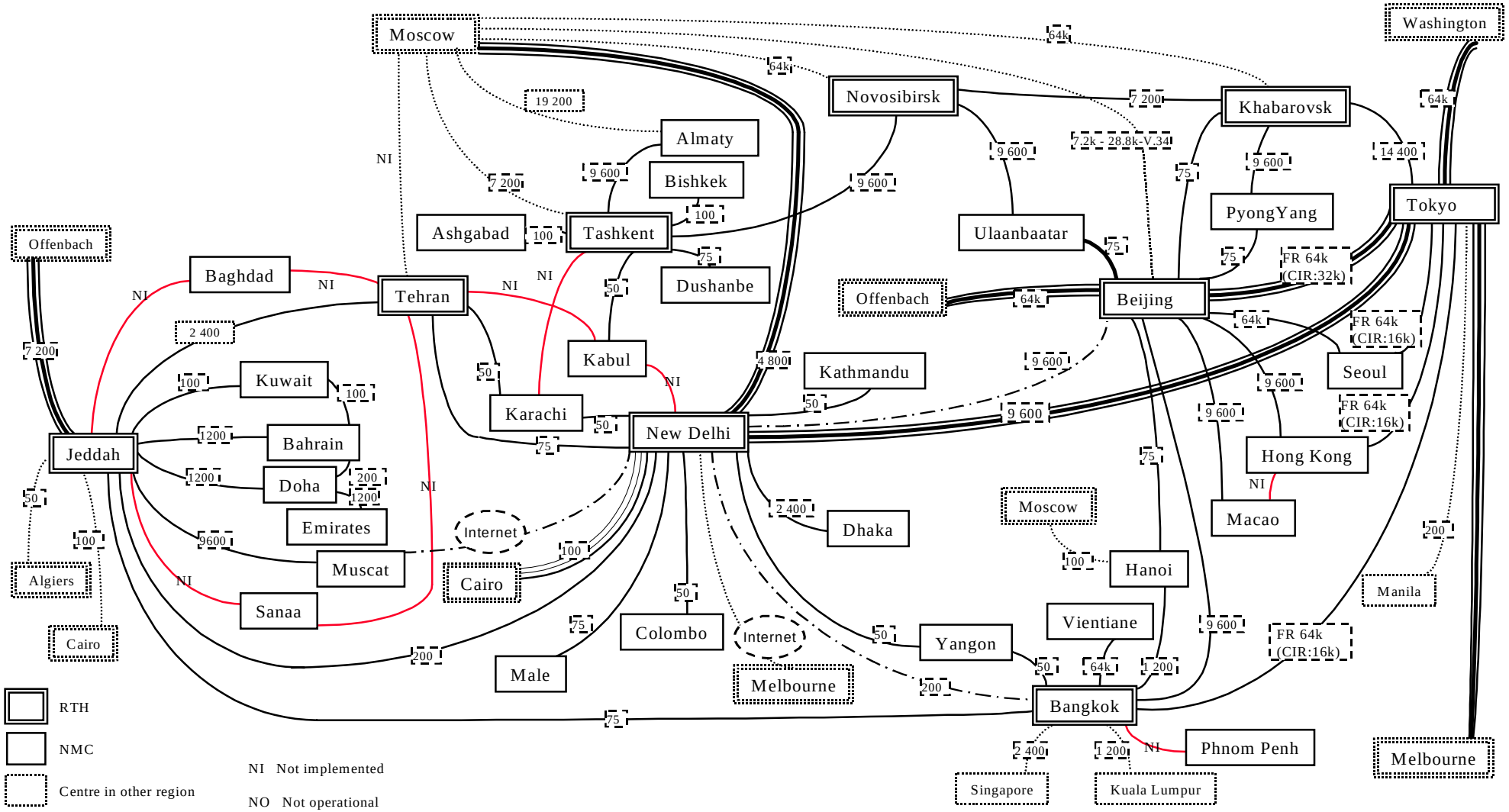

Regional Meteorological Telecommunication Network for Region II (Asia)

point-to-point circuits implementation (transmission speed in bit/s)

10/I/2002

List of silent stations in Region II on the Main Telecommunication Network

SYNOP:

Afghanistan, Islamic State of	40904 40913 40922 40938 40942 40945 40954 40971 40974 40977 40988 40990 40996
Cambodia	48966 48982 48983 48991 48998 48972 48978
India (north of latitude 20°N)	42587 42920 42977
India (south of latitude 20°N)	43226 43415 43495
Iran, Islamic Republic of	40716 40721 40872 40877 40897
Iraq	40608 40621 40634 40637 40642 40658 40665 40672 40676 40684 40686
Kuwait	40570
Lao People's Democratic Republic	48924 48927 48930 48935 48940 48947 48952 48955 48957 48926
Myanmar	48064 48099 48107
Pakistan	41516 41517 41518 41519 41532 41533 41564 41565 41592 41641 41504 41520 41568 41570 41577 41672
Russian Federation (in Asia)	21965 23331 24105 25428 25538 25744 25956 28506 30405 31199 31521 31527 31702 32195 32207 32252 36096
Saudi Arabia	40369 40386 40432 41006 41010 41014 41016 41080
Tajikistan	38609 38937 38944 38947
Turkmenistan	38511
United Arab Emirates	41198
Uzbekistan	38141
Viet Nam	48860
Yemen	41372 41416
Total:	107 stations.

List of silent stations in Region II on the Main Telecommunication Network

TEMP:

Afghanistan, Islamic State of	40938 40948
Cambodia	48991
China	54337 54497
Democratic People's Republic of Korea	47041
Iraq	40650 40608
Kazakhstan (in Asia)	35394 35671 36003
Lao People's Democratic Republic	48940
Myanmar	48008 48053 48062 48097
Nepal	44454
Pakistan	41640 41675
Qatar	41170
Russian Federation (in Asia)	20046 20292 21647 21982 23022 23552 24817 25173 25399 25428 25563 30521 30692 30965 31329 31510 31909 32618
Saudi Arabia	40373 40430
Tajikistan	38836 38954
Turkmenistan	38392
United Arab Emirates	41218
Yemen	41404 41480 41494
Total:	47 stations.

Follow-up action to the recommendations of the Implementation Co-ordination Meeting on the Main Telecommunication Network (ICM-MTN –2001)(Geneva, June 2001)

1. Review of the functions and responsibilities of RTHs included in the Manual on the GTS for bulletin correction.

1.1 The ICM–MTN recommended that the functions and responsibilities of RTHs included in the Manual on the GTS related to the correction of bulletins by RTHs should be reviewed in order to limit correction to the originating NMC and possibly the associated RTH, with a view to avoiding the transmission of multiple bulletins with the same abbreviated headings and different contents.

1.2 The functions and responsibilities of RTHs for bulletin correction are given in the following paragraphs of the Manual on the GTS:

- Paragraph 2.1 of Part I of Volume I (see under 1.3.2)
- The paragraphs 3.3 parts II of Volume II for Regions I, II, III and IV as follows:

  "3.3 Functions of RTHs:

  3.3.1 RTHs in Region () should perform the telecommunication functions defined in 2.1, Part I, Volume I of this Manual.

  3.3.2 In particular, each RTH in the Region should have the following duties:

  /…/

  (d) checking and correcting in order to maintain standard telecommunication procedures."
- The paragraphs 3.3 Parts II of Volume II for Regions V and VI as follows:

  "3.3 Functions of RTHs

  RTHs in Region () should perform the telecommunication functions defined in 2.1, Part I, Volume I of this Manual."

Action proposed

It is proposed to recommend to CBS to amend the Manual on the GTS – Volume I – Part I – paragraph 2.1 as follows:

"2. FUNCTIONS AND RESPONSIBILITES OF THE METEOROLOGICAL CENTRES

2.1 The World Meteorological Centres (as regards telecommunications) and the Regional Telecommunication Hubs shall be responsible for:

/…/

(e) Before relaying a message issued from their zones of responsibility (as an RTH in a Region and/or as an RTH located on the MTN) on the GTS, checking the parts related to the telecommunications of the message in order to maintain standard telecommunication procedures. The RTH informs the associated centre originating or compiling the message of any correction to be made to the message. The RTH and the associated centres make arrangements for the insertion of the message without errors on the GTS."

It is proposed to recommend to the Regional Associations I, II, III and IV to align the text of the Paragraphs 3.3 of the Part II of Volume II on the text of the paragraph 3.3 of the Part II of Volume II for Regions V and VI, in particular by deleting the sub-paragraph 3.3.2(d).

2. Use of different CCCC for new types of data and products

2.1 The ICM-MTN agreed that that the use of different CCCCs for centres (WMC, RTH, RSMC or Meteorological Satellite centre) preparing a large number of bulletins would extend the current provisions for the allocation of abbreviated headings. The meeting recommended that this procedure should be further reviewed by the ICT-ISS, in light of further experience.

2.2 Two cases should be considered:

- The centre needs to differentiate the bulletins at the level of the CCCC but still uses the Tables of Attachment II-5 of the Manual on the GTS; this is the case of WMC Washington, which use different CCCCs to differentiate the bulletins containing processed information issued from different models.
- The centre needs to extend the Tables of Attachment II-5; this is the case of ECMWF which uses the current $T_1T_2A_1A_2$ii allocations in Table B2 with its CCCC=ECMF, and uses T_2 = D for divergence and T_2 = V for vorticity with CCCC=ECMW.

Action proposed

It is proposed to recommend that the centres, that use different CCCCs to differentiate bulletins but still use the Tables of Attachment II-5, inform of the differences between the relevant bulletins (e.g. types of models used) in the column "remarks" of the catalogue of meteorological bulletins (WMO Publication No. 9, Volume C1).

The RTH focal points should inform the Secretariat of the needs to extend the Tables of Attachment II-5, and to send relevant proposals to the Secretariat. The Secretariat should compile the proposals and should submit them to the members of the ICT-ISS.

3. Changes to Tables of Attachment II-5

Table A

3.1 The ICM-MTN recommended to follow the evolution of the remaining requirements for the transmission of GRID bulletins and to delete the designators T_1 = D and T_1 = G from Table A when possible.

Action proposed

The RTH focal points should inform the Secretariat of the remaining requirements for the transmission of GRID bulletins and propose a possible date for the deletion of the designators T_1 = D and T_1 = G from Table A. The Secretariat should compile the proposals and should submit them to the members of the ICT-ISS.

Table B1

3.2 The ICM-MTN considered a proposal to allocate a specific data type T_2 for the data presented in the code form FM 65-XI Ext. WAVEOB. The meeting recommended to invite the ICT-ISS to further consider this question, in particular to identify the requirements and possible issues and impacts of such an allocation.

Action proposed

It is proposed to allocate T_2 = W when T_1 = S for the data presented in the code form FM 65-XI Ext. WAVEOB, and to delete the reference to FM 65 (WAVEOB) for T_2 = O when T_1 = S .

3.3 Noting the present duplication of the allocation of abbreviated headings for ozone bulletins, the ICM-MTN recommended that the designator T_2 = L be deleted from table B1 (T_1 = S).

Action proposed

It is proposed to delete the designator T_2 = L from table B1 (T_1 = S).

Table B2

3.4 The ICM-MTN noted that current Table B2 covers both GRIB/GRID and pictorial information; As proposed by RTHs Melbourne and Toulouse, it could therefore be split into two Tables, a revised Table B2 for GRIB/GRID bulletins (= D, G, H, X or Y) and a new Table B6 for pictorial information (T_1 = P, Q). The letters C, F, G, I, L, M, S, X and Y for T_2 are only used for pictorial products, and can be allocated to GRID/GRIB bulletins containing new products, such as vorticity and divergence data. The meeting agreed on the principle of using two Tables, a revised Table B2 for GRIB/GRID bulletins (T_1 = D, G, H, X or Y) and a new Table B6 for pictorial information (T_1 = P, Q). The meeting recommended that the ICT-ISS further consider the detailed allocation of the data type designators T_2 in these two Tables.

Action proposed

It is proposed to amend Table B2 and add a Table B6. The members of the ICT-ISS should first review the draft proposal and make comments to the Secretariat. The Secretariat should send the refined proposal to the RTH focal points for comments and submit the compiled comments to the ICT-ISS.

Draft proposal for amendments to Table B2

Data type designator T_2 (when T_1 = D, G, H, V, X or Y)

Instructions for the proper application of the data type designator

1. The designator specified in this table should be used to the greatest extent possible to indicate the type of data contained within the text of the bulletin.

2. Where more than one type is contained in the text, the designator for one of the data types should be used.

3. When the table does not contain a suitable designator for the data type, an alphabetic designator which is not assigned in the table should be introduced and the WMO secretariat notified.

Designator	Data Type	Designator	Data Type
A	Radar data	N	Radiation
B	Cloud	O	Vertical velocity
C	Vorticity	P	Pressure
D	Thickness (relative topography)	Q	Wet bulb potential temperature
E	Precipitation	R	Relative humidity
F			
G	Divergence	T	Temperature
H	Height	U	Eastward wind component
		V	Northward wind component
J	Wave height + combinations	W	Wind
K	Swell height + combinations		
M	For national use	Z	Not assigned

Draft proposal for a new Table B6

Data type designator T_2 (when T_1 = P, Q)

Instructions for the proper application of the data type designator

1. The designator specified in this table should be used to the greatest extent possible to indicate the type of data contained within the text of the bulletin.

2. Where more than one type is contained in the text, the designator for one of the data types should be used.

3. When the table does not contain a suitable designator for the data type, an alphabetic designator which is not assigned in the table should be introduced and the WMO secretariat notified.

Designator	Data Type	Designator	Data Type
A	Radar data	N	Radiation
B	Cloud	O	Vertical velocity
C	Clear air turbulence	P	Pressure
D	Thickness (relative topography)	Q	Wet bulb potential temperature
E	Precipitation	R	Relative humidity
F	Aerological diagrams (Ash Cloud)	S	Snow cover
G	Significant weather	T	Temperature
H	Height	U	Eastward wind component
I	Ice flow	V	Northward wind component
J	Wave height + combinations	W	Wind
K	Swell height + combinations	X	Lifted index
L	Plain language	Y	Observational plotted chart
M	For national use	Z	Not assigned

FOCAL POINTS ON THE FEASIBILITY STUDY OF AN IMPROVED RMTN IN REGION II

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EUMETSAT MDD in Region II

Activities of the Sub-group on regional aspects of GTS

1. Background information

1.1 The twelfth session of Regional Association II (Seoul, Republic of Korea, September 2000) was informed of the concurrence by EUMETSAT to extend the existing MDD status in Regions I and VI to Region II. The Association agreed to integrate MDD into the RMTN as an inter-regional component and expressed its appreciation to EUMETSAT. The Association further agreed that, in accordance with CBS guidelines, a co-ordination mechanism should be developed to ensure that requirements of the user WWW centres of MDD in Region II were met to the largest extent possible. The Association requested its Working Group on Planning and Implementation of the WWW to establish the necessary arrangements, to prepare the relevant amendments to the Manual on the GTS – Volume II – Regional Aspects – Region II (Asia) – in co-operation with the operator of the MDD and to submit them to the president of the Association for approval.

1.2 The chairman of the Working Group on Planning and Implementation of the WWW in Region II has established an MDD group of experts entrusted with the task of developing proposals:

- For the development of a co-ordination mechanism to ensure that requirements of the user WWW centres of MDD in Region II are met to the largest extent possible;
- For amendments to the Manual on the GTS.

The membership of the group includes:

- Alexander Gusev, co-ordinator of the Sub-Group on Regional Aspects of the GTS in Region II (convener)
- Fereydoon Minavi(Islamic Republic of Iran)
- Ahmed Hamoud Mohammed Al Harthy (Oman)
- Volker Gärtner (EUMETSAT)
- The WMO Secretariat

The group would only work by correspondence.

2. Development of a co-ordination mechanism to ensure that requirements of the user WWW centres of MDD in Region II are met to the largest extent possible

2.1 The following mechanism is proposed:

- A RA II MDD schedule group is entrusted to compile data and products requirements of the WWW centres receiving MDD in Region II, to prepare proposals for changes to the MDD transmission programmes with indications of priorities and to submit the proposals to the chairman of the Working Group on Planning and Implementation of the WWW in Region II.
- The chairman of the Working Group on Planning and Implementation of the WWW in Region II reviews and submits the proposals for changes to the MDD transmission schedules to a focal point designated by EUMETSAT, through the WMO Secretariat.

2.2 It is suggested that the membership of the RA II MDD schedule group be established as follows:

- The co-ordinator of the Sub-Group on Regional Aspects of the GTS in Region II (chairman)

- Two experts designated by RA II Members countries receiving MDD (one operating an RTH and the other an NMC)
- One representative of EUMETSAT
- One representative of the WMO Secretariat (Secretary)

2.3 The RA II MDD schedule group would work by correspondence.

3. Preparation of amendments to the Manual on the GTS

3.1 The content of the paragraph 3.11 of the Manual on the GTS – Volume II – Regional Aspects – Region II (Asia) is related to the satellite-based communication system operated by China. It is proposed to move this content to a new paragraph 3.11.1. The amendment related to MDD should consist in the drafting of a new paragraph 3.11.2.

3.2 The following paragraph 3.11.2 is included in the Manual on the GTS – Volume II – Regional Aspects – Region I (Africa) – Part I:

"3.11.2 The METEOSAT geostationary meteorological satellites operated by EUMETSAT provide a meteorological data distribution (MDD) service as part of the RMTN. RTHs Bracknell, Rome and Toulouse operate MDD uplink Earth stations and ensure the input of selected meteorological information, included selected data and products from RTHs and RSMCs in Region I."

Action: The MDD group is invited to consider the inclusion of a similar paragraph 3.11.2 into the Manual on the GTS – Volume II – Regional Aspects – Region II (Asia) – Part I. The text should take into account the implementation of Meteosat Second Generation (MSG) in the near future which will eventually replace the current Meteosat. With MSG, the MDD programme will be embedded in the LRIT digital transmission that is uplinked by the primary EUMETSAT Earth station.

UK Satellite Facilities Pilot Project
to Broadcast Data and Products for WWW Purposes

1. Introduction

The UK Met. Office (UKMO) operates a satellite distribution facility for meteorological data. Part of the available capacity is funded by the International Civil Aviation Organisation (ICAO) and is used to send data on the SAtellite DIStribution service (SADIS) to aviation customers in Europe, Africa and Asia. UKMO itself funds the remaining capacity, which is used to meet UK national requirements; this part is known as the UK Satellite Facility (UKSF). Part of the capacity of the UKSF has been offered to WMO to help meet requirements for the distribution of meteorological data within the World Weather Watch (WWW) programme. It was concluded that this offer was of potential benefit to WMO Region II because the footprint of the Intelsat used for SADIS/UKSF has excellent coverage of this region.

This paper describes the technical aspects of the operation of the satellite broadcast facility. A Pilot Study for its use in Region II in support of WWW and an outline implementation plan are discussed.

2. The UKMO Satellite Broadcast System

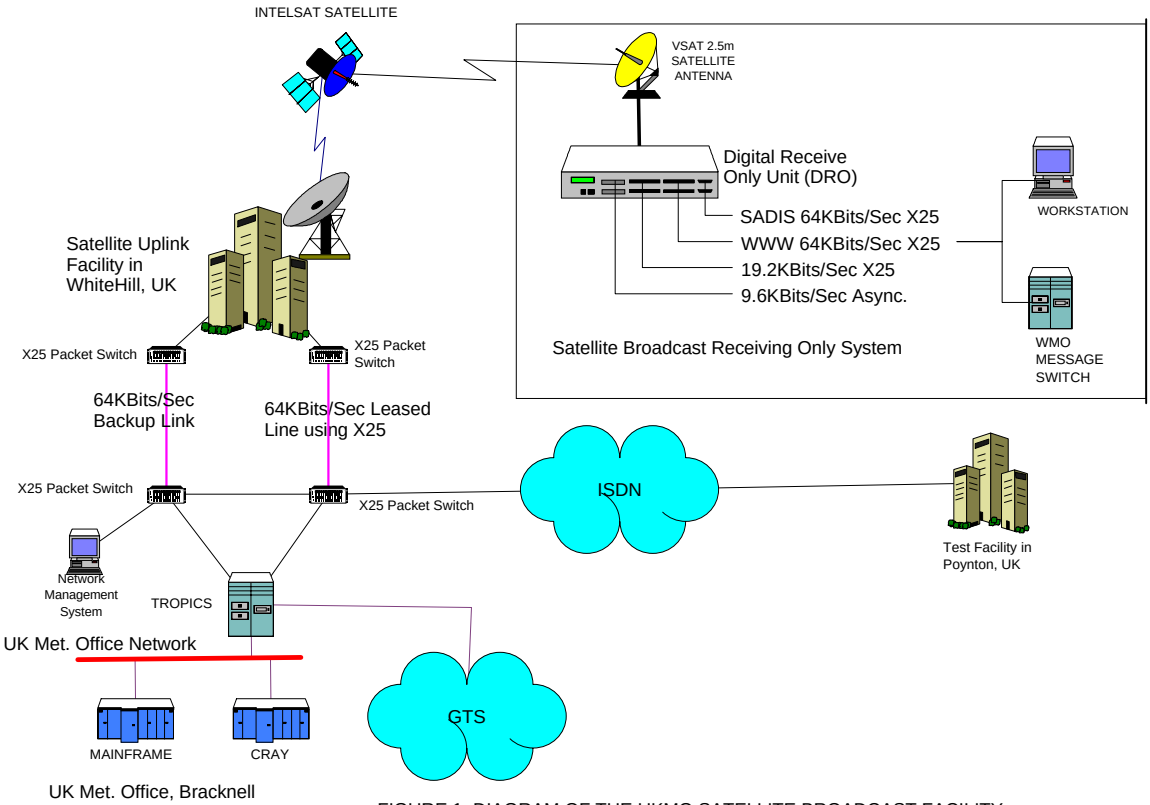


FIGURE 1: DIAGRAM OF THE UKMO SATELLITE BROADCAST FACILITY

2.1 System Description

A diagram of the UKMO satellite broadcast system is shown in Figure 1. The data for transmission on the satellite broadcast is sent from the UKMO WMO message switch TROPICS to the satellite uplink facility at Whitehill, UK over a 64 Kbits/Sec leased line using X25. A backup line via an alternate route is available if the main one fails.

There is a test system located at Poynton, UK. It simulates the operational system and allows changes to be tested before they become operational. Data can be provided to the test system using an ISDN connection.

A Network management System (NMS) at Bracknell is used to control the processing equipment at the satellite uplink station.

The satellite uplink facility uses a 15m diameter dish to broadcast the data via 'Intelsat 604' which is located in a geostationary orbit at 60° East.

The capacity of the satellite broadcast is 128Kbits/Sec; however, the forward error correction necessary to obtain reliable data transfers reduces the effective capacity available to the UKMO to 64Kbits/Sec and provides transmission error rates of 1 in 10^9. The available capacity is divided into 38.4KBits/Sec for SADIS and 25.6Kbits/Sec for the UKSF.

2.2 Data Reception System

The data is received by a VSAT satellite antenna and passed to a Digital Receive Only (DRO) unit that outputs the data from one of four ports. Each port is used for a separate service; for example, port 2 is reserved the data for WWW. This port supports X25 and operates at 64Kbits/Sec. This port can be connected to any system capable of handling WMO bulletins sent using X25 such as a WMO message switch or a suitably configured Workstation.

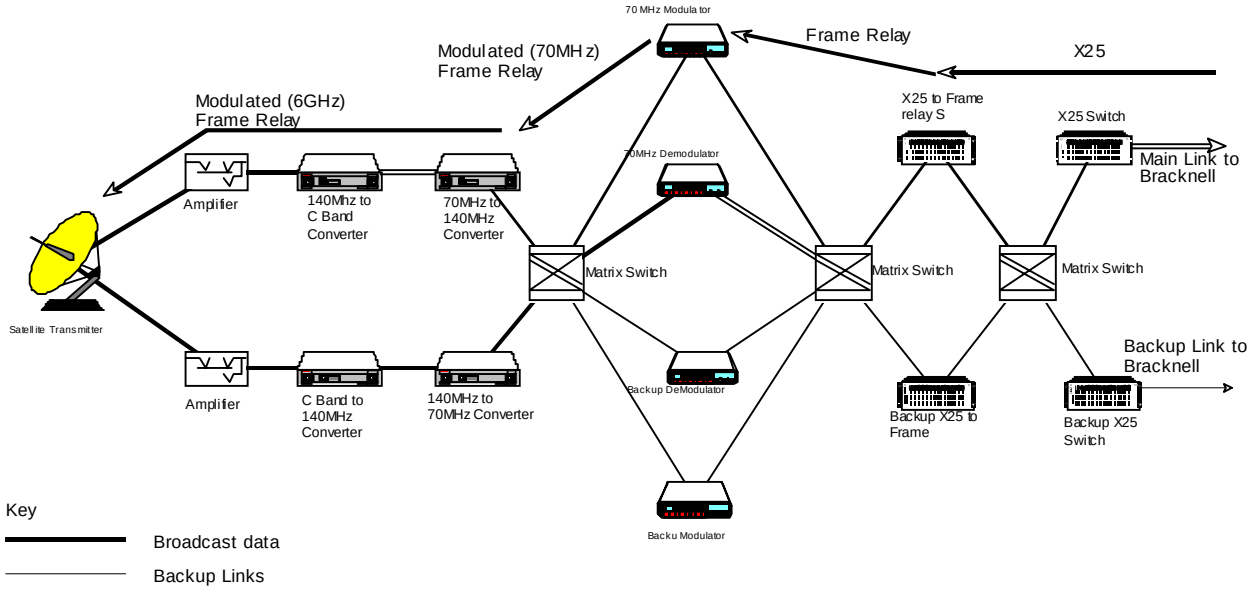
With forward error correction on the satellite broadcast the error rates are typically one in 10^9. The approximate cost of the various elements of the receiving system is shown in Table 1.

Table 1: Receiving System Approximate Costs

Equipment	**Suppliers**	**Cost**
VSAT Antenna	Many Suppliers	£1,000.00 to £2,000.00
Digital Receive Only unit	Astrium	£5,000.00
Workstation *	Information Available at : http://www.met-office.gov.uk/sadis	£5,000.00 minimum

* Note that the Workstations are only configured to receive SADIS data from Port 1 of the DRO, they would have to be modified to receive the WWW data on port 2.

Figure 2: The Satellite Uplink Facility at Whitehill, UK



2.3 The Satellite Uplink Facility

A more detailed diagram of the satellite uplink facility at Whitehill is shown in figure 2. The data coming in from Bracknell in X25 is converted to Frame Relay before being modulated at the satellite uplink carrier Frequency of 6.3GHz and sent up to the satellite.

Parts of the processing chain are duplicated. The matrix switches allow processing to be switched to a backup component using the Network Management System at Bracknell.

2.4 The Coverage of the satellite Broadcast

Figure 3 shows the footprint of the broadcast.

Figure 3: Footprint of the Satellite Broadcast

2.5 System Status and Proposed Enhancements

The current system has been operating the SADIS broadcast for ICAO since March 1995. During the period 2000/2001 the system was enhanced to enable reception of data from a specified number of 2-way systems. This 2-way service is currently under trial with an aim to declaring it operational by July 2002, and will be available to ICAO members from that point. This enhancement also enabled the UK to provide a broadcast for RA II members, as described in section 3 below.

The licence for the SADIS satellite bandwidth is scheduled to expire in 2004, but it is anticipated that ICAO will ask the UK to extend this for a further period, probably until 2009.

We have encountered difficulties with the supplier of the receivers. The original US supplier of a part of the DRO has sold the patent rights to another company and there has been an interruption in the supply of receivers. However the new company has now promised to start supply of the parts so that receivers will be available as from May 2002, but unfortunately at an increased charge.

3. Use of the UKSF by WMO Region II Members

The Met Office has offered the use of part of the UKSF bandwidth to provide a broadcast of data for reception by WMO Regional Association II. The broadcast was implemented at the end of November 2000 and is available on port 2 of a SADIS receiver but currently contains only a limited amount of observational data. RTH Moscow has routed RA II data to Bracknell over the GTS connection between our two centres.

A pilot project was proposed to test the usefulness and ease of reception of this broadcast and Macao, Nepal and Sri Lanka have volunteered to take part in this trial. The Met Office has offered to support, through the VCP, either the upgrade of existing receivers or provision of receivers where none exists at these sites, and is currently in discussion with Astrium and the workstation suppliers to this end. However no timetable for this is yet available.

To make best use of the available capacity it is recommended that a UKSF user group is formed. That group would be responsible for consolidating the requirements of the WMO region II members for the WWW data to be transmitted.

There are a number of possible data sets that could be sent to WMO Region II members:

Observations: As mentioned above RTH Moscow provides some observational data required for regional use to Bracknell over the GTS and these are relayed. The data volume of the observations is small, less than 2MBytes per day. The UKMO does receive aviation meteorological data from states within Region II, but these products are broadcast over SADIS and so would not be included as part of this proposal.

Charts: UKMO do not produce charts for the WMO region II area except those for the aviation community that are already on the SADIS broadcast. UKMO do receive charts from both Moscow and Tokyo that we could include if requested by the users. The average size of a low resolution T.4 chart is about 60KBytes; high resolution charts are 100KBytes.

Forecast Products: Forecast products as defined in the Bracknell catalogue and agreed as part of WMO resolution 40 can be made available. The data volume of a typical output from the numerical model at Bracknell on a 2.5 degree by 2.5 degree grid in 6 hours time intervals is about 3MBytes of data. It is possible that this data may need to be sent twice in case errors prevent the data from being reconstructed.

Table 2 shows the time taken to send this data using the bandwidth available assuming the data throughput is 90% of the available bandwidth:

Table 2 Expected Transmission Times of WWW Meteorological Data

Data Type	**Size**	**Transmission Time**
Observations	2MBytes per Day	12 minutes per day
One T4 Chart	60KBytes per Chart	20 seconds per Chart
GRIB Forecast Model Data.	3MBytes	36 minutes (assuming sent twice)

4. Pilot Project

The aim of the Pilot Project is to establish the ease of implementation of the equipment and the ease and efficiency of reception of the broadcast data at the pilot sites. To help measure this, it will be useful to receive from the pilot sites timing information of reception of data and products, plus a report on any difficulties encountered in installing and commissioning the reception equipment. Exact details of the information required have yet to be identified, but will be detailed before the project begins.