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COMMISSION FOR BASIC SYSTEMS

ABRIDGED FINAL REPORT OF THE EXTRAORDINARY SESSION

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NOTE

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CONTENTS

ANNEXES

Page

GENERAL SUMMARY OF THE WORK OF THE SESSION

1. OPENING OF THE SESSION (agenda item 1)

1.1 The Extraordinary session (1990) of the Commission for Basic Systems (CBS) was held in London from 24 September to 5 October 1990 at the invitation of the Government of the United Kingdom. The session, which took place in the headquarters building of the International Maritime Organization, was opened at 10 a.m. on 24 September 1990 by Dr A.A. Vasiliev, president of the Commission.

1.2 Lord Arran, the Under-Secretary of State for the Armed Forces in the Government of the United Kingdom, welcomed the participants to Britain. He considered it very appropriate for the Commission for Basic Systems to be meeting in the headquarters of the International Maritime Organization as operational weather forecasting had its roots deeply set in shipping. He recalled that in 1854 the British Government had appointed Captain Robert Fitzroy to gather and collate marine meteorological observations. Fitzroy's concern for the terrible loss of life and ships in storms around the British Isles had led to the first analysis of weather patterns and eventually to Britain's first storm warning being issued by the Meteorological Department in 1861. This had been made possible by the development of the electric telegraph which permitted the rapid collection of meteorological observations and provided the key to international co-operation in the exchange of meteorological data through what is now the Global Telecommunication System.

1.3 Lord Arran considered that this commitment to sharing information among all countries, independent of political or geographical boundaries, was a most refreshing characteristic of the meteorological community. On the topic of climate change, which he recognized was not within the terms of reference of CBS, Lord Arran emphasized the importance of CBS's role in providing for regular and accurate observations necessary for research into man's influence on climate. On behalf of Her Majesty's Government he formally acknowledged the role played by WMO, and its technical commissions, the CBS in particular, in giving mankind the basic tools with which to address the problem. He wished the participants a successful meeting.

1.4 On behalf of the Secretary-General of WMO, the Deputy Secretary-General, Dr D.N. Axford welcomed the participants on behalf of the Organization. He conveyed the Secretary-General's regrets at not being able to be present at the opening of the session because of other commitments in connection with the preparations for Negotiations on a Climate Convention; the Secretary-General did however plan to address the session on Monday, 1 October 1990. Dr Axford expressed his gratitude to the Government of tbe United Kingdom and to the Meteorological Office for the invitation to hold the session in London and for having made all the necessary arrangements. He also thanked the Secretary-General of the International Maritime Organization for having placed such excellent facilities at the meeting's disposal. The Deputy Secretary-General paid tribute to the great meteorological traditions of the United Kingdom and to the major contributions to the science of meteorology that had been made by British scientists. The United Kingdom also had a long and distinguished history in the international aspects of meteorology and still played a very active role in WMO affairs and in the activities of CBS in particular. He expressed the Organization's special appreciation for the interest and support by the United Kingdom Government in the area of climate change.

1.5 Dr Axford stressed the importance of the Commission's main task in ensuring world-wide co-operation in the operation and further development of the World Weather Watch, the core programme of the Organization on which much of its other activities depend. He noted that the session's agenda included items covering the three main components of WWW, the Global Observing System (GOS), the Global Data-processing System (GDPS) the Global Telecommunication System (GTS), as well as the support functions of data management and implementation support activities. In these days of rapid technological advances, of increasing concerns regarding man's influence on weather and climate and ever more demanding requirements placed upon the system for accurate and reliable data and information, Dr Axford felt that the Commission's tasks, not only at the current session but in the years ahead, could not be overestimated. He assured the meeting of the full support of the Secretariat and wished it every success in its deliberations.

1.6 In welcoming participants to the headquarters building of the International Maritime Organization, the Secretary-General of IMO, Mr W.A. O'Neil, remarked on the close and fruitful co-operation that had always existed between IMO and the relevant bodies of WMO based on the interdependence between meteorological services and shipping. WMO had always provided every assistance necessary to help IMO achieve its objectives of safer ships and cleaner oceans. He welcomed the continuing progress being made in the reliability of weather forecasts upon which safety of life at sea so much depends and referred to the development of the global maritime distress and safety system to be implemented between 1992 and 1999, for the dissemination of maritime safety information including storm warnings and forecasts.

1.7 Dr J. Houghton, Permanent Representative of the United Kingdom with WMO, said how pleased he was that CBS should be meeting in London. He considered that CBS was the most important of the WMO technical commissions as it provided the basis for almost all meteorological work. He referred to recent developments in computer modelling and emphasized that better models required better observations. He felt that high quality data with good geographical coverage was the key to the meteorology business and he hoped CBS would continue to devote a major part of its effort to this end.

1.8 In concluding the opening ceremony the president of the Commission, Dr A.A. Vasiliev, thanked the previous speakers for the warm words addressed to the Commission and expressed his appreciation to the Government of the United Kingdom and to the Secretary-General of the IMO for the kind invitation and facilities provided for the session. The president emphasized the importance of improving the WWW system to meet the requirements of Meteorological Services and to provide data for studies of urgent problems related to global climate change, the preservation of the ozone layer and the mitigation of natural disasters. He felt that future CBS activities should be focused on the search for new ways to obtain observational data, to eliminate losses of information, to overcome delays in the implementation of regional WWW development plans, to improve the accuracy of forecasts, and to facilitate access to products from GDPS centres. He added that in the field of data management, further improvements were needed in monitoring data quantity and quality. The president expressed the hope that the session would find efficient and acceptable solutions to the problems submitted for its consideration.

1.9 On Monday, 1 October 1990, the Secretary-General, Professor G.O.P. Obasi addressed the meeting. He re-iterated the thanks of the Organization to Her Majesty's Government for the invitation to hold the meeting in London and to Dr Houghton and his staff for making all the necessary preparations. Professor Obasi emphasized the importance of the Commission's work in the development and operation of the World Weather Watch. He referred to the great advances and achievements that had been made since the birth of the WWW including, for example, the fact that the level of skill of current five-day forecasts was about the same as for one-day forecasts in the 1950s. While WMO and CBS could be justly proud of their achievements, the need to continuously re-examine, refine and update the basic systems must, nevertheless, be recognized; greater use of automation, enhanced telecommunication services, more efficient forms of data representation, increased standardization and improved data quality were some of the areas which he felt required attention.

1.10 The further development of the system was especially important in the light of the many challenges with which the Organization was faced. These included the need to reduce the adverse effects of severe weather phenomena as part of the global effort being undertaken during the International Decade for Natural Disaster Reduction in which WMO is playing a leading role. The world-wide attention being given to the issue of climate change due to the enchanced "greenhouse effect" will of course have a major impact on WMO activities in the future and there will no doubt be additional requirements placed upon the WWW system in this regard. Professor Obasi stressed however that if WWW is to continue to develop and function as a world-wide system then we must, in the long-term interests of all Members, accelerate the co-ordinated transfer of technology and know-how to the less advanced countries. He wished all participants a successful conclusion to their discussions and a pleasant stay in London.

1.11 There were 111 participants at the session. These included representatives of 51 Members of WMO and 9 international organizations. A complete list of participants is given in Annex I to this report.

2. ORGANIZATION OF THE SESSION (agenda item 2)

2.1 Consideration of the report on credentials (agenda item 2.1)

At the first plenary meeting, the representative of the Secretary-General presented a provisional list of participants which was accepted as a first report on credentials; further reports were submitted to the session at ensuing plenary meetings. It was decided not to establish a Credentials Committee.

2.2 Adoption of the agenda (agenda item 2.2)

The provisional agenda was adopted by the session without change. The final agenda is reproduced as Annex II to this report.

2.3 Establishment of committees (agenda item 2.3)

2.3.1 Two working committees were set up to examine in detail the various agenda items:

(a) Committee A to consider agenda items 6.1, 6.2, 6.3, 6.4 and 6.5. Mr E.A. Mukolwe (Kenya) and Dr P. Ryder (United Kingdom) were unanimously elected co-chairmen of the committee;

(b) Committee B to consider items 6.6, 6.7, 8, 9 and 10. Mr X. Wu (China) and Mr F.S. Zbar (USA) were unanimously elected co-chairmen of the committee.

2.3.2 In accordance with Regulation 27 of the WMO General Regulations the Commission established a Co-ordination Committee composed of the president of CBS, the chairmen and secretaries of Committees A and B and the representative of the Secretary-General. Ms Telma A. Godoy (Chile) was appointed rapporteur on previous recommendations and resolutions of the Commission.

2.4 Other organizational questions (agenda item 2.4)

Under this agenda item, the Commission agreed that in accordance with WMO General Regulations 109 and 110 no minutes of the session would be prepared but any statements made by delegations would be reproduced and distributed if and when requested. The Commission agreed on the working hours for the duration of the session.

3. REPORT BY THE PRESIDENT OF THE COMMISSION (agenda item 3)

3.1 The Commission noted with appreciation the report of the president which detailed information on the activities of CBS since its ninth session. It was noted with satisfaction that it had been possible to convene over 30 meetings on subjects relevant to CBS and/or WWW. The Commission expressed its particular appreciation for the detailed report on the fifteenth session of the Advisory Working Group which had made an extensive review of and provided guidance on the Commission's ongoing activities.

3.2 The Commission endorsed the various actions and decisions taken by the president on its behalf and considered the various other questions raised in his report under the relevant agenda items of the session.

4. STATUS OF WWW IMPLEMENTATION AND OPERATION, INCLUDING MONITORING (agenda item 4)

Status of implementation of the GOS

4.1 The Commission noted that, although there were wide variations from Region to Region and from one observation time to another, the levels of implementation of the surface and upper-air observing programmes in relation to the requirements of the regional basic synoptic networks remained at about 88% and 82% respectively. Whilst these figures represented very little change over the previous few years, the actual number of observations made at the main standard times had increased in the past decade by some 3% for surface observations and over 5% for upper-air observations. It was further noted that:

(a) In addition to the stations included in the regional basic synoptic networks, the GOS surface-based sub-system also included some 5000 supplementary stations established to meet national needs, 7000 voluntary observing ships, some 200 drifting buoys and more than 600 stations with meteorological radars;

(b) The space-based sub-system included four polar-orbiting and five geostationary meteorological satellites. These satellite-based systems provided observation (imagery, vertical soundings, etc.) as well as data collection and meteorological information dissemination services.

Status of implementation of the GDPS

4.2 The Commission noted that the three WMCs Melbourne, Moscow and Washington, continued to produce and disseminate more than 300 analyses and forecasts daily.

4.3 More than 2 300 analyses and forecasts were prepared daily at the 26 RSMCs; among them were 25 RSMCs with geographical specialization and three RSMCs with activity specialization on tropical cyclone forecasting. The latter are co-located with RSMCs with geographical specialization. The sole RSMC with activity specialization on medium-range weather forecasting is the European Centre for Medium-Range Weather Forecasts (ECMWF). In addition, some NMCs, the World Area Forecast Centres and Regional Area Forecast Centres transmitted their products over the GTS.

4.4 The three WMCs, 19 RSMCs and 15 NMCs use computerized numerical weather prediction methods.

4.5 The WMO GRID and GRIB codes are being used increasingly for disseminating processed information.

Status of implementation of the GTS

4.6 The Commission noted that the current Main Telecommunication Network consisted of 22 circuits, all of which were in operation:

(a) 14 circuits are telephone-type circuits operating at a data-signalling rate of at least 9 600 bit/s using multiplexing facilities; the circuit Bracknell-Washington has been upgraded to allow a data-signalling rate of 64 000 bit/s and the same upgrading is planned in 1990 for the circuit Bracknell-Paris and Offenbach-Paris;

(b) Three other circuits are also telephone-type circuits at a data-signalling rate of 1 200 or 2 400 bit/s, or multiplexed to transmit simultaneously alphanumerical data and analogue facsimile;

(c) The remaining five circuits are operating at 50/100 bauds.

4.7 The full X.25 procedures (including packet level) which permit the exchange of data in binary form (for example, in GRIB or BUFR code form) are implemented on five circuits of the MTN and are planned on eight other circuits.

Global annual monitoring of WWW operations

4.8 The Commission was informed that the change in composition of the global exchange list, which corresponded to an increase of about 50% in the number of SYNOP reports expected to be received each day and which were to be monitored, precluded a direct comparison between the results for October 1989 and those for previous years. It was possible, however, to compare, Region by Region, the number of reports actually received with those expected from the RBSNs and this showed that 65% were received at MTN centres. A similar comparison made for those stations included in the global exchange list for 1987 gave 70% receipt at MTN centres. The Commission further noted that 66% of TEMP reports from stations included in the RBSNs were received at MTN centres which was much the same as in previous years although there were slightly fewer from Regions I, III and IV.

4.9 Concern was expressed by several members of the Commission that, while the statistics presented did not provide a complete picture of the actual situation, the evidence was enough to show that the level of implementation of the GOS was at best static and had even declined in some Regions. The fact that about one-third of all SYNOP and TEMP reports were not reaching GTS monitoring centres was clearly a matter that should receive attention and led the Commission to stress the importance of a more effective use of existing facilities and their enhancement where necessary.

4.10 The shortage of trained staff, the difficulties in assigning staff to remote areas and the high cost of consumables were other reasons for the lack of progress. The Commission therefore stressed again the need for greater efforts in education and training in the developing countries, the need for accelerated work in the development and deployment of automatic and semi-automatic weather stations, and for alternative solutions to avoid the high costs of upper-air sounding equipment.

4.11 Many members pointed to problems of determining the true status of WWW operations from the existing monitoring procedures and methods of analysis and presentation of the data. The Commission recalled, however, that the Working Group on Data Management was looking into the question of procedures and it invited the Secretariat to look into ways and means of improving the presentation of the information so as to provide a better indication of multi-year trends through the use of graphical representation. It was hoped also that the discrepancies in the monitoring of SHIP and AIREP reports could be resolved and in this connection it was pointed out that, although the number of voluntary observing ships had decreased somewhat in recent years, the number of reports received at GDPS centres was thought to have increased substantially due to increased use of satellites for data collection.

4.12 Finally the Commission was pleased to note that there had been a certain increase in the number of stations providing CLIMAT and CLIMAT TEMP reports but that the percentage of reports received had decreased somewhat. It was agreed that these could and should be further increased to meet all the requirements for such information. It also urged Members to inform the Secretariat of any changes in this connection to upgrade the information contained in Volume A.

5. DEMONSTRATION OF CAPABILITIES OF RSMCs MIAMI, NEW DELHI AND TOKYO (agenda item 5)

5.1 The Commission received with appreciation the presentations of RSMCs New Delhi, Miami and Tokyo which had specialization in tropical cyclone tracking and forecasting. It was noted that these centres had been providing the required services for several years with a high degree of reliability and contributed in no small measure to the mitigation of harmful effects of tropical cyclones. These presentations were requested by CBS-IX to serve as examples that would help define how future RSMCs would provide a demonstration of their capabilities as part of the established designation procedure.

5.2 The Commission was impressed by the high level of operational and scientific capabilities reached by the three centres. It noted with appreciation the continuing progress and future plans to develop further these capabilities.

5.3 The Commission considered in some detail the guidelines for the demonstration of RSMC capabilities developed by the CBS Working Group on the GDPS with a view to providing relevant advice for future presentations. In doing so it recognized that there was a large range of technical capabilities and infrastructure arrangements among Members. While confirming that the guidelines recommended by the Working Group on GDPS have proven to be useful as a basis for the demonstrations to CBS-Ext.(90), the Commission highlighted a number of aspects which needed to be covered in future demonstrations.

5.4 Emphasis was given to establishing a closely defined relationship between the RSMC and the WWW Meteorological Centres as regular users of RSMC products. This relationship must be backed up by a commitment of the RSMC to provide the agreed products and services.

5.5 In further elaboration of Recommendation 1 (CBS-IX), the Commission considered that, in pursuance of RECOMMENDS (4), the prospective RSMC should:

(a) Commit itself to make available a set of products and services designed to meet the given requirements, where appropriate in terms of specific forecast parameters and formats, the frequency of their issue and targets for timeliness, overall reliability and quality;

(b) Propose method(s) and procedures by which such products and services will be delivered;

(c) Propose method(s) and procedures by which ongoing performance will be assessed (e.g. by verification);

(d) Propose method(s) by which particular WWW Meteorological Centres' changing requirements could be made known and improvements in operational performance introduced by the RSMC;

(e) Address the question of contingency and back-up arrangements to cover situations where the RSMC may not be able to provide the required services.

5.6 In pursuance of RECOMMENDS (5) in Recommendation 1 (CBS-IX) the prospective RSMC should expect to demonstrate its general capabilities of relevance to the service to be offered (such as access to relevant data and processing capability) its ability to meet the above commitment and the suitability of its other proposals.

6. SPECIFIC WWW MATTERS, INCLUDING REPORTS BY THE CHAIRMEN OF WORKING GROUPS AND RAPPORTEURS (agenda item 6)

6.1 Global Data-processing System (agenda item 6.1)

Report of the chairman of the Working Group on the GDPS

6.1.1 The Commission noted with appreciation the report of the chairman of the CBS Working Group on the GDPS, Dr N.F. Veltishchev (USSR). The Commission expressed its great satisfaction with the important work carried out by the group at its seventh session, Geneva, 17-21 April 1989, by various sub-groups of the working groups and also those activities accomplished by correspondence since CBS-IX. The topics covered in the report of the chairman and the seventh session are discussed in detail under various sub-items of this agenda item.

Review of implementation of RSMCs with geographic specialization

6.1.2 The Commission noted with satisfaction the status of implementation of RSMCs with geographic specialization and considered that in general most RSMCs with geographic specialization fulfilled the requirements in the WWW plan but expressed some concern that some RSMCs were not fully functioning. It urged the relevant Members to increase their efforts and, if necessary, seek external assistance towards full implementation of the RSMCs. It invited regional associations to review the present GDPS network and, where appropriate, restructure it in accordance with current requirements and capability of Members to implement RSMC functions. It requested its Working Group on the GDPS to continue monitoring the progress in the implementation of RSMCs as one of its important ongoing tasks.

Review of implementation of RSMCs with activity specialization

6.1.3 The Commission noted with appreciation that efforts had been made by the designated RSMCs with activity specialization to provide the necessary specialized output products to meet the requirements of other GDPS centres as well as the end users. It invited the designated centres to consider dissemination of additional products in accordance with stated requirements. CBS was informed that France and the United Kingdom intended to apply for RSMC status using the approved procedures. France wished to offer RSMC services with activity specialization in the provision of meteorological products for use in atmospheric pollution emergency. The United Kingdom wished to offer specialization in marine services. Fiji indicated that it was proposing its NMC to become an RSMC with tropical cyclone specialization. France also stated its intention to propose St Denis/Réunion as an RSMC with specialization in tropical cyclone forecasting.

Demonstration of capability of RSMCs

6.1.4 The Commission reviewed the demonstration of functions and services of the newly designated RSMCs with activity specialization in tropical cyclone forecasting (New Delhi, Miami and Tokyo) and recorded its conclusions under agenda item 5.

Survey on the capability of various GDPS centres

6.1.5 The Commission noted with interest the evaluation carried out by its Working Group on the GDPS on capabilities of various centres. It was noted that during the past years, great progress had been made in the introduction and updating of computer systems in GDPS centres. It was also noted that currently all three WMCs and most of the RSMCs were equipped with computer systems for data collection, transmission and processing. Most NMCs in RA VI are also equipped with computer systems, but gaps are evident in RA I, RA III and parts of RA II, RA IV and RA V, especially in developing countries.

6.1.6 Regarding the objective analysis scheme(s) and NWP model(s) used by various GDPS centres, rapid progress had been made in the improvement and updating of the operational NWP models as well as in the objective analysis schemes. It was also noted that the overall quality of NWP products had steadily improved during the past years due to intensive research and development efforts and the improvement of technologies, such as supercomputers, satellites and high-speed telecommunications. It was also noted that the capabilities of some NMCs, especially those not equipped with computers or lacking good communication facilities, needed to be improved to enable the use of available NWP products. The session stressed the importance of the need to develop and maintain adequately equipped and staffed NMCs to provide better meteorological services. In this connection the Commission urged the Meteorological Services of developing countries whose NMCs were not yet equipped with real-time computer systems to make every effort to bridge the gap. It invited Members with means and capabilities to provide technical assistance in training, specification of requirements, implementation of micro-computer systems at NMCs for data collection, transmission, product reception, real-time processing/handling and interpretation of products from other major centres. The Commission noted with appreciation that forecasters from developing countries were already working alongside those in at least two major GDPS centres for periods of training in the use of NWP products.

6.1.7 The requirement for further improvement of NWP products, especially for the tropical regions, was noted. The session considered that improved feedback was desirable to enable information on the quality of the products to reach those responsible for developing the operational NWP models.

Requirements for global exchange of WWW products

6.1.8 The Commission noted with satisfaction that the WMCs and RSMCs were providing products over a wide range including global, hemispheric and regional products with periods of forecast up to 144 hours (6 days) outside the tropical belt and up to three days over the tropics.

6.1.9 The Commission noted that, in comparison with stated requirements, some deficiencies still existed:

(a) The quality of some of the products for the tropics was inadequate. Since most of the products for the tropics were from global models, special consideration needed to be given to tropical problems in those models. Useful products for the tropics were still confined to forecast periods of up to three days;

(b) The number of products available needed to be increased. For example, there was a requirement for higher resolution products in several areas of application. New products, such as forecasts of tropical cyclone tracks, also needed to be developed;

(c) The quantity and availability of products from regional models or fine-mesh models was inadequate. Some of these types of products were available only at the producing centre but not transmitted on the GTS. Similar situations existed for the specialized or tailored products from RSMCs.

The Commission invited Members operating WMCs/RSMCs to take measures with a view to mitigating these deficiencies.

6.1.10 The Commission noted with satisfaction the report of the CBS Working Group on GDPS, Subgroup on exchange of output products. It considered the results of analyses of requirements for output products from GDPS centres based on responses to a survey carried out and noted the conclusions of the subgroup that:

(a) The requirements for products from GDPS centres were not being fully met;

(b) In a large majority of cases the products requested were those advertised as available by the GDPS centres in question;

(c) Among the reasons for the failure to receive these data, problems of communications, as indicated in additional comments in some Members' responses, were undoubtedly very important.

The Commission was informed that requirements for output products and their exchange would be reviewed by the forthcoming expert meeting of the CBS Working Group on GDPS on Implementation of WMCs, NMCs and RSMCs which was expected to be held in November 1990.

Consideration of recent advances in atmospheric sciences and technology with possible impact on the operation of the GDPS

6.1.11 The session noted recent advances in atmospheric sciences and technology with possible impact on the operation of GDPS, and concluded that these trends and developments, especially in remote sensing both from space-based and ground-based platforms, development of computers and micro-processors, in particular workstations for display, and more effective use of information, would have a major impact on the GDPS. These developments provide a potential capability for further improvements in Meteorological Services in general and in particular in routine weather forecasting in all time ranges for all geographical areas. The requirements are tied as closely as possible to those which are achievable and should always be based upon the current state of the science and supporting technology. As science advances and technology develops, requirements evolve, usually to provide greater accuracy or to meet a wider breadth of need.

6.1.12 The Commission reviewed and endorsed the implementation of activities needed to facilitate further development of the GDPS as agreed by its working group. In particular, it noted the need to:

(a) Exploit improvements in super computer technology, through increases in model resolution, introduction of new data assimilation techniques and more detailed physical parameterization;

(b) Generate interpretation schemes which are independent of development of NWP models;

(c) Introduce new techniques in medium-range and extended-range forecasting, such as Monte-Carlo forecasting and lagged average forecasting;

(d) Generate new, specialized products and services to meet identified requirements.

6.1.13 In this connection it was stressed that there was a need to intensify GDPS training activities. The session considered that it would be essential for the growth of the GDPS computerized environment to establish and ensure implementation of an appropriate training programme. Such a programme should ensure availability at NMCs of trained and competent staff in operational and scientific specialization, including computer science, hardware and software specialization.

Software Help in Application Research and Education (SHARE) Programme

6.1.14 The Commission considered requirements for software in the application of GDPS to be implemented under the WWW Programme. It considered that this should be co-ordinated through the existing mechanism within the Secretariat and the relevant constituent bodies. In addition, the session considered that priority be given to the following requirements for GDPS applications:

(a) Decoding and conversion of character codes and binary codes;

(b) Objective interpretation techniques, such as "Model Output Statistics (MOS)" and "Perfect Prognosis";

(c) Graphical representation of data and products, such as weather maps, soundings, and satellite imagery.

GDPS requirements for observational data

6.1.15 The Commission noted that gaps existed between GDPS requirements and target plans to be met by GOS; in addition lack of implementation of the GOS plan and losses of data on the GTS have resulted in further gaps in some regions, resulting in a further weakening of the data base of the GDPS centres. In this connection, the Commission endorsed the recommendation of its Working Group on the GDPS as follows:

(a) That increased efforts should be made to exchange globally more of the observational data already being collected;

(b) That centres should implement measures so that they can use meteorological satellite information, both data and imagery, more efficiently;

(c) That Members be urged to implement monitoring activities, in particular those related to the quality and availability of observational data and those with emphasis on tracing lost data and taking corrective measures;

(d) Measures should be taken in co-operation with ICAO to request airlines, through their appropriate organizations, to identify the best way in which aircraft meteorological information can be made available to the meteorological and the user communities;

(e) The session felt that while Table 3 in the Second WMO Long-term Plan, Part II, Volume I on "Data needs to obtain optimum results from NWP by late 1990s" was still valid and appropriate, some additional requirements should be added to it (e.g. radar data and profiler based soundings at intervals greater than four per day). These requirements have grown out of developments in technology which did not exist originally. The session also recognized discrepancies between this table and Table 5 entitled "Basic set of Global Observational Data Required and to be met by the GOS by the late 1990s" but felt that an effort to consolidate these tables would be inappropriate. The former table remains ideal; the latter was a more realistic estimate of what may be possible if appropriate efforts were undertaken.

The Commission requested the CBS Working Groups on GDPS, GOS and GTS to develop appropriate procedures including amendments to manuals to implement the above recommendations. It invited the CAeM to investigate the availability of aircraft information for the benefit of both meteorological and user communities.

Monitoring

6.1.16 The Commission considered the conclusions of its Working Group on the GDPS on monitoring activities and recommended measures concerning the role and nomination of lead centres, formats for exchange of monitoring information and their distribution. Recommendation 1 (CBS-Ext.(90)) - Amendments to the Manual on the Global Data-processing System - Monitoring the operation of the World Weather Watch was adopted. The Commission noted with appreciation the intention of the Federal Republic of Germany for RSMC Offenbach to accept responsibility as a lead centre to monitor surface data quality within RA VI, and requested its president to pursue its formal designation in consultation with the president of RA VI.

Verification of NWP products

6.1.17 The Commission noted and endorsed the action taken by the president of CBS on behalf of the Commission in approving standardized procedures on verification of NWP products developed by the seventh session of the CBS Working Group on the GDPS. The substance of these procedures are included in the annex to Recommendation 1 (CBS-Ext.(90)).

6.1.18 The Commission noted with appreciation the results of NWP product verification activities of GDPS centres which demonstrated clearly that the skill of NWP models had steadily improved over the years with a remarkable overall downward trend in errors of predicted parameters reflecting cumulative effects of improvements in the numerical weather prediction systems. It noted that further improvements required more rigorous product quality monitoring and exchange of feedback information by centres producing NWP products and those receiving and using NWP products. It requested its Working Group on GDPS to recommend an agreed form of presentation of the results of NWP product verification activities and establish a mechanism for compilation of annual results and their timely publication.

6.1.19 The Commission emphasized the need to strengthen further the NWP product verification activities of GDPS centres and invited GDPS centres engaged in NWP activities or receiving and using NWP products, and which had not yet implemented verification procedures at their centres, to take appropriate action with a view to their implementation.

Amendments to the Manual on the GDPS

6.1.20 The Commission considered proposed amendments to the Manual on the GDPS, mainly for Parts I and II based on updated requirements as contained in the Second WMO Long-term Plan Part II, Volume I - The World Weather Watch Programme (1988-1997) and procedures established by Resolution 11 (IX-RA VI) on guidelines on the general exchange of numerical products on the GTS in RA VI. It noted that the proposals were reviewed and endorsed by the CBS Working Group on the GDPS. The Commission adopted the proposals by its Recommendation 2 (CBS-Ext.(90)) - Amendments to the Manual on the Global Data-processing System - Parts I and II.

Guide on the GDPS

6.1.21 The Commission considered and endorsed the proposal of the Working Group on the GDPS that the Guide on the GDPS should be updated. It reviewed and approved the proposed table of contents of the proposed revised Guide as given in Annex III to this report.

WWW Technical Progress Reports on the GDPS

6.1.22 The Commission considered and endorsed a suggestion of the seventh session of the Working Group on the GDPS that information on the operational status of the GDPS, which is published partly in the CAS NWP annual report and partly in WMO Publication No. 9, Volume B, and in the Guide on the GDPS should be combined, enhanced and published annually as a separate WWW Technical Progress Report on the GDPS. It agreed that this publication would eliminate the necessity of providing this type of information as part of the other publications mentioned above. It reviewed the proposed contents of such an annual WWW Technical Progress Report and endorsed the version given in Annex IV to this report.

6.1.23 The Commission invited CAS and the CBS Working Group on the GDPS to review the contents of the CAS NWP annual report and WMO Publication No. 9, Volume B, respectively, with a view to ensuring that there would be no overlapping between the new publication and those two publications. Also, the Commission requested the Secretariat to collect annual information from Members for these publications, if possible by means of one integral enquiry procedure. The Commission further urged all WMO Members to submit annual national contributions starting with information for 1991 on new operational procedures (NWP models, statistical methods, etc.), output products and equipment in use at the GDPS centres, for the new publication.

Further work programme

6.1.24 The Commission agreed that the following tasks, among others, may require further study by the CBS Working Group on the GDPS:

(a) Update the Manual and Guide on the GDPS;

(b) Further development of NWP and objective interpretation schemes;

(c) Review of quality control procedures;

(d) Review the application of NWP output products for other environmental purposes, such as ice and sea-state forecasting, environmental emergency response, etc.;

(e) Further definition of observational data requirements with emphasis on aircraft data and remotely sensed data from space- and surface-based observing systems, including their assimilation.

6.2 Global Observing System (GOS) (agenda item 6.2)

Report of the chairman of the working group

6.2.1 The Commmission noted with appreciation the report of the chairman of the Working Group on the Global Observing System, Mr F. Zbar (USA). In his report the chairman informed the Commission of the outcome of the fifth session of the working group held in Geneva from 13 to 17 March 1989. To cope with its work programme the working group had re-established its Study Group on the Manual and Guide on the GOS and appointed a number of rapporteurs to keep the working group abreast of issues and developments in a number of important areas. Details of the chairman's report, which included proposed amendments to the Manual on the GOS, were discussed under the various subject headings below.

6.2.2 As a general comment on the chairman's report the attention of the Commission was drawn to Recommendation 5 (CIMO-X) which had invited the president of CBS to collaborate with CIMO in further developing the automation of visual or subjective observations. The Commission was pleased to note in this connection that the Working Group on the GOS had appointed a rapporteur on automated surface observing systems who would be in a position to ensure the necessary co-operation with CIMO on this subject.

6.2.3 Under this item the Commission was also informed by the member from Australia of his government's recent approval for the establishment of a network of eleven new observing stations for measuring sea level and possibly related meteorological parameters in the South Pacific; this was an example of how the current preoccupation with environmental and climate change issues could be exploited to improve the implementation of the WWW and the GOS in particular.

Manual on the Global Observing System

6.2.4 Following a request made by ICAO at its ninth session, the Commission had requested the Working Group on the GOS to look into the possibility of obtaining real-time observational data on atmospheric evidence of volcanic activity from existing observing networks. The Commission was therefore pleased to note that the working group had thoroughly studied the question and, after further consultation with the Secretariat and with ICAO, the chairman had proposed a suitable text for inclusion in the Manual on the GOS to prescribe the observation and reporting of volcanic activity and movement of volcanic ash clouds that could be used with existing SYNOP and METAR codes. The Commission also urged the expansion of satellite techniques to identify the occurrence of volcanic activity and movement of volcanic ash clouds and agreed to keep this matter under review. Recommendation 3 (CBS-Ext.(90)) was adopted.

6.2.5 The observer from ICAO expressed his appreciation for the prompt action taken by CBS in this matter.

Report on the baseline upper air network

6.2.6 The Commission recalled that CBS-Ext.(85) had agreed to conduct an evaluation of the hypothesis that the data from a subset of carefully selected radiosonde stations could be used to improve the quality of satellite sounding retrievals. The USA had been asked and had agreed to undertake an evaluation of the impact of the BUAN reference data on the accuracy of TIROS Operational Vertical Sounder (TOVS) data. This task was undertaken by the National Oceanic and Atmospheric Administration. Approximately 100 radiosonde and rocketsonde stations participated in the data-collection phase which was conducted during the period 15 January to 15 July 1988. The data analysis phase was completed in early 1990.

6.2.7 The Commission received the report from the USA on the results of the BUAN evaluation and noted that the participation of the Members in the evaluation had been excellent and that in some instances additional radiosonde ascents were made to provide the data base required. The CBS expressed its deep appreciation to the participants in the BUAN evaluations and especially the USA for taking on the responsibility for co-ordinating the activities and for conducting the data analyses.

6.2.8 The following conclusions had been drawn from the evaluations:

(a) The BUAN stations provided a reference data set which was significantly better than that from the full radiosonde network;

(b) It was not possible, however, to demonstrate that the retrievals from the BUAN data set were better than those obtained from the full radiosonde network;

(c) Some data loss occurred at the processing centre and some may have been lost as a result of communications difficulties;

(d) One of the important results of the BUAN evaluations was that a computer archive data base had been established which would prove to be valuable for future studies.

6.2.9 After reviewing the results of the BUAN evaluations provided by the USA the Commission agreed that it should not recommend the implementation of the BUAN on an operational basis.

6.2.10 The Commission made the following comments based upon the results of the BUAN evaluations:

(a) Further study was required by the scientific community of the procedures to improve satellite temperature retrievals through the BUAN archived data set. In this regard, the CBS was pleased to learn that participants in the ITOVS working group were planning to use the BUAN data set for such studies and encouraged the participants to keep CBS advised of the results of their work;

(b) While CIMO international radiosonde intercomparisons had already taken place, additional efforts were needed to examine the compatibility between the various sondes. In particular, efforts were required to better define the effects of solar and long-wave radiation;

(c) Particular attention needed to be given to providing high quality (i.e. accurate, timely and high-ascent) operational, synoptic radiosonde observations, especially in the southern hemisphere.

6.2.11 The Commission specifically recommended that:

(a) The TEMP code should be modified to include balloon launch time to hours and the nearest minute; and

(b) The CBS Working Group on Data Management should focus on elaborating procedures to provide end-to-end monitoring of the radiosonde data.

Definition of the space-based portion on the space-based sub-system of the GOS

6.2.12 The Commission noted that in sub-paragraph (1) to Resolution 7 (EC-XLII), which was based on a recommendation of the eighth session of the EC Panel of Experts on Satellites, the concept of a new definition for the space-based portion of the GOS was endorsed and forwarded to CBS for action to develop the necessary changes to the Guide and Manual for the Global Observing System.

6.2.13 The Commission recognized the importance of this development and agreed to participate actively in the formulation of a detailed concept with regard to the use of satellites for WMO programmes. The Commission strongly endorsed the concepts developed by the EC Panel of Experts on Satellites adding that satellite telecommunication such as MDD and WEFAX should be included in the definition. The Commission further agreed that it would be appropriate to integrate the role of the EC panel within the CBS when the Executive Council felt that such a transition should occur.

6.2.14 The Commission requested the chairman of the Working Group on the Global Observing System to develop necessary changes to the Guide and Manual on the GOS and submit appropriate amendments through the president of CBS to the forty-third session of the Executive Council for approval.

6.2.15 Considering the highly useful and important data which were provided by experimental satellites, the Commission noted with pleasure the information provided by the member from China that his country had launched a new experimental polar-orbiting meteorological satellite FY-1B on 3 September 1990. The Commission also noted with appreciation the information provided on the meteorological, oceanographic and earth-resources satellite systems operated by the USSR as well as the USA plans for the launch of environmental satellites in the next decade.

Consolidated satellite data requirements

6.2.16 The Commission noted that the EC Panel of Experts on Satellites at their November 1989 meeting had reviewed and validated a consolidated list of satellite data requirements. Furthermore, the panel had recommended a continuation of the technical review of these requirements. The Commission considered it proper to review the requirements and referred the matter to the Working Group on GDPS in co-operation with the Working Group on GOS. The Commission felt that the list was extremely important and that periodic reviews should occur on a continuing basis. It also considered that a summarized priority list would be helpful, but to be fully useful to satellite operators an explanation of the requirements would be necessary so that the interest of the need was understood. Finally, it felt that the list could evolve into a consolidated list of data requirements encompassing not only the satellite requirements but all data requirements.

6.2.17 Noting that the list did not contain satellite service requirements the Commission asked the Working Group on the GTS to develop such a list.

6.2.18 The Commission requested its president to raise these matters at the next meeting of presidents of technical commissions to be held in Geneva in November 1990.

Automated Aircraft Meteorological Data Reporting

6.2.19 The Commission discussed the overall concept of automated Aircraft Meteorological Data Reporting (AMDAR) from commercial aircraft. The AMDAR concept would include the ASDAR (reporting through meteorological satellites), VHF radio (such as is being used in Australia) and commercial satellite communications (SATCOMS).

6.2.20 The Commission received with appreciation the report on the status of automated aircraft reporting from Mr D. Painting, chairman of the Operating Consortium for ASDAR Participants (OCAP), and the WMO Secretariat. It was especially pleased to note that the ASDAR had been granted temporary certification in the UK and that certification in the US had been arranged. A unit undergoing certification had been placed in service on 13 May 1990, and encouraging results had been received both in level flight and during the ascent and descent. The evaluation programme had been established and the data from the certification unit were being critically analysed. The initial results indicated that the ASDAR data were of good quality and that the profile capability was an important addition over the prototype ASDAR systems which had been in service since 1979. Some difficulties had been identified in the data-processing algorithms, however, and the certification unit had been removed to make the corrections. The certification was expected to be resumed in late 1990, and the implementation of the first 13 production units was expected to be completed by mid-1991.

6.2.21 The Commission was informed that in Australia 21 wide-bodied aircraft had been fitted to provide data through the VHF ACARS and that 20 additional aircraft were expected to be fitted with necessary equipment in the near future. All of these aircraft were being flown on domestic routes. In addition, discussions were underway to fit equipment to up to 20 QANTAS aircraft on international routes. Australia reported that it was satisfied with the ACARS programme and believed it to be a cost-effective means of obtaining upper-air data.

6.2.22 The experiences with the ACARS, however, had identified some issues which had implications for the global implementation of the AMDAR. For example, the amount of data returned from several aircraft had been large, and significant amounts had been redundant for the purposes of meteorological forecasting. Procedures had been adopted to selectively limit the amount of information received at the meteorological centre to reduce the cost of the programme. Analyses of the reports had indicated that some temperature data seemed to have a long-term drift which was believed to be due to changes in the accuracy of the aircraft temperature sensor. Experience had also shown that the quality control procedures adopted needed to include activities of the national weather services, airlines and WWW monitoring centres.

6.2.23 In this regard, it was noted that the National Meteorological Centre of the USA was the designated centre for quality control of aircraft data. The ECMWF as a lead centre for monitoring of the quality of upper-air data was prepared to assist in the monitoring of AMDAR reports. The Commission recommended that both centres co-operate closely in the monitoring and quality control of AMDAR data.

6.2.24 The Commission expressed its deep appreciation to the participants in the Consortium for ASDAR Development (CAD) and the Operating Consortium of ASDAR Participants (OCAP) for their work over the years in bringing the ASDAR and ACARS techniques to fruition. It was especially encouraged by the prospects that serious budgetary consideration was being given to the purchase of additional ASDAR and VHF ACARS systems.

6.2.25 The Commission believed it was essential that a plan for the development of the AMDAR be prepared. It noted the work of the OCAP in this regard with appreciation and recommended that the Working Group on the GOS, the CAeM and the OCAP work together in preparing such a plan for consideration by the CBS Advisory Working Group at their meeting in 1991. A common set of requirements for data-processing algorithms from automated aircraft reporting systems should be included in considering the use of the data both in numerical analyses and in local forecasting procedures.

6.2.26 Concerning the accuracy of temperature measurements from aircraft the Commission noted that apparent problems in the calibration of sensors had been identified during the OWSE-NA and that analyses of automated reports in Australia had also found temperature errors which could be due to instrument calibration. It welcomed the initiative of the OCAP to establish a sub-group to examine the issues. It further noted that the National Meteorological Centre of the USA and the ECMWF could provide important assistance in the identification of the source of the errors.

6.2.27 The Commission noted with appreciation the significant support which had been provided by airlines and aviation organizations during the development and early implementation phases of the AMDAR programme. It considered that such assistance was essential if the full potential of AMDAR was to be realized. It encouraged, therefore, the close co-operation between the WMO bodies concerned, OCAP, and the airline community to ensure that appropriate measures were taken to provide the support required for the future development of the AMDAR within the WWW.

6.2.28 The Commission noted that airlines were actively engaged in the development of a new generation of avionics which could include automated techniques for obtaining meteorological data from commercial aircraft. It believed that the implementation of such techniques offered the potential for greatly increasing the availability of aircraft meteorological data, but that a number of issues such as the interfaces with the GTS, compatibility with other upper-air data, and data quality needed to be resolved before the data could be fully utilized.

6.2.29 The Commission believed that close co-ordination was needed between the CBS and CAeM to ensure that the AMDAR, and other techniques for the automated aircraft reporting of meteorological data, were implemented properly as elements of the GOS. It agreed that the CAeM should take the lead in establishing the dialogue with the representatives of the civil aviation community concerning the implementation of the various techniques for the automation of aircraft meteorological reports. It further recognized the continuing role of the CBS and its working groups in the integration of AMDAR and other automated techniques into the WWW. In particular, the Commission needed to consider the establishment of procedures for introducing the data into the GTS, for monitoring the quality and timeliness of the data, and for the application of these data in the preparation of meteorological products.

6.2.30 The Commission also noted that the ASDAR and ACARS techniques contained elements, such as hardware and/or software modules, which might have application in the development of the overall programme for automated aircraft reporting of meteorological data. The OCAP, in particular, had taken steps to examine the possibilities for using such modules, and had participated in discussions with both the CAeM and the airline community with the view to establishing a basis for future co-operation. Welcoming the assistance of the OCAP, the Commission encouraged its further contributions in the implementation of automated techniques for reporting meteorological data from commercial aircraft.

6.2.31 In concluding its discussion, the Commission believed that with (1) the rapid progress being made in the implementation of the ASDAR; (2) the success of the VHF ACARS programme in Australia; and (3) the potential offered by the use of SATCOMS; that the attention of Members should be drawn to the need to develop actively the capabilities of automated aircraft reporting. This development needed to include a range of aircraft and techniques and especially those aircraft flying over data sparse areas of the tropics where wind data are particularly important. The Commission, therefore, adopted Recommendation 4 (CBS-Ext.(90)) inviting the Executive Council to endorse the AMDAR concept and the development of an AMDAR programme.

Automated Shipboard Aerological Programme (ASAP)

6.2.32 The Commission received with appreciation the report of the chairman of the ASAP Co-ordinating Committee (ACC). It noted that, during the past five years, the ASAP had been brought from a development to a fully operational system in the WWW. It was particularly pleased to note the substantial effort made by the participants in the ACC to achieve the minimum goal of 12-14 ASAP systems on the North Atlantic. Studies conducted during and after the OWSE-NA showed that these ASAP systems provided data equivalent to more than four radiosonde stations making two soundings per day, and that the data quality was comparable.

6.2.33 The ASAP had fully demonstrated its value on the North Atlantic and the termination of the NAOS agreement further increased the importance of the ASAP in that region. The Commission was concerned to learn, however, that two of the originally implemented systems had been withdrawn from service due to lack of resources. In the instance of the UK, the ASAP had been withdrawn in favour of providing support to the national operation of an Ocean Weather Station. In view of the fact that the ASAP had a positive impact on the analyses for the North Atlantic where a relatively good data base exists, the Commission believed the concept offered excellent potential for use on other, more data-sparse oceans. The Commission, therefore, urged Members to take urgent steps to support the existing ASAP systems and to explore ways to increase their number.

6.2.34 The efforts of the ASAP Co-ordinating Committee to develop ways to improve the usefulness and efficiency of the ASAP concept were strongly endorsed. One way would be to develop ASAP configurations which would be suitable for use on a wider range of ships than at present. In this regard, the Commission noted that France had implemented one version of a modular ASAP. It believed that it was important to develop modular designs which would be suitable to a range of possible host vessels. It was also considered to be important to focus efforts on those shipping companies likely to maintain their operating schedules for some years to come. The Commission encouraged those efforts directed toward reducing the cost of the ASAP.

6.2.35 One of the problems concerning the ASAP had been the loss of data in the communications system. An end-to-end test had revealed a number of difficulties, and many of these had been resolved. Other sources of data loss remained, however, and the EUMETSAT offered to participate in future end-to-end tests as appropriate.

6.2.36 The Commission noted that the technical documentation for the ASAP did not reflect the current and projected configurations for the ASAP. It supported the work of the ACC to revise the documentation and recommended that the new material be published in the WWW series of reports.

6.2.37 The Commission recognized that the ASAP was a fully developed component of the WWW which was suitable for consideration in aid and other co-operative programmes. In this regard, it welcomed the suggestion by the ACC that a team of seconded experts might be made available to provide assistance to developing countries in the establishment of ASAP programmes. It recommended that the possibilities for developing a suitable implementation support activity based on this suggestion be explored and asked the Secretary-General to assist in the important work of the ACC, within the resources allocated.

6.2.38 The Commission noted that the ACC had examined the long-term availability of the OMEGA navigational aid system, and had learned that it was projected to be in operation through at least the year 2005. It was also informed that the Global Positioning System (GPS) was under development and was expected to be operational later in the decade. The Commission encouraged the ACC to keep under review the status of the various NAVAID systems, and to make provisions, as appropriate, in the ASAP planning for changes which might occur in these systems.

6.2.39 In considering the future of the ASAP, the Commission welcomed the news that additional Members and organizations were considering the use of the ASAP. It identified areas of the Indian, South Pacific and South Atlantic oceans as particularly important for consideration of new ASAP systems. It noted that a multi-national co-operative programme was being established through TOGA to place at least one ASAP on the Indian Ocean. Other efforts were underway to implement ASAP systems on routes from the West Coast of North America to Australia, as well as from Iceland to North America. These activities were strongly endorsed by the Commission as were suggestions to install ASAP equipment on fixed platforms.

6.2.40 The Commission noted that the programme documentation and plan for the ASAP, which had been prepared in 1985, had suited the early development and implementation of the ASAP in the WWW. Due to a number of technological developments in the interim, and the plans of Members and organizations noted above, the ASAP programme and planning documentation was not suitable for guiding the future development of the ASAP and needed to be revised. The Commission asked the ACC to prepare, in conjunction with the CBS Working Group on the GOS, a new programme plan which could be used to focus the implementation of the ASAP in the WWW, and to submit it to the CBS for consideration. The new planning document should summarize the current experiences gained from the operation of the ASAP and recommend an approach for deployment which would meet the needs of Members in their planning for deployment of ASAP systems. In making this request, the Commission noted that the programme documentation for the ASAP needed to reflect the WWW requirements for data from ocean areas, and be consistent with the appropriate WMO long term planning documents. Recommendation 5 (CBS-Ext. (90)) was adopted.

Report on the pilot study carried out by ECMWF

6.2.41 The Commission noted with appreciation the report on the pilot study to establish the value of information exchange between ECMWF and national focal points for radiosonde systems. This pilot study was carried out from 1 October 1988 to 31 December 1989 by ECMWF in accordance with Recommendation 11 (CBS-IX) approved by EC-XL (1988) with a view to improving the performance of the global radiosonde network. The Commission noted with satisfaction that 58 Members operating 650 upper-air stations participated in the pilot study. The contacts established with the focal points were effective. Exchange of information on data problems of availability or quality of data actually involved 20 focal points. Out of the remaining 38, 32 belonged to Members operating stations which did not present serious data quality problems; from other six focal points ECMWF did not receive feed-back information.

6.2.42 The Commission noted the valuable results of this pilot study, which were:

(a) For the period of the study, the ECMWF operational monitoring system detected 109 cases of stations presenting a significant change in their performance characteristics. Out of these 109 stations, 40 were operated by Members participating in the study at the time of the detection of the problem. The relevant focal points were informed by ECMWF, and corrective action was taken in seven cases. In addition to that, six stations which were suspect already at the beginning of the study were corrected;

(b) The information on the position and altitude of the stations contained in the questionnaires filled in by the national focal points was compared to the list given in the WMO Publication No. 9, Volume A. Significant differences were found for

90 stations out of 650. The altitude information was also compared to the results of the ECMWF monitoring; in four cases this allowed the focal points to correct their own information;

(c) On occasions the exchange of information helped to understand unusual features in the monitoring results: these features were due to particular circumstances with no error involved;

(d) The information contained in the technical questionnaires has been stored in a computerized data base and is used for the regular monitoring carried on at ECMWF. In conjunction with results of the WMO International Radiosonde Intercomparison, it will also be used for a study on improved criteria for the automatic detection of suspect stations, to be proposed to the NWP centres participating in the regular exchange of monitoring results recommended by CBS-Ext.(85).

6.2.43 Since the end of the study, the exchange of information has continued with the focal points who expressed an interest therein. It has already resulted in the correction of new problems at five more stations. In addition, several quality problems were acknowledged during the study but could not be corrected at that time for practical reasons; for these too, the exchange of information will continue. Recognizing the importance of the pilot study, which had resulted in a significant improvement of the performance of radiosonde stations, the Commission expressed its appreciation to ECMWF and participating Members for their valuable contributions. With a view to making further improvements, the Commission urged Members to continue to exchange information on the performance of radiosonde stations with ECMWF and to take appropriate corrective measures as and when necessary.

6.3 Global Telecommunication System (agenda item 6.3)

Report of the chairman of the Working Group on the GTS

6.3.1 The Commission noted with appreciation the report of the chairman of the CBS Working Group on the GTS, Mr J. Arimatea (Brazil), including the work accomplished by the group at its twelfth session, Geneva, 21-28 May 1990, and by its two study groups on operational matters and on communication techniques and protocols. The topics covered in the report of the twelfth session are discussed in detail under the various sub-items below.

Organization of the GTS

Satellite telecommunications

6.3.2 The Commission noted with great appreciation that, as requested by CBS-IX, the Working Group on the GTS duly considered the impact on the GTS of new telecommunication means and techniques, in particular satellite-based telecommunications, and developed draft amendments to the Manual on the GTS to this effect.

6.3.3 The Commission fully endorsed the conclusions of the Working Group on the GTS that satellite-based data collection and data dissemination systems were efficient and reliable, and should be used in the GTS according to its organizational principles. It was in particular emphasized that the responsibilities of NMCs for observational data collection should be respected, and that the possibility for RSMCs, RTHs and NMCs of inserting meteorological information in satellite-based data dissemination systems by direct or indirect channels should be ensured. It agreed that satellite-based data dissemination systems should complement the point-to-point GTS circuits, and that two-way multiple access telecommunication satellite services were very advantageous for implementing the RMTNs in several Regions (e.g. Regions IV and V).

6.3.4 The Commission agreed that the current geographical concept of areas of responsibility of RTHs should be replaced by a more flexible concept of RTHs taking responsibilities for associated NMCs, to better take into account the real possibility of establishing cost-effective circuits, in particular in view of international network plans of telecommunication administrations agencies. For appropriate redundancy in routeing data, NMCs might be associated to more than one RTH. The Commission invited regional associations to review the list of NMCs associated to each RTH and their RMTN plan accordingly, with a view to improving the exchange of information over the GTS.

The Main Telecommunication Network

6.3.5 The Commission endorsed the recommendation of the Working Group on the GTS to include the circuit Bracknell-Moscow, already implemented between two MTN centres on a bilateral basis, in the Main Telecommunication Network, in accordance with the provisions stated in the Manual on the GTS (Volume I, Part I, paragraph 3.1.1). The Commission agreed that the routeing plan on the MTN be revised with adequate flexibility built into the system so that problems posed by prolonged failure or inadequacy at an RTH could be overcome. It requested the chairman of the Working Group on the GTS to prepare the revised figure 1 in Attachment I-3, Volume I, Part I of the Manual on the GTS, as a matter of urgency, with the assistance of the WMO Secretariat.

Inclusion of new circuits in the GTS

6.3.6 The following procedures, developed by the working group for the inclusion of new circuits in the GTS, were endorsed by the Commission:

(a) Assessment by Members concerned of the transmission requirements to be met by the proposed new circuit, including its contributions to network reliability, its impact on the GTS traffic and the minimum circuit capacity required;

(b) Commitment by Members operating GTS centres concerned to implement the circuit and operate it; the circuit could be established on a provisional basis, by bilateral agreement of the Members concerned, and the WMO Secretariat notified;

(c) Submission of the proposal to the relevant working groups (regional working group on the WWW and/or CBS/WG-GTS), leading, if agreed, to a recommendation for the provisional inclusion of the new circuit in the GTS plan, pending its implementation;

(d) Decision by regional association(s) concerned and/or CBS, as appropriate, of the inclusion of the new circuit in the GTS plan, pending its implementation (if not already implemented under (b));

(e) Formal notification by the WMO Members concerned of the implementation of the circuit (if appropriate);

(f) Endorsement of the formal inclusion of the circuit in the GTS plan by presidents of regional associations and/or by the president of CBS, as appropriate.

Evolution of the operational structure of the GTS

6.3.7 The Commission noted with appreciation the guidelines for the evolution of the operational structure of the GTS developed by the working group, in view of the evolving data communication requirements placed on the GTS. The Commission agreed in principle on these guidelines, contained in Annex V to this report, and also felt that the requirements placed upon the GTS by the evolving WWW system should be further developed and refined in co-ordination between the Working Groups on Data Management, GDPS and GTS (see also paragraph 6.3.21). The Working Group on the GTS was requested to further develop the plan for the evolution of the operational structure of the GTS, on the basis of the consolidated data communication requirements.

Use of INMARSAT systems

6.3.8 The Commission noted with appreciation the increasing number of INMARSAT Coast Earth Stations which were accepting ships' weather reports free-of-charge to the ships, thus decreasing cost burdens to the Meteorological Services in the countries concerned. The introduction of the Global Maritime Distress and Safety System (GMDSS) of the International Maritime Organization had also led to a substantial increase in the number of WMO Voluntary Observing Ships (VOS) equipped to use INMARSAT Services.

6.3.9 The Commission noted the proposed new INMARSAT compressed message transmission service from ships, which could result in substantial cost reductions for meteorological and oceanographic reports, but which would need appropriate coding and decoding software. The Commission agreed on the need to study the proposal further, and requested its Working Group on Data Management to undertake this study in co-ordination with CMM and INMARSAT.

Exchange of seismic data (see also agenda item 9)

6.3.10 It was noted that the *Ad Hoc* Group of Scientific Experts (GSE) of the Conference on Disarmament was conducting a large-scale experiment on the exchange and processing of seismic data, including in particular level II data (GSETT-2). Several test periods were planned, in particular during four days in June 1990, seven days in November 1990, and the last phase was to take place during two months in spring 1991. Some GTS centres had taken the necessary steps to permit transmission of level II seismic data to the International Data Centre in Moscow using GTS circuits and were being involved in GSETT-2. The Commission noted that, in addition to the requirements for exchange on the GTS of level II seismic data with the closest international data centre (Moscow for centres concerned so far), the GSE wished the Washington International Data Centre also to receive all the data exchanged

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NOTE: If the circuit is implemented under (b), steps (e) and (f) are not applicable.

on the GTS. The Commission noted in this respect that dedicated medium/high speed circuits were established between International Data Centres within the framework of GSETT-2. It was agreed that the additional traffic created by an extensive exchange of seismic data - level II - on the GTS might have a significant impact on some RTHs and GTS circuits, by cumulative effect, and requested its Working Group on the GTS to further consider the matter, in co-ordination with the GSE and with the assistance of the WMO Secretariat, taking due account of the results of the tests and of the routeing requirements for this type of data.

ICAO World Area Forecast System (WAFS)

6.3.11 The Commission noted that the installation of separate telecommunication systems for the WAFS and the WWW could lead to additional capital expenditure and operating costs as well as unnecessary duplication of transmission of meteorological products. It urged therefore that following the ICAO/WMO feasibility study, all possible efforts be made to develop a joint ICAO/WMO strategy to provide transmission of meteorological data and products irrespective of whether they related to the WWW or WAFS so as to minimize costs whenever possible and maximize operational flexibility.

Technical matters relating to the GTS

Communication procedures for OSI layers 3 and higher

6.3.12 Noting the conclusions of the working group, the Commission agreed on the inclusion of virtual call (VC) procedures in the elements of X.25 procedures to be used on the GTS for facilitating in particular the use of the commercially available X.25 software packages. The Commission also concurred on the advantages of the use of logical multiplexing (virtual circuits) provided by the X.25 layer 3 procedures, and encouraged the GTS centres to use it in replacement of the multiplexing on the physical layer.

6.3.13 The Commission noted the opinion of the working group that the introduction of the packet switching mode, using packet switching equipment as front end to the RTH telecommunication computer would be beneficial for GTS operation in certain limited situations. It welcomed the pilot experiment on the use of packet switching mode of operation being set up by the working group, and invited Members to participate, as appropriate to determine the effectiveness of the method.

6.3.14 Noting with interest the opinion expressed by the working group concerning the applicability to the GTS of the Message Handling System (MHS) described in the CCITT X.400 series of Recommendations, the Commission felt that those systems could represent an opportunity to implement the internationally standardized upper layers of the OSI model within the GTS. The Commission requested its working group on the GTS to pursue its in-depth study on the applicability of the X.400 systems to the GTS.

Coded digital facsimile

6.3.15 The Commission agreed that CCITT group 4 facsimile equipment could be used on X.25 virtual circuits established within the GTS by bilateral or multilateral agreement between the GTS centres concerned.

Radio-frequency matters

6.3.16 The Commission noted the proposal for a modified frequency allocation in the 401-403 MHz band developed by the working group, which had been circulated to Members for comments. It agreed that the consolidated proposal also be submitted to the president of CIMO and to the next session of CGMS for comments. The Commission was informed that the agenda of the next World Administrative Radio Conference (WARC-92) adopted by the ITU Administrative Council included the consideration of problems associated with the use of the frequency bands in the range 401-403 MHz by the meteorological satellite and earth exploration satellite services. Pertinent excerpts of the ITU resolution are contained in Annex VI to this report. The Commission was also informed that the CCIR established a Joint Interim Working Party (JIWP) WARC-92 to carry out certain studies in preparation for the Conference, and that its final meeting was scheduled to be held from 4 to 15 March 1991 in Geneva. It requested the Secretary-General to prepare, in consultation with the presidents of CBS and CIMO and the chairman of CGMS, a working document on the proposed modification in the 401-403 MHz band to be submitted to the JIWP WARC-92. The Commission also urged Members to contact their national Telecommunication Administrations with a view to obtaining their support.

6.3.17 The Commission was informed that, in order to satisfy the requirements of the rapidly expanding terrestrial "Mobile Services", members of the "Conference Européenne des Postes et Telecommunications" (CEPT) considered the submission of a proposal to the World Administrative Radio Conference (WARC) in 1992 to make frequencies in the 2 GHz band (S-band) available for this type of service. This band is presently allocated to space radio communication services and is used by all space agencies to carry out vital operations, in particular for meteorological satellites (e.g. METEOSAT MDD uplinks). Since "Mobile Services" and space radio communication services cannot share the same frequency bands, there is a real danger that space services would have to be re-allocated to higher, as yet unidentified, frequency bands. Such a change of frequency band would require very expensive modifications to ground station networks and could lead to delays in future meteorological satellite programmes because of the resulting redesign of major programme elements. Therefore, the Commission urged Members to contact their national Telecommunication Administrations and express their concern with the envisaged change of frequency allocation in the 2 GHz band (S-band) which would significantly affect meteorological satellite programmes. It requested the WMO Secetariat to prepare a draft letter for Members to facilitate the above-mentioned contacts.

6.3.18 The Commission was also informed that the CCIR, at its XVII Plenary Assembly (Düsseldorf, 1990) adopted a study question on meteorological aid systems and one on wind profiler radars for the next study period 1991-1994. It encouraged Members to contribute to these studies, in particular through their national Telecommunication Administrations participating in the work of CCIR. It further emphasized that the allocation of frequency bands to meteorological activities was of vital importance to all Meteorological Services, particularly with the appearance of new techniques which required a review of the current situation. The Commission agreed on the need to create within WMO, as a matter of urgency, a multi-disciplinary body responsible for reviewing the allocation of radio frequency bands to meteorological activities, in co-ordination with the competent technical commission and WMO bodies (CBS, CIMO) and CGMS. The Secretary-General was requested to develop a proposal to be submitted to the next session of the Executive Council.

Operational matters

Volume C of WMO Publication No. 9

6.3.19 The Commission agreed that the section of Volume C concerning point-to-point transmission schedules was of limited interest and should be deleted from Volume C. It also agreed that a compressed format for information on bulletins containing processed information would contribute to reducing the volume of the publication.

Format of meteorological messages

6.3.20 The recommendation of the working group that the group CLLLL be deleted from the starting line as from 1 November 1991 was endorsed. One member expressed his reservations regarding the implementation date in view of the software modifications involved. The Commission also endorsed the proposal for an amendment to the format of meteorological messages, i.e. maximum length of 15 000 octets for bit-oriented messages, which is detailed in the amendments to the Manual on the GTS, Volume I, Part II. The amended tables for abbreviated headings included in Attachment II-6 of Part II of Volume I of the Manual on the GTS were also endorsed. The omission of specific reference to 925 hPa from the proposed standard levels in Table D (use of ii) was noted. There are, however, spare values one of which could be used for the 925 hPa level. It was agreed that the revised table be put into force as from 1 November 1991, to give sufficient time for the existing abbreviated headings to be changed.

Routeing of data on the GTS

6.3.21 The Commission endorsed the proposals of the working group regarding procedures for routeing data on the GTS, which were the following:

(a) Use of abbreviated heading in place of CFFFF to identify pictorial documents;

(b) Exchange on the MTN of TEMP/PILOT parts A, B, C, and D as available;

(c) Use of packet-switched public data network in case of outages of GTS centres or circuits when cost effective and operationally attractive;

(d) Exchange of information on the operation of WWW components using the abbreviated heading beginning NPXX10.

6.3.22 The Commission noted that in case of unreliable operation of some GTS circuits, data obtained from Data Collection Platforms (DCPs) could be advantageously exchanged on the GTS using a routeing different from that indicated in the GTS plan. It agreed that such measures should be covered by a prior agreement between the centres concerned. DCP data must be quality controlled before its insertion into the GTS even if non-standard routeing for this data is agreed.

Monitoring procedures

6.3.23 The Commission noted with appreciation that the working group recommended amendments to the procedures for annual global monitoring of the

WWW with the aim of reducing differences in the implementation of monitoring procedures at GTS centres. Furthermore, it was considered necessary that monitoring activities should include specific monitoring of the transport service provided by the GTS and that therefore, for example, procedures for monitoring bulletins should be developed. The Commission endorsed the recommendation of the working group in this respect. Because of the urgency of establishing the proposed procedures, the Commission urged Members concerned to start their preparations as soon as possible with a view to introducing the procedures in the 1991 global monitoring exercise. It felt that global monitoring of bulletins was desirable and recommended Members to provide software for this monitoring to other Members if it became available. It also noted with great appreciation that the preparation for tests was being made on the exchange of monitoring results on computer media (magnetic tapes or floppy disks) between several GTS centres. The Commission requested the working group to pursue its activities in this respect.

Amendments to the Manual on the GTS

6.3.24 The Commission agreed that the Manual on the GTS be amended to reflect its conclusions mentioned above. The Commission adopted Recommendations 6, 7 and 8 (CBS-Ext.(90)) for amendments to the Manual on the Global Telecommunication System, Volume I, Parts I, II and III respectively.

Future work programme of the Working Group on the GTS

6.3.25 The Commission considered the future work programme developed by the Working Group on the GTS at its twelfth session and endorsed it, emphasizing the need for the study of the organizational and technical aspects of satellite-based transmission systems. It noted that some tasks were closely related to data management and requested chairmen of the CBS Working Groups on Data Management and on the GTS to co-ordinate these tasks. The Commission confirmed that a session of the CBS Working Group on the GTS should be held regularly, at least once every four years. It also agreed that a large-scale revision of the Manual on the GTS was needed with a view to reflecting adequately the current and future evolution of the GTS, taking due account of advanced communication techniques and protocols, and of evolving WWW information exchange requirements. The Commission invited the Secretary-General to make the necessary arrangements for a drafting group of a few experts, in consultation with the chairman of the CBS Working Group on the GTS.

6.4 WWW Data Management (DM), including codes (agenda item 6.4)

Report of the chairman of the Working Group on Data Management

6.4.1 WWW Data Management is a new concept which had been introduced in the WWW Programme of the Second Long-term Plan with a view to furthering the integration and the more effective use of the GOS, GDPS and GTS. As the Working Group on Data Management was first established by CBS-IX, the Commission noted with particular interest the report of the chairman, Mr R.J. Sowden (United Kingdom) covering the work of the group and of its subgroups on Data Representation and on Codes which had been carried out since CBS-IX.

6.4.2 The Commission noted the considerable interest shown by Members which was also reflected in the large number of countries (46) that had nominated experts for the Working Group on Data Management. The Commission reviewed the work carried out and the results achieved and expressed its special gratitude for the very substantial amount of work accomplished by the working group and its subgroups and especially recognized the very valuable contributions of both chairmen of the subgroups.

6.4.3 In noting with regret that Mr R.J. Sowden was obliged to resign as chairman of the Working Group on Data Management due to his recent retirement, the Commission thanked him very much for forward-looking and fruitful ideas and the excellent leadership he had provided to the WGDM. The Commission decided to appoint Dr Geoffrey Love (Australia) as chairman of the working group subject to the agreement of his permanent representative.

6.4.4 The Commission noted with appreciation the final report of the first session of the Working Group on Data Management (Geneva, 5-9 March 1990) and the proposed work programme to be carried out prior to CBS-X. It agreed that the most effective way of improving the data management aspects in WWW was by discussions between experts in particular fields with input from experts in data management. Therefore, the work of the group is best furthered by discussion/meetings of small groups of experts on specific topics with the Working Group on Data Management, and other working groups as appropriate, providing an overview to ensure general applicability of recommendations arising. The Commission agreed on the future work programme of the Working Group on Data Management.

Distributed Data Bases Concept

6.4.5 The Commission noted with appreciation the final report of the Expert Meeting on the WWW Distributed Data Bases (DDB) Concept (Reading, UK, 25-27 October 1989) and the related deliberations of the WGDM. It welcomed an amendment to the final report of that meeting contained in Annex VII to this report which helped clarify the conceptual system of the DDB.

6.4.6 Considering the objectives of the WWW DDB proposals as discussed in the WWW SLTP, the Commission endorsed the set of principles for the DDB concept and the implementation strategy of the DDB developed by the expert meeting and submitted by the Working Group on Data Management. It asked the Working Group on DM to monitor closely the recent developments in the computer industry and especially in the software market, with regard to commercial Data Base Management Systems, which seem to become increasingly attractive to the climatological community. Also, the difference in characteristics between conventional observational data sets and data sets containing products should be investigated with a view to better understanding the possible impact on the DDB.

6.4.7 Emphasizing the need for a transitional phase enabling the evolution from existing meteorological data bases to a soundly structured DDB system, the Commission considered an initial set of requirements proposed by the WGDM for specific development needed of the GTS and GDPS systems to progress in this direction. It endorsed, in principle, this set of requirements as given in Annex VIII to this report, but also felt that further refinement would need to be undertaken by the Working Group on Data Management, in co-operation with the Working Groups on the GDPS and on the GTS, as appropriate. This applies, for instance, to the selection of appropriate CCITT standards (such as X.400) and a more precise definition of possibly overlapping functions of the GTS and DM. Complementary to the efforts of the Working Group on DM, the Commission asked the other CBS working groups to develop the requirements they would wish to place on DM, for example in terms of data flow, data types, data representation forms, exchange of data-management information.

6.4.8 Other particular actions identified were the need to design a common standard to be employed for a catalogue of data base contents at each DDB centre and the need for specific proposals for standard request/reply mechanisms. The Commission felt that these detailed proposals should be developed by an individual consultant or expert for consideration by both Working Groups on Data Management and on the GTS. It was agreed that regional associations would need to consider the organization of the implementation of such procedures at the regional level.

6.4.9 The Commission emphasized that much more work was still needed before the DDB concept was developed. Therefore, the Commission supported a number of related activities initiated by the Working Group on Data Management, such as:

(a) Investigation of requirements related to transformations between different data forms and formats;

(b) Pilot scheme for issuing and exchanging status messages;

(c) Technical survey on structures and functions of existing meteorological data bases.

The Commission asked the Working Group on Data Management to produce the respective results in due course with a view to building the necessary knowledge basis for further development of the DDB concept.

Data representation forms for observational data and products

6.4.10 The Commission noted that, although several studies had shown that using BUFR as a storage format for meteorological data bases may be very efficient for some purposes and several centres were already using this method, further experience was needed before detailed recommendations could be developed.

6.4.11 In view of the rapid expansion of the application of BUFR formats for the exchange and storage of many types of data and the complexity of reaching agreement on the table definitions needed, the Commission supported the proposal of the Working Group on Data Management to hold a further meeting of experts as soon as applicable.

Guide on Data Management

6.4.12 In recognizing the urgent need for more general awareness of specific data management issues and activities, the Commission followed the proposal of the CBS Advisory Working Group (15th session, Nairobi, 4-8 December 1989) that work should be undertaken to prepare a Guide on Data Management. The Commission supported the activities commenced by the Working Group on Data Management by identifying a list of topics for which contribution of papers should be sought. These would then form the basis for development of the Guide.

Co-operation of WWW DM with other WMO programmes

6.4.13 The Commission recognized that the WWW DM must also meet the needs of other WMO programmes and that it was important that close co-operation be maintained with experts on data management issues involved with those programmes. Of particular relevance in this respect is the Commission for Climatology's Working Group on Climate Data. The Commission supported the proposal of the Working Group on Data Management that an effective way of ensuring that respective views of this group and the Working Group on Data Management were fully known would be the appointment of rapporteurs from each group to be fully involved with all data management matters discussed by the other group and who would also attend any meetings of the group which might be arranged. The Commission invited the Secretary-General to seek endorsement by CCl.

Quality control procedures and monitoring of data quality

6.4.14 The Commission noted with appreciation the report on results of data quality monitoring based on information provided by lead centres. Three centres were appointed in November 1988 by the president of CBS, in accordance with Recommendation 8 (CBS-IX), as the lead centres for monitoring upper-air data quality RSMC ECMWF, surface marine data quality - RSMC Bracknell, and satellite and aircraft data quality - WMC(NMC) Washington.

6.4.15 The session noted that, after its appointment, RSMC ECMWF started compiling the results of its upper-air data quality monitoring in 1989. Consolidated reports were produced every six months and sent to the WMO Secretariat. They contained lists of stations providing erroneous data of geopotential height and wind and informed about improvements and deteriorations during the period. Currently, the GDPS centres of the UK Meteorological Office, Japan Meteorological Agency, WMC Washington and RSMC ECMWF also participate in a monthly exchange of statistics on upper-air observations monitoring. The format of these results was agreed by CBS-IX (Recommendation 3) and comprised lists of so-called suspect stations, selected according to simple objective criteria based on root mean square departures between observations and numerical fields.

6.4.16 The Commission noted that RSMC Bracknell in its role as a lead centre had monitored data from ships, drifting buoys, moored buoys and other marine platforms. Following a CBS recommendation, four centres, i.e. RSMC Bracknell, RSMC ECMWF, RSMC Tokyo and WMC Washington have exchanged monitoring information each month. As lead centre, RSMC Bracknell has submitted two reports to the WMO Secretariat for January-June 1989 and July-December 1989, presenting monitoring results for observations of pressure only. Follow-up action was taken by the WMO Secretariat.

6.4.17 The Commission noted that monitoring of aircraft and satellite data quality was carried out by WMC(NMC) Washington on the basis of information exchanged between RSMCs Bracknell, ECMWF and Tokyo. The centres have agreed on an initial format for exchanging information on data quality of aircraft reports, as well as SATOB (cloud-motion vectors) and SATEM (temperature profiles retrieved from satellite radiometry) reports. In many cases the causes of errors were identified and discussed with data producers. Some problems of aircraft data quality need further investigation.

6.4.18 CBS-IX had emphasized the importance of co-ordinating the activities of data quality control and monitoring of data quality and noted that the WMO/ECMWF Workshop on Data Quality Control Procedures (Reading, 6-10 March 1989) reviewed the status of real-time procedures used in WMO Regions and discussed the current status of data quality monitoring, especially in leading GDPS centres. The recommendations of this workshop were submitted to the fifth session of the Working Group on the GOS and to the seventh session of the Working Group on the GDPS. Both working groups improved and adopted the recommendations. The Second WMO/ECMWF Workshop on Meteorological Operational Systems (Reading, 4-8 December 1989) developed improvements to the procedures for exchanging information on monitoring on data quality. The Working Group on Data Management collected the various recommendations and produced a consolidated list of recommended procedures. The Commission endorsed the procedures as they are reflected in Annex IX to this report.

6.4.19 The Commission noted that these procedures were in fact embedded in a constant process of operational improvements of the participating centres and that further development would be best achieved by means of expert meetings and workshops, as appropriate. The co-ordinating role of the lead centres in their area of responsibility was emphasized.

6.4.20 The Commission further expressed the view that monitoring exercises served little purpose unless the monitoring results were effectively conveyed to the relevant data producers and the identified problems were corrected. It noted that this was already being done by RSMC ECMWF as a continuation of the Pilot Study in which direct contact was established with national focal points for radiosonde systems and it requested the other lead centres to consider similar action for the data types for which they were responsible.

6.4.21 The Commission expressed appreciation to all lead centres for their valuable contributions to the monitoring of data quality.

Graphical representation standards

6.4.22 Over many years a set of symbols for surface observations contained in the Manual on the GDPS have been in use. The symbols formed a consistent set for the representation of meteorological information in graphical form. As, on one hand, "present weather" is now also being observed by automatic stations, and the "9-groups" have been adopted, and on the other hand the use of high resolution graphical workstations is increasing besides the use of plotted charts, an amendment to the current set of symbols is required. To this end revised proposals were submitted by the Working Group on Data Management. The Commission adopted these and stressed that the new symbols for surface stations did not abolish or change the existing set. They should provide a comprehensive standard of graphical representation of the observed weather elements on all graphical representation media used in the meteorological community. Recommendation 9 (CBS-Ext.(90)) was adopted. Noting that the recommendations for the standardized plotting of upper-air information had been withdrawn from the Manual on the GDPS the Commission also discussed a new proposal. The Commission felt, however, that further study was needed and referred it back to the WGDM/Subgroup on Data Representation.

6.4.23 In considering the storage and exchange of information in graphical form and the adoption of specific graphics software standards, the Commission expressed the view that further study and practical experiments were needed before firm recommendations could be made. The Commission, nevertheless, felt that some general guidance might be helpful to Members considering:

(a) That the application of computer graphics are a fundamental tool in operational meteorology;

(b) That personal computer systems appear to be particularly suitable for developing countries, due to their widespread availability and the lower costs;

(c) That graphical workstations generally have better performance and graphical resolution than personal computers;

(d) That the operating system UNIX appears to be the most suitable for this area of application both in terms of functional flexibility (e.g. multi-tasking) and in terms of standardization.

6.4.24 The Commission encouraged all centres to implement interactive graphics systems into their routine operations as soon as practicable. To this end, the Commission agreed on the following principal guidelines:

(a) Users should be aware of the GKS standard for graphical software;

(b) The existence of general purpose, widely portable operating systems may be of interest, for example UNIX-type operating systems for technical workstations, and DOS for simple single user tasks;

(c) The design of graphical systems should be modular and consist of a data handling subsystem, a graphical subsystem and a user interface with precisely defined software interfaces between them;

(d) The communications component for the access to the GTS should, whenever feasible, not reside on the graphics system;

(e) The graphics system should be able to handle WMO agreed character and binary formats; in view of the increasing role of binary codes and their greater flexibility, internal conversion of character formats in the data-handling subsystem should be used, whenever practicable;

(f) The meteorological graphics community is encouraged to co-operate with and participate in the CBS software exchange in order to exchange specific software modules for graphics and data handling and thus, help to spread well-proven, standardized software and to reduce development cost.

Exchange of software

6.4.25 Based on the decisions of CBS-Ext.(85) and CBS-IX, the Commission discussed the exchange of meteorological applications software between WMO Members. The exchange of meteorological application software should help Members in obtaining well-proven standardized software modules, design ideas and development methodologies. It should enhance the transfer of technology to less advanced countries and also become a tool for the planning of WMO co-ordinated projects, such as SHARE, by reflecting the most common needs for software and technical support.

6.4.26 The Commission observed that the exchange of software or provision of software support, emanating under the software exchange, should, in each case, be arranged as a bilateral (multilateral) agreement between a donor and the recipient country (countries). The Commission reviewed the results of two questionnaires sent out by the Working Groups on the GDPS (May 1989) and on Data Management (May 1990) and was pleased to note that by July 1990:

(a) 142 programmes were offered by 18 Member countries;

(b) 200 programmes were requested by 32 Member countries.

6.4.27 The Secretary-General was invited to compile the results of both surveys in a software registry and to publish it to inform Members about offered and/or requested software. The registry should be in the English language only (offers/requests in other languages will be translated by the Secretariat) and be regularly updated (e.g. once a year). The registry should also be made available on floppy disk, should Members wish to receive it in that form.

6.4.28 Members were encouraged to actively contribute to the project and the Commission especially invited Members operating computerized centres to consider the list of requested software with a view to making their software available as appropriate.

Binary codes

6.4.29 The Commission noted that the results of the activities of the Subgroup on Data Representation, and in particular the conclusions and recommendations of its first session (Geneva, 15-19 May 1989), were approved by the chairman of the CBS Working Group on Data Management and the president of CBS, and adopted as Recommendation 23 (CBS-89) - Amendments to FM 92- GRIB tables and FM 94 - BUFR descriptor tables, subsequently approved by the President of WMO for use as of 1 November 1989. It was further noted with appreciation that the approved specifications were issued in a remarkably short time as Supplement No. 1 (dated September 1989) to the Manual on Codes (WMO-No. 306).

6.4.30 The Commission considered that there was an urgent need for the development of international standards for representation of satellite image. It was informed and noted with appreciation that this task was being addressed by the CBS Working Group on Data Management through its Subgroup on Data Representation.

6.4.31 The Commission was informed that the evaluation of many proposals for augmentation of BUFR and GRIB and other data representation aspects was currently being undertaken. These will be further reviewed at an expert meeting of the subgroup planned to be held in October 1990.

Character codes

6.4.32 The Commission noted with appreciation that action had been taken by correspondence by the Subgroup on Codes on the following:

(a) Expansion of the TEMP code to provide for upper-air reports from mobile land stations, FM 38-IX TEMP MOBIL, by Recommendation 22 (CBS-89);

(b) Editorial correction of FM 88-VI Ext. SATOB and in specification of group $7R_{24}R_{24}R_{24}R_{24}$ in Section 3 of SYNOP;

(c) Expansion of the algorithm for allotting station index numbers in the Antarctic to provide for proper identification of new stations in certain areas.

6.4.33 The Commission reaffirmed its decision that changes to character codes should be introduced only when it was absolutely necessary. It urged Members and its Working Group on Data Management Subgroup on Codes to take into account possible increase in workload on centres when proposing amendments to character codes.

6.4.34 The Commission reviewed and agreed to the proposed changes to DRIBU code in order to restructure its representation and incorporate new data types currently becoming available from drifting buoys. It noted that the revised code, named DRIFTER, made use of the current structure of TESAC code for reporting sub-surface information when these were available and would replace the current DRIBU code. Recommendation 10 (CBS-Ext.(90)) - Proposed code FM 18-IX Ext. - DRIFTER - Report of a drifting buoy observation to replace FM 14-VIII DRIBU - was adopted.

6.4.35 The Commission reviewed and agreed to proposed amendments to TEMP code, to provide for:

(a) Follow-up action on Recommendations 13 and 20 (CBS-IX) to meet ASAP requirements, by completing the specifications of relevant code tables;

(b) Meeting the criteria for automatic processing and reporting of significant levels in TEMP in accordance with guidance developed by CIMO;

(c) Further standardization of coding procedures for reporting 925 hPa level data by inclusion of 925 hPa as a standard level in Part A of TEMP code.

Recommendation 11 (CBS-Ext.(90)) - Proposed amendments to FM 35-IX TEMP, FM 36-IX TEMP SHIP, FM 37-VIII TEMP DROP and FM 38-IX TEMP MOBIL was adopted.

6.4.36 The Commission considered proposed amendments to GRID and GRAF codes with a view to harmonizing the specifications of types of parameters with those in GRIB table 2. It agreed with the recommendation of the Subgroup on Codes as modified by the CBS Working Group on Data Management to provide for optional inclusion of the group $2n_Tn_Ta_1a_2$ in Section 0 and 5 of FM 47-V GRID and FM 49-VII GRAF. Recommendation 12 (CBS-Ext.(90)) - Proposed amendments to FM 47-V GRID, FM 49-VII GRAF - was adopted.

6.4.37 The Commission reviewed and agreed to proposed modifications to the SYNOP/SHIP code and regulations of BATHY and TESAC to address the following requirements:

(a) Further standardization in reporting station pressure for use in NWP models whose vertical co-ordinates depend on surface pressure (Section 1, group $3P_oP_oP_oP_o$);

(b) The use of pressure tendency algorithms as adopted by Recommendation 7 (CIMO-IX) for application with synoptic automatic weather stations (Section 1, group 5appp);

(c) The indication of the actual time of observation, in particular for asynoptic data obtained by interrogation of automatic stations by satellite (Section 1, 9-group in the form of 9GGgg);

(d) Reporting of other types of solar radiation in addition to net solar radiation as required by CAgM and for use in meso-scale forecast models to initiate and verify fluxes of solar and terrestrial radiation in the models (Section 3, groups $5j_1j_2j_3j_4$ $j_5j_6j_7j_8j_9$ in the form 55SSS $j_5F_{24}F_{24}F_{24}F_{24}$ or 553SS j_5FFFF);

(e) Follow-up action on CBS Recommendation 12 (CBS-IX) on the global use of the 7-group in Section 3 in the form $7R_{24}R_{24}R_{24}R_{24}$;

(f) Corrections and minor editorial changes to improve and clarify certain specifications of supplementary information (Section 3, group $9S_PS_Ps_ps_p$);

(g) Minor modification to regulation of BATHY and TESAC as given in the annex to paragraph 3.8.1 of the report of the subgroup to resolve a problem noted in the encoding of the optional group for reporting the surface wind.

Recommendation 13 (CBS-Ext.(90)) - Proposed modifications to FM 12-IX SYNOP and FM 13-IX SHIP and minor modifications to regulations of FM 63-IX BATHY and FM 64-IX TESAC - was adopted.

6.4.38 The Commission reviewed and agreed to a recommendation on extension of the ASDAR code to report aircraft meteorological data automatically relayed to ground stations by various communications systems, i.e. ASDAR (satellite data relay) and ACARS (VHF data relay using ARINC and SITA AIRCOM). It noted that the revised code, renamed AMDAR, was structured so as to retain the unique ASDAR section, but at the same time to serve as a suitable message format for selected exchange over low-speed communication circuits when other automatic relay systems were used. It noted that the extension to include the new Section 3 provided for reporting from ACARS systems of the flight level and the maximum derived equivalent vertical gust. Recommendation 14 (CBS-Ext.(90)) - Proposed modification and extension of FM 42-ASDAR to FM 42-AMDAR - Aircraft report (Aircraft Meteorological Data Relay) - with a new Section 3 was adopted.

6.4.39 The Commission considered and agreed to recommendations of the first session of the Subgroup on Codes, as reviewed and endorsed by the first session of the CBS Working Group on Data Management on a new generation of the aeronautical meteorological codes METAR/SPECI/TAF/ARFOR/ROFOR as defined in the light of new operational requirements stated by ICAO (except for ARFOR/ROFOR) in the report of the conjoint COM/MET/OPS Divisional Meeting (1990)/ninth session of CAeM and to make the specification and representation of the code as self-evident as possible for the benefit of a diversity of users. It noted with satisfaction that the operational requirements of ICAO and aeronautical user organizations would be met by the proposed new codes METAR/SPECI/TAF. ICAO expressed appreciation for WMO's assistance in this long and complex task and, in particular, for the speed and efficiency with which the new generation of aeronautical meteorological code forms had been developed by CBS. Recommendation 15 (CBS-Ext.(90)) - Proposed FM 15-IX Ext. METAR, FM 16-IX Ext. SPECI, FM 51-IX Ext. TAF, FM 53-IX Ext. ARFOR and FM 54-IX Ext. ROFOR - was adopted.

6.4.40 The Commission noted that the need for development of one set of codes for real-time exchange of radiological data in lieu of the several existing national coding practices was agreed to by CBS-IX. The session was informed that the proposed Radiological Codes were based on requirements stated by CBS-IX (general summary, paragraph 9.6) and procedures published in WMO/IAEA Manual on the Use of the WMO/GTS for Early Notification Convention and recently adopted BUFR specification (Class 23 - dispersal and transport and Class 24 - radiological elements). It was noted that the proposed draft specifications for FM 22-IX Ext. RADREP - Radiological Data Report - (monitored on a routine basis and/or in case of an accident) and FM 57-IX Ext. RADOF - Radiological Trajectory Dose Forecast (defined location and expected time of arrival), were extensively reviewed by the Subgroup on Codes before and at its first session and finalized by a small group of its members established by that session, chaired by the chairman of the Subgroup on Codes and charged with the responsibility of recommending a final version to this CBS-Ext. session.

6.4.41 The IAEA observer informed the Commission that IAEA was currently reviewing the data and information requirements that were used to develop the proposed radiological codes. He indicated that the updated requirements would be finalized in the next four to five months and that the overall requirements would not change drastically, but would be an expansion of the old requirements with some changes to format for the purpose of clarity. Following discussions within the session's Subgroup on Codes, the IAEA observer confirmed that IAEA had no objection to the Commission approving the use of the revised radiological RADREP and RADOF codes with the following understanding:

(a) The revised codes will be used for routine radiological monitoring data but will not be adopted by IAEA at this time for emergency purpose and hence will not be used for modifying the WMO-IAEA GTS Manual;

(b) IAEA will review the codes thoroughly to assure that it can be used for their need to also transmit the formatted data by other means (telex, faxcimile, electronic mail) and provide comments to the CBS Working Group on Data Management Subgroup on Codes;

(c) IAEA will provide to the CBS Working Group on Data Management Subgroup on Codes, in the next four to five months, their revised radiological data information requirements to be used in updating the emergency sections of the code. This will then be the basis for changes to the WMO-IAEA GTS Manual and any decoding software the IAEA might send to their Member States;

(d) IAEA recognize that the WMO and, in particular, the Commission for Basic Systems and its Working Group on Data Management are the experts on codes but, at times, the working group will need IAEA radiological expertise to assure that their requirements are met fully.

6.4.42 The session was informed by the observer of the Commission of the European Communities that the Commission of the European Communities (CEC) was actively liaising with the International Atomic Energy Agency (IAEA) to ensure that the two systems achieved maximum possible compatibility in this and other matters. One aspect particular to the Convention system is the provision for data communication via the GTS and the consequent need for appropriate coding standards. To the extent that the preparation of such standards may itself produce a feedback effect on the basic data format, therefore the CEC is interested in following developments. The invitation for CEC to be represented together with the IAEA at the CBS meeting had been very much appreciated and the CEC looked forward to maintaining contact with the CBS, and in particular its Subgroup on Codes as the data provisions were further developed.

6.4.43 The Commission reviewed and agreed to the final draft version of the proposed codes for real-time exchange of radiological data. Recommendation 16 (CBS-Ext.(90)) - proposed FM 22-IX Ext. RADREP - Radiological data report - (monitored on a routine basis and/or in case of an accident) and FM 57-IX Ext. RADOF - Radiological trajectory dose forecast - (defined location and expected time of arrival) - was adopted.

6.4.44 The Commission noted the recommendation of the Working Group on Data Management that WMO-No. 306, Manual on Codes, Volume I, should be split into two parts on the next occasion when longer supplements are processed and issued as parts A and B with separate covers, i.e.:

(a) Volume I, International Codes, Part A - Alphanumeric Codes;

(b) Volume I, International Codes, Part B - Binary Codes.

6.4.45 The session reviewed the proposed future work programme and agreed that the following tasks would require further study by the Subgroup on Codes beyond CBS-Ext.(90):

(a) Development of sea-level code;

(b) General review of specifications to provide in each code inclusion of data definition (e.g. Section 1 of GRIB and BUFR);

(c) Updating of the radiological codes on the basis of revised requirements from IAEA;

(d) Maintenance of existing code forms;

(e) Development of new code forms to meet urgent requirements.

6.5 Report of Rapporteurs on Satellite Data (agenda item 6.5)

6.5.1 The Commission noted with appreciation the report provided by the Rapporteurs on Satellite Data Retrieval Methods and Use of Quantitative Satellite Systems - P. Menzel (USA) and J. Le Marshall (Australia). The report identified the substantial progress being made in the reception, processing and application of satellite data. Of particular interest to CBS was the increasing use of satellite data by developing countries.

6.5.2 The Commission concurred with the rapporteurs' assessment that substantial efforts were still required to make more effective use of the current satellite data. This statement confirmed one of the conclusions drawn in the final report on the OWSE-North Atlantic to the effect that satellite data were still under-utilized. A common theme in both reports is that, while progress is being made, numerical assimilation techniques are not yet well matched to the unique characteristics of the satellite sounding data. Further, the use of sounding data in national programmes needed major emphasis. The Commission also noted that, to be used effectively, the satellite data had to be disseminated to national Meteorological Services and this implied that the GTS needed to be strengthened in some areas. The Commission noted the need to continue to evaluate the impact of the various satellite data forms. The results of such studies should be taken into consideration by satellite agencies when planning future programmes.

6.5.3 Special note was taken of the significant changes, either in progress or to be implemented during the decade, in the capabilities of the meteorological satellites. The planned introduction of improved micro-wave sounders and sounders with better vertical and horizontal resolution were considered to be of high priority to meet the needs of the Members.

6.5.4 The Commission recognized the role played by the EC Panel of Experts on Satellites in the identification of major issues and the formulation of possible strategies to be followed by WMO. The importance of maintaining stable and compatible data-processing techniques, especially in view of the new sounding instruments to be introduced by several satellite operators, was noted. It was considered essential to prepare a statement on the minimum performance characteristics of data-processing software if effective use was to be made of satellite data and derived products. The Commission noted in this regard, that the existing software packages in use for the local processing of TOVS data had been developed and maintained on an interim basis through the International TOVS Working Group (ITWG). Provision needed to be made for the long-term maintenance of any satellite-processing software if it was to be used generally in the WWW. The Commission therefore, urged appropriate Members to consider providing the resources needed to maintain any satellite data-processing software used operationally in the WWW. Noting the Direct Read-out Service and the particular importance of satellite data in predicting severe local weather, the Commission stressed the need for TOVS software to be available to all national Meteorological Services.

6.5.5 In view of the work already carried out by the ITWG concerning the processing of satellite data, the Commission believed that the ITWG could assist in the preparation of the statement on the minimum performance characteristics of data-processing software for satellite data, especially for local use by developing countries. It asked its president to consult with the ITWG on the possibilities for developing such a statement. It noted further that once the performance characteristics had been developed, it would be necessary to evaluate, on a regional basis, any software based on these characteristics.

6.5.6 Noting the report of the rapporteurs, the Commission identified the need to provide adequate training to Members both in the characteristics of the satellites and in the effective application of the data. It noted that such training had been included in the "Guidelines for the education and training of personnel in meteorological and operational hydrology" (WMO-No. 258) and agreed that additional emphasis needed to be given to training in these aspects. In this regard, the Commission believed that donors to multi- and bi-lateral aid programmes should be encouraged to assist the developing countries to make better use of the existing satellite data and to prepare for the changes expected later in the decade.

6.5.7 The Commission, therefore, endorsed the need for an increased emphasis on co-ordinated international training programmes regarding the use of satellite data, especially in regard to the theory and concepts of satellite soundings and the application of such data in national forecast programmes. It also considered it to be important to provide workshops on the future capabilities of satellite systems and the potential impact these would have on the various meteorological programmes. The Commission asked the Secretary-General to bring to the attention of the VCP donors and others, the importance of expanding both the number and type of satellite training activities for developing countries.

6.5.8 The USA noted that innovative training was required if the benefits of satellite data were to be made accessible to a larger group of Members. In this regard, the USA informed the Commission that it intended to provide a series of training workshops for developing countries in 1991 and 1992. Such training would be co-ordinated with WMO and would be given on a regional basis for RA I, RA III and RA IV. The Commission welcomed the offer of the USA and asked the Secretary-General to provide appropriate assistance within the resources allocated for such purposes.

6.5.9 The Commission was informed by EUMETSAT that a series of METEOSAT data users symposia had been held on the use of satellite data in operational and research programmes of the Members. EUMETSAT advised that the proceedings of these symposia were available and could be provided to Members upon request.

6.5.10 In regard to training and workshops, the Commission welcomed the offer of the ITWG, as relayed by the rapporteurs, to assist in such training programmes. It asked the Secretary-General, therefore, to work with the ITWG and the rapporteurs to develop a series of training workshops and lectures which would make use of the unique capabilities of the participants in the ITWG concerning the existing and future satellite programmes, and applications of the data.

6.5.11 A number of Members expressed their view that additional efforts were needed to increase the use of satellite data. In this regard, the Commission was informed that a jointly sponsored workshop was planned by the ECMWF and EUMETSAT. In addition, ECMWF and EUMETSAT noted that a joint research unit had recently been formed to examine the ways in which the satellite data could be used more effectively in operational meteorological programmes. Australia informed the Commission that satellite data were essential to its provision of meteorological services. As part of its work to make the most effective use of the satellite data, Australia had developed a number of innovative techniques, such as the use of the TOVS data to monitor the distribution of total ozone. The Commission strongly endorsed these activities and encouraged Members to consider further steps to develop procedures for making effective use of the satellite data.

6.5.12 The point was made during the discussions that the impact of satellite data needed to be examined further. While there was little doubt that existing satellite systems had had a strong positive impact in the southern hemisphere, the impact in the northern hemisphere had been less pronounced and it was considered necessary to better define the value which could be attributed to the satellite information before convincing arguments could be made for making major improvements to the satellite systems or to the ground data-processing procedures. The Commission, therefore, encouraged appropriate Members and organizations to conduct such impact studies and to make the results known to the meteorological community.

6.5.13 The Commission noted that an important factor in the increased use of satellite data had been the availability of relatively inexpensive and direct access to satellite services, such as the Data Collection System (DCS), WEFAX, TIROS Information Processor (TIP) beacon and Meteorological Data Distribution (MDD). It further noted that the DCS and MDD capabilities were under evaluation through the OWSE-AF (both Phases I and II) and were expected to play an important part in the augmentation of the GTS in RA I. The Commission therefore requested the president to draw the attention of the satellite operators to the value of and need to continue the Direct Read-out Services. The Commission was informed of the status of the direct broadcast sevices provided from USA satellites. Annex X to this report contains the information provided by the USA.

6.5.14 The rapporteurs had informed the Commission that the ITWG had expressed an interest in conducting further studies of the data sets obtained during the evaluations of the Baseline Upper-air Network (BUAN). The Commission encouraged such studies and asked the rapporteurs to keep the Commission informed of the results obtained. Regarding improvements to satellite data bases, the Commission took note of the importance of the CIMO intercomparisons of radiosondes since the results of such intercomparisons were a valuable source of information in the development of improved satellite retrieval procedures.

6.5.15 In describing its future programme the EUMETSAT indicated that the second generation METEOSAT was under development, but that it would not carry a high resolution sounding instrument. Consideration, however, was being given to a polar orbiting satellite which would carry such an instrument. EUMETSAT also indicated that it had recently instituted an electronic bulletin board for the rapid dissemination of information on the status of the METEOSAT satellites. Information on the use of the bulletin board could be obtained by contacting EUMETSAT directly.

6.5.16 The Commission stressed the need for sounding data of higher resolution than that currently expected to be available from radiometers to be flown during the next decade. Improved soundings from polar orbiters are expected to be especially useful during this period. It believed that improved vertical resolution was central to the improvement in meteorological data bases over many areas, especially the southern hemisphere and ocean areas. It further noted the need to develop software for data processing of sounding data which meets the minimum requirements of the meteorological community. Such software needed to have a measure of standardization and compatibility from version to version, thus providing a stable basis for developing applications programmes.

Demonstrations of satellite data reception and processing facilities

6.5.17 The Commission received with great interest and appreciation presentations on satellite data reception and processing facilities. These were:

(a) ATMOSAT - Interactive IBM PC/AT system for processing of TOVS data (Poland);

(b) MIST - Meteorological Information System (United Kingdom);

(c) Meteorological data distribution by geostationary satellite (EUMETSAT);

(d) Meteorological application graphics integrated colour system MICROMAGICS (ECMWF);

(e) SMCPPS - PC-based data processing and display of data from geostationary and polar-orbiting meteorological satellites (China);

(f) DARTCOM - Desktop satellite image acquisition display and processing (United Kingdom).

These presentations demonstrated some recent advances in this area and included systems under development as well as systems currently in operational use.

Studies concerning future satellite programmes

6.5.18 The Commission noted that the EC Panel of Experts on Satellites at their November 1989 meeting had proposed a study of the future capabilities of satellites. EC-XLII adopted their recommendations and requested CBS to propose an appropriate mechanism and study:

(a) The changes to satellite capabilities planned for the 1990s;

(b) The minimum performance characteristics of satellite receiving and processing equipment for specific WMO applications.

6.5.19 The Commission fully agreed that satellite studies were essential and noted the work which had already been started as a result of the joint EUMETSAT/ECMWF meeting in June 1989. The Commission noted that a number of recommendations had been addressed to CBS from both the rapporteurs on satellites and the EC Panel on Satellites raising important issues. It felt that these recommendations required both long- and short-term actions to address them properly. The Commission also noted the recent action of the Executive Council in requesting the EC Panel on Satellites to examine its role with respect to integrating its functions within CBS.

6.5.20 In addressing the issues which require specific studies mentioned in paragraph 6.5.18, the Commission noted that a similar study had been performed as part of the normal activities of the Working Group on the Global Observing System during its fifth session. The Commission requested the working group to carry out a study which identified the plans of satellite operators for new satellite systems, including ground processing systems and relevant research satellite systems planned for the 1990s. The Commission felt that study (b) above should await the completion of study (a) since workstations were evolving rapidly; yet it was important to take into consideration the new satellite observing capabilities planned for the 1990s as part of the workstation capabilities.

6.5.21 Several organizational and programmatic approaches were suggested to deal with the growing satellite activities of the Commission, but it was recognized that a long-term approach and a permanent structure within CBS to address satellite issues should be considered. The Commission requested the president to examine this issue and develop a proposal on how this should be provided. It also emphasized the urgency of this request noting that the issue of future arrangements for satellite matters are likely to be discussed at a forthcoming meeting of the presidents of the technical commissions and the next session of the Executive Council. In developing the approach the changing organizational environment and financial considerations should be taken into account.

6.6 WWW Implementation Support Activities (ISA), including the Operational Information System (OIS) and Implementation Co-ordination activities (WIC) (agenda item 6.6)

6.6.1 In the WWW system the application of affordable computer technology offers an opportunity to improve Members' capabilities to exchange and process large volumes of data and to narrow the technological gap between Meteorological Services. Results of the WWW Integrated Systems Study (completed in 1985) showed that there is a need for close co-ordination when implementing systems components which interface with each other on a national, regional or global level. This is one of the aims of the WWW/ISA which is proposed to be renamed WWW System Support Activities (WWW/SSA).

WWW system support activities (WWW/SSA)

6.6.2 The Commission stressed the importance of the WWW/SSA to all Members for the improvement of the WWW. The projects under WWW/SSA aim at a co-ordinated introduction of proven technology and methods into the operational components of the WWW (GOS, GDPS, GTS) and their full integration through the provision of reference information, arrangements for advice, assistance and the development of dedicated training programmes. The Commission considered in particular that improving telecommunications was a cost effective way of improving the availability of observations and products to all Members.

6.6.3 The Commission noted with appreciation the large number of Members that had received support of various types, such as planning and engineering advice as well as hardware and/or software support (MSS and SHARE), through WMO co-ordinated projects with direct involvement of WWW/SSA during the past two years. However, the Commission recognized that difficulties were increasingly caused, on one hand, by the complexity and variety of the computer systems involved and, on the other hand by the limited manpower available in the Secretariat for the co-ordination and engineering support required for such systems. The Commission also voiced concern that software produced under training programmes by trainees was later used operationally in WMO co-ordinated computer projects by recipient countries. The Commission felt that such software did not fully satisfy either the requirements regarding quality and reliability for operational applications or the need for support and maintenance.

6.6.4 The Commission agreed that WMO needed an improved strategy which ensured the optimal use of resources while serving the needs of as many Members as possible. This would lead away from individual solutions towards the development of model solutions for common problems on the basis of standardization and modularity and must take into account commercial developments as well as Members' initiatives in offering suitable components for integration into the WWW system. The Commission noted the role of the Secretariat in the execution of these projects, which were often funded by UNDP, and stressed the need for proper project management in view of their highly complex and technical nature.

6.6.5 The Commission welcomed the Secretary-General's initiatives in establishing the Technical Advisory Board (TAB) and the Co-ordinating Committee on SSA (CC/SSA) which provided technical advice and recommendations on conceptual and training matters pertaining to WMO co-ordinated projects relating to the automation of Meteorological Services. Based on the guidelines developed by the TAB (November 1989) the Commission discussed and endorsed the following strategy:

(a) The CBS working groups formulate the WWW requirements on a global scale and determine the structural implications for the WWW systems as a whole. They also advise on standards, techniques and procedures to be used. The Working Groups on Regional WWW Systems Planning, Co-ordination and Implementation have an important role in identifying deficiencies, specifying requirements and planning assistance projects under the SSA on a regional scale;

(b) An integrated meteorological automated system should consist of the three separate basic functions:

- Message switching system;
- Data handling sub-system;
- Presentation sub-system;

Precisely defined interfaces should exist between these functions. Each hardware solution for an NMC should be configured to accommodate these basic functions to the extent required by the country;

(c) Software, data representation forms, interfaces and communication procedures should strictly adhere to appropriate ISO and WMO agreed standards;

(d) Software, before being considered for distribution to Member countries within a WMO co-ordinated computer project, should be fully tested and running in a realistic operational environment;

(e) A firmly guaranteed mechanism for:

- Initial technical and training support (before the implementation of the computer system);
- Long-term updating and maintenance;
- Long-term training support;

is necessary for each WMO co-ordinated computer project. The provision of these support functions should be the responsibility of donors, whenever feasible. Funding plans should be developed at the outset of the project to ensure that the necessary resources in terms of funds, expertise and long-term support services will be available over many years. Long-term support services can only be provided as long as the received computer programmes are not altered by the recipients;

(f) For each WMO co-ordinated computer project, the WMO Secretariat should prepare a document explaining the rules of distribution for the software especially license issues, rights to proliferate or alter the software, liability, etc. This document should be transferred to the recipient together with the software.

6.6.6 The Commission emphasized that the training programmes (e.g. SHARE) aim at the transfer of knowledge needed for the smooth operation of computer systems as well as the creation of local expertise which would allow for self-reliance in planning, adapting and maintaining such systems in the future.

6.6.7 The Commission recognized that the successful implementation of meteorological application software required automated access to data on the GTS and that this could, in many countries, be better and more economically achieved by means of a limited automated telecommunication system rather than by a "full scale" automatic message switching system (which is in fact designed for RTHs and large NMCs). In this connection, the Commission endorsed the opinion expressed by the twelfth session of the Working Group on the GTS concerning the basic requirement for such a front-end, off-the-shelf communication system using widely available system components such as the C programming language or the UNIX operating system which were available on a wide range of computer systems. The Commission invited the Secretary-General to refine the specifications of a system which could be used in appropriate WMO co-ordinated computer projects.

WWW Operational Information Service (WWW/OIS)

6.6.8 The Commission noted that the OIS provided information on the implementation and operation of WWW systems as received from Members. Emphasis was placed on the accuracy of the information and on its timely dissemination to provide notifications of operational changes as rapidly as possible.

6.6.9 The Commission noted the two-year schedule for new editions and supplements to basic WWW directories on observing stations, data processing, meteorological bulletins, transmission schedules, information for shipping, international list of observing ships, lists of stations for global and regional exchange, etc. which will continue to be issued under the OIS as part of the WMO programme of mandatory publications (cf. Annex XI to this report). In this connection the Commission requested the Advisory Working Group to review the content and schedules of operational WWW publications with a view to streamlining the flow of information contained therein.

6.6.10 These publications are complemented by the weekly METNO and WIFMA notifications on the GTS and by the monthly letter of the operation of the WWW which will be further expanded to meet the new information requirements of the WWW system. The Commission noted that, in addition to the magnetic tapes currently available, operational information would also be distributed on floppy disk to respond to the needs of a larger number of Members and WWW centres.

6.7 Operational WWW Systems Evaluations (OWSE-NA and OWSE-AF) (agenda item 6.7)

OWSE-North Atlantic (OWSE-NA)

6.7.1 The Commission received with great appreciation the report on the Operational WWW Systems Evaluations-North Atlantic prepared by the Committee on the OWSE-NA (CONA). It recognized the substantial effort which had been put into the organization and conduct of the evaluations themselves, and into the preparation of the final report. In receiving the report, the Commission wished to thank each of the participating Members and organizations. It was grateful to the many individuals who had worked to achieve the successful conclusion of the work. It wished to thank particularly the two chairmen of the CONA, Dr D. Axford and Dr T. Mohr, for guiding the work over roughly a five-year period from inception to final report. Special thanks went to Mr J.M. Nicholls (United Kingdom) and Dr A.P. Baede (Netherlands) for their comprehensive presentations on the operational and scientific results of the OWSE-NA.

6.7.2 The Commission noted that the conclusions and recommendations took several forms and that some could be considered directly while others needed to be referred to CBS working groups and/or other WMO constituent bodies. As a first step, it asked all CBS working groups to review thoroughly the report and to prepare recommendations for specific actions which should be considered by either the CBS or other bodies. It asked that the chairmen of the CBS working groups prepare draft recommendations for consideration by the Advisory Working Group, as appropriate.

6.7.3 Special note was taken of the statement in the report that "resources devoted to improving data quality of existing systems would result in greater benefits, at less cost, than the deployment of more systems producing data of poor quality". It also considered the general conclusion that the effective assimilation of the data remained a large and pressing issue. It agreed that improvements to data quality and availability and to data assimilation should have high priority in the efforts to improve the WWW.

6.7.4 Particular attention was given to the monitoring programme conducted during the OWSE-NA. This monitoring had identified several types of issues in the data exchange which had not been clearly identified earlier. In the specific examples of the ASAP and drifting buoys, dramatic improvements had been made in the availability of data. Analyses of the information provided by several centres revealed specific problems in data quality, for example with non-ASAP ship reports and aircraft reports. The Commission recognized that the intense level of monitoring used during the OWSE-NA could not be maintained for long periods of time for the WWW in general. It did agree, however, that it was necessary to identify co-ordinated actions which could be taken by the several elements of the WWW to clearly identify the sources of problems and their possible solution.

6.7.5 The Commission, therefore, asked the Working Group on Data Management to prepare a plan for improving the monitoring of the exchange of meteorological information and the implementation of procedures for "integrating" the several responsible elements of the WWW in the identification of data exchange problems and their solution. It was especially important, for example, to be able to generate not only statistics on the receipt of observations at main processing centres, but also to indicate the influence each part of the WWW, from observation site to processing centre, had on the final statistics.

6.7.6 The Working Group on GDPS was asked to assess the situation concerning data assimilation procedures at both main and national centres and to provide recommendations on what steps could be taken by the CBS and/or Members to improve the use of meteorological data, particularly from the systems employed during the OWSE-NA.

6.7.7 The Commission noted the recommendation by CONA, Resolution 5 (EC-XLII), and the subsequent activities to organize the Co-ordination Group on the COSNA (CGC). In view of the substantial improvement to the observing system on the North Atlantic which had been achieved during the period of the OWSE-NA and the co-ordination mechanisms established, the Commission fully endorsed the need for and organization of the CGC. It was especially important to ensure that the momentum gained during the OWSE-NA to make improvements in the GOS were not lost. The withdrawal of at least one of the remaining Ocean Weather Ships and the continued introduction of new technology raised serious systems issues which the Commission believed could be considered effectively on a co-ordinated regional basis. It further believed that the lessons learned during the OWSE-NA should be applied in the future and stressed the importance of monitoring the effects of incremental change to observing systems and networks. It also agreed that additional work still was required to obtain reasonable estimates of the cost involved with the operation of the observing programme on the North Atlantic. The Commission, therefore, adopted Recommendation 17 (CBS-Ext.(90)) on the organization of the CGC. In adopting the recommendation the Commission encouraged the active participation of countries bordering the North Atlantic in Regions I, IV and VI.

6.7.8 In applying the lessons of the OWSE-NA to other parts of the WWW, the Commission gave special attention to the conclusion in the report that "WMO commissions and regional associations needed to take a more active role in defining the issues, setting the priorities and identifying the appropriate Members and organizations to resolve them". It believed that the preparation of guidance to the other commissions and regional associations concerning WWW issues would be a useful first step. The Commission, therefore, asked the Advisory Working Group to prepare guidelines for the use of other commissions and regional associations concerning the highest priority issues for implementation of the WWW. These guidelines could include, for example, the specific set of issues on a regionalized basis, their priority and the possibilities for joint funding. The purpose of these guidelines would be to encourage the appropriate Members and organizations to deal with specific major WWW issues on a coherent basis.

OWSE-Africa

6.7.9 The meeting received with appreciation the first report on the organization and status of the OWSE-AF from Mr E. Mukolwe, chairman of the OWSE-AF Steering Group. It was pleased to learn that the implementation of Phase I had been nearly completed, and that the evaluations had been started. The rapid progress was attributed to:

(a) The enthusiasm of the individuals involved;

(b) The ability to co-ordinate existing VCP, bi-lateral, and other co-operation projects to focus on the OWSE-AF activities;

(c) The strong support of the Members and organizations participating.

6.7.10 In reviewing the report, the Commission noted that significant effort had been required and problems experienced in adapting existing hardware and software to the requirements of the OWSE-AF. In addition, new procedures had to be developed for exchanging the data through the Data Collection and DCP Retransmission Systems (DCS/DRS). The Commission was informed that there had been close co-ordination and co-operation between the Members involved, EUMETSAT and the Secretariat. It noted that the problems encountered during the implementation could not have been resolved without the close co-ordination which had been achieved.

6.7.11 Several RA I participants in the OWSE-AF informed the Commission of their experiences. Guinea and Kenya both indicated that there had been significant problems during the early phases of the implementation. The Commission was informed during the presentations on the status of the OWSE-AF that the implementation activity had been substantially larger than had been anticipated because:

(a) The DCPs and DRS receivers needed to be integrated into a system and this entailed revisions to existing operating procedures, for example in the assignment and use of the time slot allocations;

(b) Various equipment and software components thought to be operational were not and modifications had to be made; and

(c) The special evaluation procedures required had to be organized and resources found to carry them out.

However, each of the participants agreed with the assessment of the chairman of the OWSE-AF Steering Group and the delegate of Ghana that the learning process had been extremely beneficial and that the use of the DCS/DRS would make substantial contributions to the exchange of data in RA I.

6.7.12 The delegate from Kenya added, however, that while the early evaluation results showed high rates of data availability through the DRS for individual stations (exceeding 95% in many instances) the same evaluation results showed that there had been only modest or no improvement in the availability of the data at main processing centres. He also noted that the data needed to be exchanged efficiently throughout RA I if their cost were to be justified. The Commission, therefore, noted that the Working Group on the GTS needed to examine the results coming from the OWSE-AF evaluations with a view to identifying sources of data loss in the GTS and to make recommendations on how the data losses could be avoided.

6.7.13 Although the evaluation programme had not yet been fully activated, the preliminary results had demonstrated that:

(a) The use of the DCS/DRS could significantly increase the availability of observational data at national centres;

(b) That the national Meteorological Services were able, with appropriate support, to incorporate the level of technology used in the OWSE-AF into their operational programmes.

6.7.14 One important lesson learned already is that substantial national effort is required to ensure that the operators are fully trained in the use of the DCP/DRS and to monitor the performance of their stations so that they comply with established procedures. The Commission further recognized the need for the careful training and orientation of operators in the operation of the overall system.

6.7.15 Several important considerations for further implementation had also been identified. Additional analysis was required, for example, to develop recommendations on:

(a) The long-term support of the equipment;

(b) The procedures for the effective use of the DCS/DRS, including national or other monitoring;

(c) Modifications to the general GTS procedures to make efficient use of the new technology, including the procedures for entering the data onto the GTS;

(d) Hardware and/or software modifications required to ensure that the equipment met the requirements of both the Members and the WWW system; and

(e) The type and level of general support required on a continuing basis.

6.7.16 The Commission noted the comments of several participants concerning the extension of the Phase I evaluations to other countries in RA I. It recalled that the Organizing Meeting for the OWSE-AF had agreed on a set of participants for Phase I based on criteria agreed during the meeting. One of those had been the need to keep the number of participants to a relatively small number because of the substantial costs involved. It also recalled that the Organizing Meeting had agreed that certain bilateral programmes supported by France and Germany had been included, either directly or co-ordinated with the OWSE-AF, together with specified VCP and UNDP programmes supported through the WMO. The Commission agreed with the assessment of the chairman of the OWSE-AF Steering Committee that an expansion of the number of participants in Phase I at this time would be detrimental to the evaluations.

6.7.17 In reaching this conclusion, the Commission noted that the Phase II evaluations were designed to focus on the MDD. It was possible that, given the availability of sufficient resources, additional participants might be included in the OWSE-AF through the MDD evaluations. It also welcomed implementation activities which would serve to strengthen and/or augment the Phase I facilities which had been installed. In this regard the comment was made by the representative of ASECNA that DCP and DRS equipment was being installed in some countries in Africa through activities supported by ASECNA. Some of these countries were already participating in the OWSE-AF. It was noted, however, that it was not possible to add additional work to the already overloaded evaluation programme.

6.7.18 The Commission believed that, based on the results to date, the OWSE-AF would provide valuable information on the future implementation of the DCP and DRS equipment in RA I and other Regions. It recognized, however, that efforts were required to ensure that the use of the DCS/DRS and the MDD would properly augment the existing GTS and not adversely affect it as a result of the too rapid implementation of new technology. In this regard, the Commission noted the need to develop strategies for the incorporation and use of these new technologies into the WWW.

6.7.19 Note was taken of the status of the Phase II evaluations concerning the MDD. The Commission expressed its appreciation to EUMETSAT for arranging to demonstrate the MDD capabilities at several WMO meetings during 1990, including CBS-Ext.(90). Such demonstrations had been an effective way of introducing a large number of Members to the opportunities offered by the MDD.

6.7.20 The Commission believed that the combination of the DCS/DRS and the MDD offered the potential for major improvement to the exchange of data and products in RA I. The availability of this information was expected to have a profound impact on the ability of many Members in the Region to provide improved and/or new meteorological services.

6.7.21 In reviewing the overall work programme for Phases I and II, the Commission noted that despite the strong support provided to date, additional support was required to meet the objectives of the OWSE-AF. In view of the importance of the OWSE-AF to the further development of the WWW in RA I, the Commission agreed that additional efforts needed to be made to find the resources required. It, therefore, adopted Recommendation 18 (CBS-Ext.(90)) concerning the OWSE-AF.

General

6.7.22 In reviewing the activities of Members and organizations concerning the OWSEs for the North Atlantic and Africa, the Commission noted with satisfaction the substantial progress which had been made since the concept had first been agreed at EC-XXXVI (1984). The OWSE-NA had been completed and the OWSE-Africa was being implemented and the evaluation phase begun. Discussions on each of the OWSEs are reported separately in the general summary. The Commission wished to express its overall appreciation to the Members, organizations and especially the individuals who had contributed to these activities.

6.7.23 The Commission reviewed the terms of reference for the OWSEs which are contained in Resolution 3 (EC-XXXVI). It noted that while emphasis at that time had been placed on the GOS, the concept of OWSEs had been intended to apply to all parts of the WWW. The OWSE-Africa, for example, in concentrating on the improvements to the GTS in RA I. The Commission realized that because the WWW was an integrated system, each OWSE would contain elements of several parts of the WWW, although emphasis might be placed on only one.

6.7.24 In light of the experiences with OWSEs to date, the Commission believed that a general statement was needed on how to guide the future organization and implementation of OWSEs. Recommendation 19 (CBS-Ext.(90)) was adopted.

7. CONSIDERATION OF THE THIRD WMO LONG-TERM PLAN (TLTP) (agenda item 7)

World Weather Watch Programme

7.1 The Commission noted that the draft of the Third WMO Long-term Plan prepared in November 1989 had undergone a thorough review process by Members, by CBS working groups and by the Executive Council and that a revised draft was being prepared for submission to Congress in 1991. The Commission was informed of the substantive amendments to Part II, Volume I - World Weather Watch, which were being made as a result of the comments and proposals that had been received.

7.2 The Commission endorsed the draft TLTP for the World Weather Watch and accepted the amendments without change except for the amendment to paragraph 137 of the TLTP entitled "Project 14.3 - Codes and exchange formats". The Commission wished to encourage migration towards the use of bit-oriented codes and adopted the following revised version of the amendment to paragraph 137:

> "Project 14.3 - Codes and exchange formats. To further develop bit-oriented codes for the efficient exchange and storage of observational data and products, to keep under review the existing WMO character oriented codes to meet the requirements for the transmission and storage of meteorological data and products both for automated and non-automated centres, to develop techniques for the transformation between bit-oriented and character-oriented codes and to develop principles for the utilization of these codes within the WWW. The achievements of this objective should provide flexible procedures that will cope with the data needs of Members and meet the increased requirements for the large volume transmission and storage of meteorological data."

7.3 The Commission discussed at some length the new "Public Weather Services Programme" and how this could be handled. A few delegates expressed reservations as to the appropriateness of this programme being dealt with by CBS but most felt that the objectives were of the highest importance. The Commission agreed that it should take on the additional responsibility, but expressed the hope that the assumption of this responsiblity would not be to the detriment of its many existing tasks.

7.4 The Commission was unanimous in its view that in order to carry out the programme in an effective manner additional Secretariat staff resources would be necessary and the infrastructure of the Commission would have to be strengthened. In this regard the Commission agreed that at this time the envisaged programme would not require the establishment of a working group for example, but would require additional dedicated professional staff supplemented by seconded experts.

7.5 The revised list of projects to be carried out under this programme was examined by the Commission. It considered that the new project

41.3 "Role of satellites in public weather services" was essentially a part of the other two projects and should not be identified separately. In addition the Commission agreed that the project for the "Exchange and co-ordination of hazardous weather warnings among neighbouring countries" which had been deleted from the draft TLTP, should be re-installed as project 42.3.

8. EDUCATION AND TRAINING RELATED TO CBS ACTIVITIES (agenda item 8)

8.1 The Commission examined with great interest the document submitted by the Secretary-General on the education and training activities of the Organization since its last session. It was noted with appreciation that fifteen training events - workshops, seminars or special short courses - in areas of relevance to CBS, had been held between mid-1988 and the end of 1989. A further seven events were planned to be held before the end of 1991 subject to the availability of funds. The Commission also noted that six training publications had been issued since its last session. It wished to record its appreciation for the efforts which had been made by the Secretariat and by individual Members in accomplishing the programme.

8.2 The Commission agreed, that however much training was accomplished there would always be a need for more in regard to both the number of personnel to be trained and the subjects in which they required the training. It was felt that innovative approaches would have to continue to be sought and that realistic goals should be set in order to avoid disappointment. Continually rising costs, especially of fellowships, was also a problem to be addressed and several members felt that greater efforts could be made to arrange for training in the recipients' own country(ies) or in neighbouring countries with a view to reducing costs.

8.3 A requirement which was given much emphasis by the Commission was for the retraining of instructors so that they were kept up to date with modern technology, methods and techniques. This of course applied in the more advanced countries just as much as in the developing countries. Frequent reference was made particularly to the need for training in telecommunication procedures and data processing and in telecommunication equipment maintenance and repair. In this connection the need was expressed for "user-friendly" training materials on the highly complicated telecommunication protocols for use in RMTCs.

8.4 Many participants spoke highly of the usefulness of attaching personnel for short periods to advanced meteorological centres for on-the-job training and experience. There were many benefits in such arrangements in that the trainees learned not only how products were prepared but also the importance of certain inputs to the preparation of the products and how to make better use of them in their own countries. It was important however, that there was a continuous feed back from the recipient countries to the regional meteorological centre. The Commission noted with satisfaction that the short-term fellowships offered at the Bracknell and Washington centres at their "ACMAD Bench" and "South American Desk", respectively, were organized to ensure that benefits were realized by the centre providing the fellowship as well as by the fellows and their home countries. In this connection the hope was expressed that it might be possible for Members to take some steps to ensure that trained personnel remained in their national Meteorological Services for a reasonable period of time after training.

8.5 Other requirements expressed by the session included training workshops in satellite data interpretation combined with nowcasting and very short range forecasting as well as training in a wide range of subjects required by some countries in Eastern Europe. In connection with the WMO plan of action for the IDNDR, the need for the preparation of training materials on the physical nature and forecasting of hazardous weather phenomena was stressed (see agenda item 9).

8.6 Finally the Commission noted the measures proposed by the Executive Council aimed at easing the problem of increasing requirements for fellowships to be met from very limited resources. The Commission accordingly urged its members to comply with the exhortations of the Executive Council that:

(a) Members should clearly define the purposes of the training required for fellows and ensure that on return trainees have opportunities to transfer the acquired knowledge to staff colleagues, thus multiplying the benefit of the training received;

(b) Members without UNDP-assisted projects in meteorology and hydrology should make every effort to develop such projects in their countries to finance their training requirements. In addition, Members are urged to participate in group training activities under umbrella or sub-regional projects.

9. RELATIONSHIP OF THE WWW WITH OTHER WMO AND INTERNATIONAL PROGRAMMES, INCLUDING REGIONAL PROGRAMMES (agenda item 9)

Accidental release of hazardous materials into the atmosphere

9.1 The Commission noted that WMO was continuing to co-operate closely with IAEA on the action to be taken in the event of the accidental release of hazardous material into the atmosphere. Working arrangements between the two agencies had been expanded to include the use of the GTS in support of the IAEA Conventions on early notification and on assistance in the case of a nuclear accident or emergency.

9.2 In this connection a format for the exchange of data stipulated under the IAEA Early Notification Convention had been developed and distributed and the CBS Working Group on Data Management was developing codes for the exchange of radioactivity data. It was also noted with appreciation that direct access by the Secretariat to the GTS had been established which would allow it to interact with Members and international organizations in emergency situations. It was understood that this included stand-by provisions during daytime but not a full scale operational capability.

9.3 The Commission expressed its appreciation for the actions taken by the Secretary-General and the president of CBS in establishing interim arrangements with three GDPS centres for the provision of specialized products concerning the atmospheric transport of radionucleides. Pending the designation of two RSMCs per Region to satisfy the needs of IAEA and Members for high resolution regional products, the GDPS Centre, Paris, has accepted, ad interim, the responsibility to provide such products on a global scale.

Centres Bracknell and Montreal had agreed to provide similar services in back-up mode. The Commission noted that procedures for the activation of these functions and the dissemination of products were being developed in collaboration with IAEA and the GDPS centre concerned.

9.4 The delegate from France presented a paper describing the operational procedures and models used in the Paris Meteorological Centre in providing special meteorological products in the case of accidents entailing the injection and transport of dangerous materials into the atmosphere. The Commission welcomed the initiative and expressed its great appreciation for the work done by France in this area. It expressed the hope that further steps would be taken soon by other centres to develop a similar operational capability which would lead eventually to the designation of two specialized centres in each Region.

Exchange of seismic data over the GTS

9.5 Recalling its request to the Working Group on the GTS to continue its study of the implications of the transmission of Level-II seismic data over the GTS, the Commission noted with appreciation that the necessary procedures for the transmission of such data, as requested by the Group of Scientific Experts (GSE) of the Conference on Disarmament, had been developed and that a large-scale experiment, referred to as GSETT-2, for the exchange of the data was underway. The Commission further noted the decision of EC-XLII that support to the Conference on Disarmament should be pursued in as far as it would not have an adverse impact on the main purpose of the GTS and that CBS was requested to continue its studies in this regard. The technical aspects of this subject were discussed under agenda item 6.3.

International Decade for Natural Disaster Reduction (IDNDR)

9.6 The Commission noted that EC-XLII had adopted a WMO Plan of Action defining the participation of the Organization in the IDNDR. The Commission reiterated the view that WWW was the basic programme which provided the tools for reducing the effects of meteorological and other environmental disasters. This had always been an intensive part of the activities of national Meteorological Services and perhaps the most important contribution that could be made to the IDNDR would be to concentrate on improving the existing system. It was therefore gratifying to note that one of the main thrusts of the activities to be undertaken in the agreed Plan of Action is:

> "Filling the gaps in the implementation of the observing networks, telecommunication and data-processing facilities as defined in the WWW Plan and which are required for establishing or upgrading warning systems."

9.7 It was obvious that CBS had an important role to play in this regard and the session decided to adopt Recommendation 20 (CBS-Ext.(90)) further defining this role.

World Climate Programme

9.8 The Commission gave particular attention to the role of WWW in the issue of climate change which was currently the focus of much world-wide attention. Noting that WMO was expected to play a leading part in the coming years in the scientific aspects of climate change monitoring and research, the Commission recognized that there would be a considerable interdependence on the systems and services of the World Weather Watch in these activities. This applied particularly to the data gathering and management functions and the methods and techniques of applying the data.

9.9 It was further recognized that the requirements on the GOS in particular were likely to be more demanding, in terms of the range of variables and their continuous recording, than the requirements of weather analysis and forecasting and that the gradual blurring of the distinction between real-time, near real-time and climatological data handling would call for specific data management functions in order to achieve standardized and efficient procedures across the WMO programmes, including the WCP and the Global Atmosphere Watch. In addition, there are expected to be opportunities to improve the WWW data sets as a result of the deployment of systems to provide information for climate studies. There were also likely to be implications for the GTS and for the application of GDPS products and facilities to climate monitoring.

9.10 Noting the CCL requirements for reference climate stations and reference baseline data sets the Commission recognized the need for CBS to provide active support to CCL activities, but also emphasized that observing networks and monitoring should be fully integrated within the WWW and not developed as separate activities. The Commission endorsed the proposal of the Working Group on Data Management to establish mutual rapporteurs with the CCl Working Group on Climate Data. It also strongly supported the Secretary-General's proposals, in the Programme and Budget for the next financial period, for projects aimed firstly at the expansion of the GOS, to meet the needs of global climate monitoring and secondly at the application of GDPS products and facilities. If funding for these is approved, the Commission requested the Secretary-General, in consultation with the president of CBS and the chairmen of the CBS working groups, to make arrangements for the proposed expert meetings with the participation of other technical commissions concerned. In the Commission's view the highest priority should be attached to identifying the requirements for observations.

Marine Meteorology and Associated Oceanographic Activities Programme

9.11 Noting the continuing interdependence of the WWW and the Marine Meteorology and Associated Oceanographic Activities Programme, the Commission stressed the need to maintain close co-ordination between its own activities and those of CMM. It noted with satisfaction that the same view had been expressed by CMM and that CMM experts were participating in a number of CBS activities and in meetings of CBS subsidiary bodies. Particular attention has been given to ensuring that oceanographic requirements for real-time data exchange will continue to be met by the upgraded WWW Data Management procedures and to making the necessary code modifications in consultation with ICC, to accommodate new types of data from drifting buoys. The Commission supported a proposal made by a sub-group within CMM for a joint CMM/CBS/INMARSAT effort to study the implications for Members of recent developments in procedures for the collection of ships' reports via INMARSAT.

Regional Programmes

9.12 The Commission was pleased to note that all regional associations had established working groups to deal with the regional aspects of WWW, and that all were represented on the CBS working groups, including the Advisory Working Group; thus an excellent system for the two-way flow of information between the Regions and the Commission was in place.

9.13 Although four of the regional working groups had only recently been established and had not yet begun to tackle their programmes, the Commission noted with satisfaction that the RA I and RA VI working groups were very active in co-ordinating various aspects of WWW implementation in their respective Regions. The Commission acknowledged the important role played by the Secretariat in identifying needs and opportunities for information exchange and co-ordination between the associations and the Commission and requested the Secretary-General to continue to carry out this function. The Commission also pointed to the need to ensure co-ordination and co-operation between the Regions in the implementation of the WWW.

10. REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION AND OF RELEVANT EXECUTIVE COUNCIL RESOLUTIONS (agenda item 10)

10.1 In accordance with the established practice, the Commission examined those resolutions and recommendations adopted prior to its Extraordinary session (1990) which were still in force. It was noted that, with the exception of Recommendation 1 (CBS-IX) concerning the procedures for the designation of RSMCs, the action on all other recommendations had been completed or their content included in the relevant WMO manuals, and it was therefore decided not to keep them in force. Resolution 1 (CBS-Ext.(90)) was adopted.

10.2 The Commission also examined the Executive Council's resolutions in the field of CBS and agreed that Resolution 3 (EC-XXVII) regarding the OWSE-NA need no longer be kept in force and that the two resolutions concerning ASAP, namely Resolution 4 (EC-XXXVI) and Resolution 2 (EC-XXXVII), should be replaced by a new resolution based on Recommendation 5 (CBS-Ext.(90)). Recommendation 21 (CBS-Ext.(90)) was adopted.

11. DATE AND PLACE OF THE TENTH SESSION OF THE COMMISSION (agenda item 11)

11.1 In the absence of any formal invitation from delegations at the session, the Commission decided that the date and place of its tenth session should be determined by its president, after consultation with the Secretary-General, and in accordance with the provisions of Regulation 181 of the General Regulations.

12. CLOSURE OF THE SESSION (agenda item 12)

12.1 The president of the Commission, Dr A.A. Vasiliev, in his closing remarks, reviewed the work that had been accomplished by the session. He felt that it had been a particularly harmonious and successful session with a number of important decisions taken affecting not only the WWW but also other WMO programmes as well as those of other international organizations. He mentioned in particular the discussions on satellite activities, on the new Public Weather Services programme and on the International Decade for Natural

Disaster Reduction. The success of the session had been due in no small measure to the excellent facilities provided and the very efficient support of the local Secretariat for which he expressed his high appreciation. He thanked the United Kingdom authorities for the generous hospitality which had been very much enjoyed by all participants. Finally, the president offered his best wishes to two retiring members of the Commission, Mr R.J. Sowden and Mr C.F Reudink, who had made outstanding contributions to the Commission's work over many years

12.2 On behalf of the participants, Mr J.R. Neilon (USA) thanked the president for his excellent conduct of what had been a very productive session. He also thanked the members of the WMO and local Secretariats who had provided most valuable and effective contributions to the work.

12.3 The extraordinary session of the Commission for Basic Systems closed at 10.30 a.m. on 5 October 1990.

RESOLUTION ADOPTED BY THE SESSION

Res. 1 (CBS-Ext.(90)) - REVIEW OF THE PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION FOR BASIC SYSTEMS

THE COMMISSION FOR BASIC SYSTEMS,

NOTING the action taken on the resolutions and recommendations adopted prior to its extraordinary session (90),

CONSIDERING that all the resolutions and recommendations adopted prior to its extraordinary session (90) and still in force have been reviewed,

DECIDES:

(1) To keep in force Resolutions 1, 2, 3, 4, 5, and 6 (CBS-IX);

(2) To keep in force Recommendation 1 (CBS-IX);

(3) Not to keep in force the other recommendations adopted before its extraordinary session (90);

(4) To publish in the final report of the extraordinary session (90) the texts of the recommendation and resolutions which are to be kept in force*.

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* The texts of the resolutions and recommendation which were kept in force are reproduced in the annex to this resolution.

Annex to Resolution 1(CBS-Ext.(90))

THE RESOLUTIONS AND RECOMMENDATION OF THE COMMISSION FOR BASIC SYSTEMS ADOPTED PRIOR TO ITS EXTRAORDINARY SESSION (90) AND MAINTAINED IN FORCE

Res. 1 CBS-IX) - ADVISORY WORKING GROUP OF THE COMMISSION FOR BASIC SYSTEMS

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Paragraph 7.13.5 of the general summary of the abridged final report of Fifth Congress,

(2) Resolution 1 (CBS-VIII) - Advisory Working Group of the Commission for Basic Systems,

CONSIDERING that a working group is of value in advising the president of the Commission and in assisting him in his duties of co-ordination and planning,

DECIDES:

(1) To re-establish the Advisory Working Group of CBS with the following terms of reference:

(a) To advise the president of the Commission, as necessary, in his functions of expressing opinions or taking action on urgent or non-controversial matters;

(b) To assist the president in short- and long-term planning of the work of the Commission and of its working groups;

(c) To assist the president in the co-ordination, guidance and development of the WWW support functions;

(d) To review the internal structure and working methods of the Commission;

(e) To assist the president in the co-ordination of the activities of CBS;

(f) To formulate specific plans for the specialized education and training activities in the field of responsibility of CBS;

(g) To keep under review the work of the Commission;

(2) That the composition of the Advisory Working Group shall be as follows:

President of CBS (chairman)
Vice-president of CBS
Past president of CBS
Chairmen of the CBS Working Groups on the GDPS, GOS, GTS and DM
Mr D. J. Gauntlett (Australia)
Mr Luo Jibin (China)
Mr E. A. Mukolwe (Kenya)

NOTE: This resolution replaces Resolution 1 (CBS-VIII) which is no longer in force.

Res. 2 (CBS-IX) - WORKING GROUP ON THE GLOBAL DATA-PROCESSING SYSTEM (GDPS)

THE COMMISSION FOR BASIC SYSTEMS,

NOTING Resolution 5 (CBS-VIII) - Working Group on the Global Data-processing System,

CONSIDERING that there is a need for the continuation of the work of the working group established by Resolution 5 (CBS-VIII),

DECIDES:

(1) To re-establish the Working Group on the Global Data-processing System with the following terms of reference:

(a) To keep abreast of scientific and technical developments relating to the method of meteorological analysis and forecasting for general purposes and to consider the implementation of new techniques;

(b) To identify problems associated with meteorological analysis and forecasting at various scales and time ranges requiring study and research and to bring them to the attention of the president of CBS, with a view to referring them to the relevant technical commission, as required;

(c) To consider the co-ordination of observational data requirements of the WWW and provision of advice on the formulation of requirements to be met by the Global Observing System;

(d) To review requirements of Members and relevant constituent bodies for WMC and RSMC products;

(e) To co-ordinate the production of analysed and forecast data by WMCs and RSMCs taking account of requirements of Members for new kinds of products;

(f) To consider the transmission priorities of processed products to meet the requirements of NMCs and other users;

(g) To develop proposals on matter relating to real-time and non-real-time quality control, storage and retrieval of data in co-ordination with the Working Group on Data Management;

(h) To keep under review the established procedures for standardized verification of numerical products and for monitoring the quality of observations, and to develop additional proposals where necessary in consultation with the Working Group on Data Management;

(i) To provide co-ordination and guidance on the use of modern data-processing techniques for meteorological analysis and forecasting including the processing and interpretation of incoming products by NMCs;

(j) To monitor progress on implementation of relevant parts of the Second WMO Long-term Plan on matters related to the GDPS;

(k) To keep under review and up to date the Manual and Guide on the GDPS;

(l) To keep under review and up to date relevant training syllabi as required and to suggest training materials and the holding of seminars and symposia;

(m) To establish, as necessary, study groups composed of experts, or to appoint rapporteurs, for consideration of specific problems of a technical or operational nature;

(n) To act upon matters referred to the working group by the president of CBS;

(2) To give the working group the following composition:

(a) An expert designated by each regional association;

(b) An expert nominated by each of the Members responsible for the operation of a World Meteorological Centre (WMC);

(c) Experts nominated by Members, or groups of Members, operating Regional Specialized Meteorological Centres (RSMCs);

(d) Experts nominated by other Members wishing to participate actively in the work of the group;

(e) Experts who may be nominated by presidents of other technical commissions;

(3) To select, in accordance with Regulation 31 of the General Regulations, Dr N. F. Veltishchev (USSR) as chairman of the working group;

(4) To request the chairman to submit, through the president of the Commission, a report to the Commission, not later than six months before its next session.

NOTE: This resolution replaces Resolution 5 (CBS-VIII) which is no longer in force.

Res. 3 (CBS-IX) - WORKING GROUP ON THE GLOBAL OBSERVING SYSTEM (GOS)

THE COMMISSION FOR BASIC SYSTEMS,

NOTING Resolution 4 (CBS-VIII) - Working Group on the Global Observing System,

CONSIDERING that there is a need for the Working Group on the Global Observing System to be re-established to keep under constant review observational requirements of the WWW, WCP, WCRP, IGOSS as well as other international programmes, DECIDES:

(1) To re-establish the Working Group on the Global Observing System with the following terms of reference:

(a) To review and advise on the observational data requirements of the WWW, other WMO programmes and other international programmes;

(b) To review and advise on the design and implementation of the Global Observing System taking account of:

- Established requirements for data;

- The cost, capabilities and performance of observing systems including information received from OWSEs;

(c) To review the procedures for monitoring and quality control of observational data in co-operation with the CBS Working Groups on the GDPS, GTS and DM;

(d) To keep the Manual and Guide on the GOS under review and to make recommendations for amendments;

(e) To provide inputs to Operational WWW Systems Evaluations (OWSEs), to analyse the information acquired during OWSEs and to apply it in planning the GOS as a whole;

(f) To keep abreast of developments in advanced satellite remote sensing and surface-based remote sensing;

(g) To keep under review matters related to the development and introduction of new observing systems into the GOS;

(h) To monitor progress of the implementation of the Second WMO Long-term Plan on matters related to the GOS;

(i) To keep up to date relevant training syllabi and to suggest training materials and the holding of seminars and symposia;

(j) To establish necessary study groups composed of experts or to appoint rapporteurs for consideration of specific problems of a technical or operational nature;

(k) To act upon matters referred to the working group by the president of CBS;

(2) To give the working group the following composition:

(a) An expert designated by each regional association;

(b) Experts nominated by other Members wishing to participate actively in the work of the working group;

(c) Experts designated by the presidents of the Commission for Marine Meteorology and the Commission for Instruments and Methods of Observation;

(d) Experts who may be nominated by presidents of other technical commissions;

(3) To select, in accordance with Regulation 31 of the General Regulations, Mr F. S. Zbar (USA) as chairman of the working group;

(4) To request the chairman to submit, though the president of the Commission, a report to the Commission not later than six months before its next session.

NOTE: This resolution replaces Resolution 4 (CBS-VIII) which is no longer in force

Res. 4 (CBS-IX) - WORKING GROUP ON THE GLOBAL TELECOMMUNICATION SYSTEM (GTS)

THE COMMISSION FOR BASIC SYSTEMS,

NOTING Resolution 7 (CBS-VIII) - Working Group on the Global Telecommunication System (GTS),

CONSIDERING:

(1) That the implementation of the World Weather Watch Plan 1988-1997 will require a series of technical studies on the GTS,

(2) That the evolution in data-exchange requirements stemming from the World Weather Watch, other WMO programmes and joint programmes between WMO and other organizations, entail a constant review of the world-wide telecommunication system,

DECIDES:

(1) To re-establish the Working Group on the Global Telecommunication System, with the following terms of reference:

(a) To keep under review the organizational and planning aspects of the entire Global Telecommunication System of the World Weather Watch, including the collection and distribution of meteorological information through meteorological and communications satellites;

(b) To keep under review the organizational, technical and procedural aspects of the Main Telecommunication Network, including its interfaces with Regional Meteorological Telecommunication Networks;

(c) To keep under review the further development of real-time and non-real-time monitoring procedures relating to the GTS operation, in co-ordination with the Working Group on Data Management;

(d) To follow closely the progress on the implementation and continued operation of meteorological telecommunication systems and to formulate recommendations with a view to remedying shortcomings and effecting improvements;

(e) To keep under constant review developments in telecommunications techniques, procedures and equipment, including international standards on data communications, and to formulate for meteorological information exchange (in binary, alphanumeric, and pictorial form), proposals on international standardization of operating practices, procedures and equipment;

(f) To keep in touch with the relevant activities of working groups of regional associations;

(g) To co-ordinate its activities with the work of the Working Group on Data Management and of other working groups of CBS, with a view to integrating the GDPS, GOS and GTS subsystems into a WWW system conceived as an entity;

(h) To provide inputs to OWSEs, analyse the information acquired during OWSEs relating to telecommunications and apply the results in planning the GTS;

(i) To keep abreast of the activities of the International Telecommunication Union, the International Organization for Standardization, the International Civil Aviation Organization, the International Maritime Organization and other international organizations concerned on matters pertaining to meteorological telecommunications;

(j) To monitor progress of the implementation of the Second WMO Long-term Plan on matters related to the GTS;

(k) To keep up to date relevant training syllabi, as requested, and to suggest training materials and the holding of seminars and symposia;

(l) To keep the regulatory and guidance material under review;

(m) To establish necessary study groups composed of experts, or to appoint rapporteurs, for consideration of specific problems of a technical or operational nature;

(n) To act upon matters referred to the working group by the president of CBS;

(2) To give the following composition to the working group:

(a) The chairmen of the Working Groups on Meteorological Telecommunications of regional associations and the rapporteurs on Regional Meteorological Telecommunications;

(b) An expert to be nominated by each of the Members responsible for the operation of World Meteorological Centres and the Regional Telecommunication Hubs on the Main Telecommunication Network;

(c) Experts nominated by Members responsible for the operation of Regional Telecommunication Hubs which are not on the Main Telecommunication Network;

(d) Experts nominated by other Members wishing to participate actively in the work of the group;

(e) Experts who may be nominated by presidents of other technical commissions;

(3) To select, in accordance with Regulation 31 of the General Regulations, Mr J. Arimatéa (Brazil) as chairman of the working group;

(4) To request the chairman to submit, through the president of the Commission, a report to the Commission not later than six months before its next session.

NOTE: This resolution replaces Resolution 7 (CBS-VIII) which is no longer in force.

Res. 5 (CBS-IX) - WORKING GROUP ON DATA MANAGEMENT (DM)

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 6 (CBS-VIII) - Working Group on Codes,

(2) Resolution 25 (Cg-X) - Second WMO Long-term Plan (Volume 1, Part II - The World Weather Watch Plan and Implementation Programme),

CONSIDERING:

(1) That orderly overall real-time data management is an essential prerequisite for the efficient operation of a flexible, integrated WWW system, to cope with the rapid evolution of meteorological requirements and techniques and to ensure that WWW data and products are available to Members in a timely and convenient fashion,

(2) That in view of the diversity and complexity of problems relating to WWW management functions, it is desirable to entrust their solution to a permanent group of experts on these subjects,

DECIDES:

(1) To establish a Working Group on Data Management, with the following terms of reference:

(a) To keep under review the provision of services of meteorological data management supporting the main WWW elements (GOS, GDPS and GTS) in both real time and non-real time, i.e.:

(i) Co-ordination and orderly monitoring of the generation and flexible exchange of observational data and products;

(ii) Quality control, storage and retrieval of observational data and products;

(iii) Representation forms (meteorological codes and formats) and procedures for syntax conversion (binary, character and graphics) of observational data and products;

(b) To develop or adjust appropriate (interfacing) meteorological data-management specifications to:

(i) Provide observational data and products in an efficient manner and convenient to the various application entities;

(ii) Meet new, revised or specialized requirements for WWW facilities and services;

(iii) Ensure that mutually compatible and internally consistent subsets of data emerge from data being obtained in different manners on different time and space scales;

(iv) Facilitate the transfer of management and monitoring information (i.e. status of operation) among the various WWW centres;

(c) To consolidate and co-ordinate statements received from other bodies, Members, regional associations, other technical commissions and appropriate international organizations on the need for new international forms of presentation of observational data and products within the WWW system using suitable code forms, formats and data representation forms (binary, character and graphic);

(d) To keep abreast of the activities of ISO on matters relating to international standards on systems architecture;

(e) To monitor progress on implementation of relevant parts of the Second WMO Long-term Plan on matters related to data management;

(f) To keep up to date relevant training syllabi, as requested, and to suggest training materials and the holding of seminars and symposia;

(g) To keep the regulatory and guidance material under review;

(h) To establish necessary study groups composed of experts, or to appoint rapporteurs, for consideration of specific problems of a technical or operational nature;

(i) To act upon matters referred to the working group by the president of CBS;

(2) To give the working group the following composition:

(a) An expert designated by each regional association;

(b) Experts to be nominated by Members responsible for the operation of World Meteorological Centres and/or advanced Regional/Specialized Meteorological Centres, and other Members wishing to participate actively in the work of the group;

(c) Experts designated by the chairmen of the CBS Working Groups on the GOS, GDPS and GTS;

(d) Experts who may be nominated by presidents of other technical commissions;

(3) To select, in accordance with Regulation 31 of the General Regulations, Mr R. J. Sowden (UK) as chairman of the working group;

(4) To request the chairman to submit, through the president of the Commission, a report to the Commission not later than six months before its next session.

NOTE: This resolution replaces Resolution 6 (CBS-VIII) which is no longer in force.

Res. 6 (CBS-IX) - RAPPORTEURS ON SATELLITE DATA RETRIEVAL METHODS AND USE OF QUANTITATIVE SATELLITE DATA

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) The importance of quantitative satellite data to the forecast and service programmes of both developing and developed countries,

(2) The rapid advances being made in the application of quantitative satellite data,

(3) The improvements under way or planned for the near future in satellite data-processing techniques and satellite sensing systems,

(4) The large areas of the globe where the data base is not sufficient to meet Members' needs,

(5) The important activities of several international organizations and/or bodies, such as the International TOVS Study Conference, to develop new or improved techniques for the production of quantitative meteorological information from satellite data,

CONSIDERING the urgent need of Members to be informed of these new developments in regard to quantitative satellite data,

DECIDES:

(1) To appoint two rapporteurs on satellite data retrieval methods and the use of quantitative satellite data with the following terms of reference:

(a) To keep under review the progress being made with respect to vertical soundings of the atmosphere, giving particular attention to polar-orbiting satellites but also giving attention to soundings from geostationary satellites as may be appropriate to provide a comprehensive review of the status of satellite data retrieval methods. This review should include, but not necessarily be limited to:

(i) Satellite instrumentation for soundings; performance characteristics, calibration and related factors which influence the retrieval of atmospheric soundings from satellite data;

(ii) Procedures for transmission, reception and quality control of sounding data since these influence the retrieval methods; and

(iii) Data retrieval methods by which radiance information is converted into soundings, including any supporting calibration techniques and/or information required during the retrieval process;

(iv) Results of the Baseline Upper-Air Network evaluation;

(b) As appropriate, to keep under review the use of satellite sounding data to assess the utility of the retrieval methods and to identify their strengths and/or weaknesses;

(c) To keep under review the application and impact of quantitative satellite data in analyses and forecasts;

(d) To keep under review new techniques and/or methods for data retrieval, especially those which could be of practical use to developing countries;

(e) To liaise with the International TOVS Study Group or similar organizations as a means of exchanging information on data retrieval methods and on problems regarding the impact of satellite sounding data;

(f) To provide periodic reports to the chairman of the CBS Working Group on the GOS and, as appropriate, to assist him with relevant satellite matters;

(g) To assist the president of CBS as required in the matter of satellite data retrieval methods;

(h) To report on the above matters to CBS/Ext.(90) and CBS-X;

(2) To invite Dr J. Le Marshall (Australia) and Dr W. P. Menzel (USA) to serve as the rapporteurs.

Rec. 1 (CBS-IX) - PROCEDURE FOR THE DESIGNATION OF REGIONAL/SPECIALIZED METEOROLOGICAL CENTRES (RSMCs)

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) The Second WMO Long-term Plan, Part II, Volume 1 - World Weather Watch,

(2) The final report of the thirteenth session of the CBS Advisory Working Group, paragraph 6.4,

(3) The abridged report of the Tenth World Meteorological Congress, paragraph 3.1.1.2,

CONSIDERING that there is a need to establish procedures for the designation of new Regional/Specialized Meteorological Centres (RSMCs),

RECOMMENDS the following procedure for broadening the functions of existing RSMCs and for the designation of new RSMCs to be introduced with effect from 1 July 1888:

(1) Statement of requirements for WWW products and services initiated and endorsed by the WMO constituent body or bodies concerned;

(2) Identification of capabilities of relevant existing RSMCs and/or candidate RSMCs, to meet the requirements;

(3) Determination in principle whether there is a requirement to:

(a) Broaden the functions of an existing RSMC; and/or

(b) Establish a new RSMC;

(4) Formal commitment by a Member or a group of co-operating Members to fulfil the required function(s) of a centre;

(5) Demonstration of the capabilities to CBS and the constitutent body or bodies referred to under (1);

(6) Recommendation by CBS to include in the Manual on the GDPS:

(a) The new function(s) of the existing centre; or

(b) The identification and functions(s) of the new centre;

(7) Acceptance of the CBS recommendation by Congress or the Executive Council.

RECOMMENDATIONS ADOPTED BY THE SESSION

Rec. 1 (CBS Ext.(90)) - AMENDMENTS TO THE MANUAL ON THE GLOBAL DATA-PROCESSING SYSTEM - MONITORING THE OPERATION OF THE WWW

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) The report of the seventh session of the Working Group on GDPS, general summary, paragraph 8.1.4,

(2) Attachment II-14 of the Manual on the GDPS,

CONSIDERING:

(1) That there is a need to further clarify procedures used to monitor the quality of observations received on the GTS by GDPS centres,

(2) That monitoring procedures have been set up by designated lead centres and a number of techniques which may be used for monitoring the quality of observations have been developed,

(3) That there is a need to nominate lead centres in each WMO Region which should carry out the monitoring of surface data quality,

(4) That the accuracy of forecasts produced by numerical prediction models should be monitored by objective verification procedures,

RECOMMENDS that the amendments to the Plan for Monitoring the Operation of the WWW, Attachment II-14 of the Manual on the GDPS, given in the annex to this recommendation, be adopted for inclusion in the Manual on the GDPS as well as relevant parts in the Manual or the Guide on the GOS as appropriate and the Manual on the GTS, with effect from 1 July 1991;

INVITES the president of CBS to nominate, in consultation with presidents of regional associations, lead centres in the WMO Regions for the monitoring of surface data quality;

REQUESTS the Secretary-General, to make appropriate changes, as given in the annex to this recommendation, in the Manual on the Global Data-processing System;

AUTHORIZES the president of CBS, in consultation with the Secretary-General to make any consequent purely editorial amendments as regards the Manual on the Global Data-processing System.

Annex to Recommendation 1 (CBS-Ext.(90))

AMENDMENTS TO THE MANUAL ON THE GLOBAL DATA-PROCESSING SYSTEM
MONITORING THE OPERATION OF THE WWW

The Plan for Monitoring the Operation of the WWW, Attachment II-14 of the Manual on the Global Data-processing System should be modified as follows:

- Paragraph 22 to read:

22. For each type of observation a lead centre shall be nominated from time to time by the president of CBS. The lead centre should liaise with the participating centres to co-ordinate all the monitoring results of that observation type and to define common methods and criteria to be used for compiling the monthly statistics. The lead centre should draw the attention of appropriate focal points, where they have been identified, and the WMO Secretariat to obvious problems as they are detected. It should also produce every six months a consolidated list of observations of the relevant observation type believed to be of consistently low quality. Information on problems with observing systems, as well as individual observations, should also be included. When compiling the consolidated lists of suspect stations the lead centres should be vigorous so as to identify only those stations where they are confident that the observations are of consistently low quality. They should state which elements of the observation are considered of low quality and provide as much information as possible identifying the problem. The list should be passed on to the participating centres and to the WMO Secretariat. Where focal points have not been identified the Secretariat should notify Members of agencies responsible for the observations which appear to be of low quality, and request them to make an investigation with a view to identifying and correcting any possible cause of error. Members should be asked to reply within a fixed period of time, reporting on any remedial action and stating if any assistance is required. Monitoring results including follow-up action should be made available to CBS, the Executive Council and Congress. In the case of enquiries made by WMO, feedback to the lead centres is requested.

- Statistical verification of numerical weather prediction

NOTES at the end of Table F to read:

1. Daily values of these parameters should be computed for each specified area. Monthly averages should then be computed from the daily values of all forecasts varifying within the relevant month. The variation of the distance between the grid points by latitude should be taken into account in a consistant way by using the cosine of latitude as a weighing factor for verification against analyses.

2. The exchanged information should include a count of the number of observations used in the verification of each parameter at each level and forecast hour.

3. The number of runs forming the monthly means should also be exchanged routinely.

4. Quarterly 72-hour forecast mean 1000 and 500 hPa error maps should be included with the annual published results.

5. The observations used for verification should be screened to exclude those with large error.

- Appendix to Table F to be replaced by the following:

APPENDIX TO TABLE F

NETWORKS OF RADIOSONDE STATIONS TO BE USED IN THE STANDARDIZED VERIFICATION OF NWP

The networks of radiosonde stations are for those geographical areas for which there is good uniform coverage. They are updated annually by the WMO Secretariat, based on information on quality and availability provided by the lead centre for radiosondes and published in the Monthly Operation Letters as appropriate. The four networks defined consist of radiosonde stations lying within the geographical areas:

1.	25°N - 60°N	50°W - 145°W	(North America)
2.	35°N - 70°N	10°W - 28°E	(Europe)
3.	25°N - 65°N	60°E - 145°E	(Asia)
4.	10°S - 55°S	90°E - 180°E	(Australia/New Zealand)

Rec. 2 (CBS-Ext.(90)) - AMENDMENTS TO THE MANUAL ON THE GLOBAL DATA-PROCESSING SYSTEM - PARTS I AND II

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) The report of the seventh session of the Working Group on the GDPS, general summary, paragraph 9.1,

(2) Second WMO Long-term Plan, Part II, Volume I - WWW Programme (1988-1997),

(3) Resolution 11 (IX-RA VI) - Guidelines on the general exchange of numerical products on the GTS in RA VI,

(4) Manual on the GDPS, Parts I and II,

CONSIDERING that there is a need to update the Manual on the GDPS to reflect the updated requirements of organization and functions of the GDPS including data processing for real-time and non-real-time users,

RECOMMENDS that the amendments to Parts I and II and the attachments thereof in the Manual on the GDPS, given in the annex to this recommendation, be adopted for inclusion in the Manual on the GDPS as well as relevant parts of the Manual on the GOS and the Manual on the GTS, to take effect on 1 July 1991;

REQUESTS the Secretary-General to make appropriate changes, as given in the annex to this recommendation, in the Manual on the Global Data-processing System;

AUTHORIZES the president of CBS, in consultation with the Secretary-General, to make any consequent purely editorial amendments as regards the Manual on the Global Data-processing System.

Annex to Recommendation 2 (CBS-Ext.(90))

AMENDMENTS TO THE MANUAL ON THE GDPS - PARTS I AND II

PART I

ORGANIZATION AND FUNCTIONS OF THE GLOBAL DATA-PROCESSING SYSTEM

1. PURPOSE OF THE GDPS

1.1 The main purpose of the Global Data-processing System (GDPS) shall be to prepare and make available to Members in the most cost-effective way meteorological analyses and forecast products. The design, functions, organizational structure and operations of the GDPS shall be in accordance with Members' needs and their ability to contribute to and benefit from the system.

2. FUNCTIONS OF THE GDPS

2.1 <u>The real-time functions of the GDPS shall include:</u>

(a) Pre-processing of data, e.g. retrieval, quality control, decoding, sorting of data stored in data base for use in preparing output products;

(b) Preparation of analyses of the three-dimensional structure of the atmosphere with up-to-global coverage;

(c) Preparation of forecast products (fields of basic and derived atmospheric parameters) with up-to-global coverage for one to 10 days ahead;

(d) Preparation of specialized products such as limited area very-fine-mesh short-range forecasts, long-range forecasts (beyond 10 days), tropical cyclone track forecasts, tailored products for marine, aviation and other purposes;

(e) Monitoring of observational data quality.

2.2 <u>The non-real-time functions of the GDPS shall include:</u>

(a) Preparation of special products for non-real-time weather or climate-related diagnosis (i.e. 10-day or 30-day means, summaries, frequencies and anomalies) on a global or regional scale, as agreed upon within the WWW system;

(b) Intercomparison of analysis and forecast products, monitoring of observational data quality, verification of the accuracy of prepared forecast fields, diagnostic studies and NWP model development;

(c) Long-term storage in a recommended format and medium of GOS data and GDPS products, as well as verification results for operational and research use;

(d) Maintenance of a continuously updated catalogue of the data and products stored in the system;

(e) Conduct of workshops and seminars on the preparation and use of GDPS output products.

3. ORGANIZATION OF THE GDPS

The GDPS shall be organized as a three-level system of World Meteorological Centres (WMCs), Regional Specialized Meteorological Centres (RSMCs) and National Meteorological Centres (NMCs), which carry out GDPS functions at the global, regional and national levels, respectively. The GDPS shall also support other WMO programmes and relevant programmes of other international organizations in accordance with policy decisions of the Organization.

4. FUNCTIONS OF GDPS CENTRES

4.1 The general functions of GDPS centres shall be as follows

4.1.1 World Meteorological Centres (WMCs)

These shall consist of few centres applying sophisticated high-resolution global NWP models which also describe the relevant physical processes of the tropical atmosphere and preparing for distribution to Members and other GDPS centres the following products:

(a) Global (hemispheric) analysis products;

(b) Short-and medium-range forecast products with a global coverage, but presented separately, if required, for:

(i) The tropical belt;

(ii) The middle and high latitudes or any other geographical area according to Members' requirements;

(c) Climate-related diagnostic products, particularly for tropical regions.

WMCs shall also carry out verification and intercomparison of products, support the inclusion of research results into operational models and their supporting systems and provide training courses on the use of WMC products.

4.1.2 Regional Specialized Meteorological Centres (RSMCs)

4.1.2.1 Centres with geographic specialization

These shall be either existing national or regional centres, which have accepted responsibilities by multilateral or regional agreement or centres implemented by a joint co-operative effort by several countries in a region. The functions of RSMCs with "geographic" specialization shall include:

(a) Providing the interface between WMCs and NMCs by formatting and distributing global products to meet needs in a particular region;

(b) Undertaking limited-area fine-scale analyses and fine-mesh forecast products for 12-48 hours, for designated areas.

4.1.2.2 Centres with activity specialization

The functions of RSMCs with "activity" specialization include among others:

(a) Providing long-range or medium-range forecasting products;

(b) Providing advisories for tropical cyclones, severe storms and for other dangerous weather phenomena (see also the Tropical Cyclone Programme);

(c) Providing tailored aviation* or marine products to service users in a particular area;

(d) Providing trajectories or dispersion of pollutants in case of nuclear or chemical accident;

(e) Providing information on prolonged adverse weather conditions, including drought monitoring;

(f) Undertaking activities related to WCP and other WMO or international programmes.

RSMCs shall also carry out verification and intercomparison of products and arrange regional workshops and seminars on centres' products and their use in national weather forecasting. RSMCs with "geographic" and activity specialization should be co-located where possible.

4.1.3 National Meteorological Centres (NMCs)

The functions of NMCs shall include preparation of:

(a) Nowcasts and very short-range forecasts;

(b) Short-, medium- and long-range forecasts by applying objective or manual interpretation methods to products received from World and Regional Specialized Meteorological Centres or by integrating limited-area models using boundary conditions based on these products;

(c) Special-application user products, including warnings for severe weather;

(d) Non-real-time climate-related analyses and diagnosis.

NMCs should be linked via suitable terminals to computer systems at other GDPS centres in order to carry out inter-processing activities between centres, according to bi- or multi-lateral agreements among Members.

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* The role of the ICAO WAFS and its responsibilities to provide tailored products for international aviation are recognized.

NOTES: (1) The national data-processing activities may also be concerned with large-scale analyses and forecasts.

(2) Detailed specifications of the real-time and non-real-time functions of WWW centres are given in Parts II and III, respectively.

(3) The basic organization of the GDPS is also given in Chapter A.2.1 of the Technical Regulations.

(4) In some instances WMCs, RSMCs and NMCs are co-located and the functions of one centre are included in those of the other.

4.2 The above functions of the various centres shall not affect the status of any international commitments of Members for support to shipping and aviation, nor determine the manner in which Members execute these responsibilities.

P A R T II

DATA PROCESSING FOR REAL-TIME AND NON-REAL TIME USES

1. FUNCTIONS OF WMCs, RSMCs and NMCs

1.1 GDPS products and services

Each Member or group of Member(s) responsible for a GDPS Centre should ensure that its centre performs the relevant category of the following functions:

1.1.1 Real-time products and services for middle latitudes and sub-tropical areas

For middle latitudes and sub-tropical areas, the GDPS should provide the following products and services in real-time:

(a) Surface and upper-air analyses;

(b) Prognoses one to three days in advance, including:

(i) Surface and upper-air prognoses of pressure (geopotential), temperature, humidity and wind in maps or other form;

(ii) Diagnostic interpretation of Numerical Weather Prediction (NWP) products to give:

- Areal distribution of cloudiness;

- Precipitation location, occurrence, amount and type;

- Sequences at specific locations (time diagrams) at the surface and aloft of temperature, pressure, wind, humidity, etc., subject to agreements between Members where appropriate;

- Vorticity advection, temperature/thickness advection, vertical motion, stability indices, moisture distribution, and other derived parameters as agreed by Members;

- Jet-stream location and tropopause/layer of maximum wind;

- Numerical products providing sea-state or storm-surge forecasts;

(c) Prognoses four to ten days in advance, including:

(i) Surface and upper-air prognoses of pressure (geopotential), temperature, humidity and wind;

(ii) Outlooks of temperature, precipitation, humidity and wind in map or other form;

(d) Interpretation of numerical products using relations derived by statistical or statistical/dynamical methods to produce maps or "spot" forecasts of probability of precipitation or precipitation type, maximum and minimum temperature, probability of thunderstorm occurrence, etc.;

(e) Sea-state and storm-surge forecasts using models driven by winds from global NWP models;

(f) Independent real-time quality control of the level II and level III data defined in note (3) below.

1.1.2 Real-time products and services for tropical areas

For tropical areas, the GDPS should provide the following products and services in real-time:

(a) Surface and upper-air analyses;

(b) Prognoses one to three days in advance, including:

(i) Surface and upper-air prognoses, particularly of wind and humidity in map or other form;

(ii) Diagnostic interpretation of NWP products to give:

- Areal distribution of cloudiness;

- Precipitation location/occurrence/amounts;

- Time sequence of weather parameters at specific location, subject to agreement between Members where appropriate;

- Jet stream and layer of maximum wind locations;

- Numerical products providing sea-state or storm-surge forecasts;

(iii) Through use of special NWP nested models or by diagnostic interpretation of fine-mesh global models to give:

- Tropical storm positions and tracks;
- Tropical depression and easterly wave positions and movement;

(c) Prognoses four to five days in advance, including:

(i) Surface and upper-air prognoses, particularly of wind and humidity;

(ii) Outlooks of precipitation, wind, cloudiness and wet and dry periods;

(iii) Life cycle of tropical storms;

(d) Interpretation of NWP prognoses using statistical or statistical/dynamical methods to produce maps or specific location forecasts of cloudiness, temperature range, precipitation probability, etc.;

(e) Sea-state and storm-surge forecasts using models driven by winds from global NWP models;

(f) Independent real-time quality control of the level II and level III data defined in note (3) below.

1.1.3 Non real-time products and services

The GDPS shall also provide the following products and services in non real-time:

(a) Long-range outlooks when operationally useful;

(b) Climate-related diagnoses (ten-day - or thirty-day mean charts, summaries, anomalies, etc.) particularly for the tropical/sub-tropical belt;

(c) Intercomparison of products, verification and diagnostic studies, as well as NWP model development;

(d) Access to data, products and intercomparison results using internationally accepted formats and media;

(e) Provision of continuously updated catalogues of data and products; and

(f) Guidelines on the operational use of GDPS centre products;

(g) Carrying out periodic monitoring of the operation of the WWW.

1.2 Functions of Members responsible for GDPS centres

1.2.1 Interpretation at NMCs

National Meteorological Centres (NMCs) should be able to fully use, interpret and interact with GDPS products in order to reap the benefits of the WWW system. Appropriate guidance on methods for the interpretation of the GDPS output to end-user products shall be made available to Members, as well as methods for verification and intercomparison of forecasts.

1.2.2 Accessibility of products

GDPS products should be accessible through a system of World Meteorological Centres (WMCs) and Regional Specialized Meteorological Centres (RSMCs)* with functions and responsibilities according to agreements among Members.

1.2.3 Data Management

The WWW Data Management function shall be used to co-ordinate the real-time storage, quality control, monitoring and handling of GDPS data and products.

1.3 Responsibilities of WMCs

1.3.1 Output products

Each WMC, applying sophisticated high-resolution global NWP models which also describe the relevant physical processes of the tropical atmosphere, should prepare for distribution to Members and other GDPS centres the following products, based on the lists in paragraph 1.1 to 1.1.3 above:

(a) Global (hemispheric) analysis products;

(b) Short- and medium-range forecast products with a global coverage, but presented separately, if required, for:

  (i) The tropical belt;

  (ii) The middle and high latitudes or any other geographical area according to Members' requirements;

(c) Climate-related diagnostic products, particularly for tropical regions.

1.3.2 WMCs should also carry out verification and intercomparison of products, support the inclusion of research results into operational models and their supporting systems and provide training courses on the use of WMC products.

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* The structure of the GDPS is defined in paragraph 40 of the Second WMO Long-term Plan, Part II, Volume I - The World Weather Watch Programme 1988-1992.

1.4 Responsibilities of RSMCs

1.4.1 Output products

Regional Specialized Meteorological Centres (RSMCs) shall be designated in each Region, capable of preparing with the support of WMCs and where applicable RSMCs outside the Region - analyses and short- and medium-range forecast products with the highest possible quality and with the Meteorological content, geographical coverage and frequency required by Members and agreed for the system. Output products from RSMCs should comprise:

(a) Analyses and prognoses at the surface and in the free atmosphere for short- and medium-ranges, for the tropical, sub-tropical and extra-tropical areas, according to the obligations of each RSMC and as agreed by the regional association;

(b) Interpreted forecasts of specific weather parameters in map form or at specific locations (e.g. precipitation amounts, temperature, wind, humidity, etc.) subject to agreement between Members, when appropriate;

(c) Storm-position and track forecasts for the areas affected by tropical storms;

(d) Climate analyses and, if possible, long-range outlooks of wet and dry periods;

(e) Results of forecast verifications and intercomparison studies.

1.4.2 Use of automated procedures

Regional Specialized Meteorological Centres should make optimum use of information from different observing systems, numerical methods and computer techniques.

1.4.3 Binary/character conversion capabilities for transmission

In order to meet the requirements of NMCs for output products in character representation and/or graphical form, all RSMCs should have facilities for conversion of products from binary to character and/or graphical form for regional transmission.

1.4.4 Constraints for adjacent centres

To the maximum extent feasible, adjacent RSMCs with geographical specialization should be prepared to assume each other's functions. This does not necessarily mean that each RSMC should be prepared to use the analytical models employed by RSMCs adjacent to it. Each RSMC should, however, be able to issue products covering equivalent geographical areas and to give information generally similar to that contained in the products of adjacent RSMCs.

1.5 Members' responsibilities

Each Member shall ensure that it has a National Meteorological Centre adequately staffed and equipped to enable it to play its part in the World Weather Watch.

1.5.1 NMC functions

Each Member should ensure that its National Meteorological Centre performs the functions defined in Part I, paragraph 4.1.3 as elaborated in Part II, paragraph 1.1 to 1.2.3.

1.5.2 Checking of collected information

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

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

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

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

Level 1: Primary data. In general these are instrument readings expressed in appropriate physical units and referred to Earth co-ordinates. Examples are: radiances or positions of constant-level balloons, etc. but not raw telemetry signals. Level I data still require conversion to the meteorological parameters specified in the data requirements.

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

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

ATTACHMENT II.6

OVERALL LIST OF OUTPUT PRODUCTS OF WMCs

1. ANALYSES

Surface)

850 hPa)

700 hPa)

500 hPa)

300 hPa)

250 hPa) Parameters: Pressure (P)/Geopotential height (H),

200 hPa) Temperature (T), Wind (W) and Humidity (R), as appropriate

150 hPa) and applicable

100 hPa)

70 hPa)

50 hPa)

30 hPa)

20 hPa)

10 hPa)

Relative topography, in particular the thickness 500/1000 hPa

Jet stream

Tropopause

Nephanalyses

Digitized cloud mosaics*

Mapped radiometric data*

Land and sea-surface temperature*

Snow and ice cover

Storm alerts*

Area coverages: northern hemisphere and southern hemisphere middle latitude and sub-tropical areas, tropical belt

Times of reference (H): 00 and 12 UTC, as applicable.

2. FORECASTS

Surface)

850 hPa)

700 hPa)

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* Based on satellite information.

500 hPa)

300 hPa)

250 hPa)

200 hPa) Parameters: P/H, T, W, and R, as appropriate and

150 hPa) applicable

100 hPa)

70 hPa)

50 hPa)

30 hPa)

20 hPa)

10 hPa)

Relative topography, in particular the thickness 500/1000 hPa

Area distribution of cloudiness

Precipitation location, occurrence, amount and type
Sequences at specific locations (time diagrams) at the surface and aloft of T,P,W, and R.

Vorticity advection, temperature/thickness advection, vertical motion, stability indices, moisture distribution, and other derived parameters.

Jet-stream location and tropopause/layer of maximum wind

Numerical products providing sea-state or storm-surge forecasts

Tropical storm positions and tracks

Tropical depression and easterly wave positions and movement

Four to ten days in advance outlooks in middle latitudes and sub-tropical areas or four to five days in advance outlook in the tropics of T, W, R and precipitation

Life cycle of tropical storms

Forecasts of probability of precipitation and temperature extremes for middle latitudes and sub-tropical areas or forecasts of cloudiness, temperature range and precipitation probability for tropical areas

30-day mean surface) Parameters: P/H, T, W and R as appropriate

30-day mean 850 hPa) and applicable

30-day mean 500 hPa)

Area coverages: northern hemisphere and southern hemisphere middle latitude and sub-tropical areas, tropical areas

Times of reference (H): 00 and 12 UTC

Times of validity: H+12, H+24, H+36, H+48, H+72, H+96 and H+120 hours for tropical areas and up to H+240 hours for middle latitude and sub-tropical areas

3. 5-DAY, 15-DAY AND 30-DAY MEAN VALUES

Surface)

850 hPa) Parameters: P/H, T, W and R as appropriate and applicable

500 hPa)

Relative topography the thickness 500/1000 hPa

Sea-surface temperature (preferably anomaly)

Area coverage: northern hemisphere and southern hemisphere middle latitude and sub-tropical areas, tropical areas.

ATTACHMENT II.7

OVERALL LIST OF OUTPUT PRODUCTS OF RSMCs

1. ANALYSES

Surface)

850 hPa)

700 hPa)

500 hPa)

400 hPa)

300 hPa)

250 hPa) Parameters: P/H, T, W and R, as appropriate

200 hPa) and applicable

150 hPa)

100 hPa)

70 hPa)

50 hPa)

30 hPa)

20 hPa)

10 hPa)

Tropopause and maximum wind <u>or</u>

Tropopause and vertical wind shear

Relative topography, in particular the thickness 500/1000 hPa

Stability

Precipitable water

Snow depth

Changes to 500 hPa, 24 hours

Changes to relative topography the thickness 500/1000 hPa, 24 hours

Freezing level

Pressure changes, 3 hours

Pressure changes, 12 and/or 24 hours

Precipitation areas - 6 hours

Precipitation areas - 24 hours

Sferics

Radar echoes

Nephanalyses

Sea-surface temperature

Sea ice

State of sea*

Sea surge*

Thermoclines*

Superstructure icing*

Top of Ekman layer

Transpiration and evaporation estimates*

Water balance assessments involving estimates of soil moisture deficits or soil moisture deficits or soil moisture contents*

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* Subject to confirmation by the technical commissions concerned.

Estimates of potential photosynthesis (possible dry matter production)*

Surface air trajectories*

850 hPa air trajectories*

700 hPa air trajectories*

500 hPa air trajectories*

Times of reference (H): 00,06, 12 and 18 UTC, as applicable

2. FORECASTS

Surface)

850 hPa)

700 hPa)

500 hPa)

400 hPa) Parameters: P/H, T, W, and R as appropriate and

300 hPa) applicable

250 hPa)

200 hPa)

150 hPa)

100 hPa)

Jet-stream location and tropopause/layer of maximum wind

Relative topography the thickness 500/1000 hPa

Significant weather

Freezing level

Vorticity

Vertical motion

Areas distribution of cloudiness

Precipitation location, occurrence, amount and type
Sequences at specific locations (time diagrams) at the surface and aloft of T,P,W, and R

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* Subject to confirmation by the technical commissions concerned.

Vorticity advection, temperature/thickness advection, stability indices, moisture distribution, and other derived parameters

Numerical products providing sea-state or storm-surge forecasts

Tropical storm positions and tracks

Tropical depression and easterly wave positions and movement

Four to ten days in advance outlooks in middle latitudes and sub-tropical areas or four to five days in advance outlook in the tropics of T, W, R and Precipitation

Life cycle of tropical storms

Forecasts of probability of precipitation and temperature extremes for middle latitudes and sub-tropical areas or forecasts of cloudiness, temperature range and precipitation probability for tropical areas

State of sea*

Sea surge*

Sea-surface temperature

Thermoclines*

Sea ice

Superstructure icing*

Times of reference (H): 00, 06, 12 and 18 UTC as applicable

Times of validity: H+12, H+24, H+36, H+48, H+72, H+96 and H+120 hours for tropical areas and up to H+240 hours for middle latitude and sub-tropical areas

3. PLOTTED DATA

Plotted surface data (3-hourly)

Plotted upper-air data (850, 700, ... 100 hPa)

Tabulated winds

Aerological diagrams

NOTE: This list includes products which may also be required by Area Forecast Centres in accordance with requirements determined by ICAO.

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* Subject to confirmation by the technical commissions concerned.

ATTACHMENT II.8

PREFERENCE LIST OF OUTPUT PRODUCTS OF WMCs TO WHICH HIGHEST PRIORITY SHOULD BE GIVEN FOR PREPARATION

1. ANALYSES

Surface	00, 12 UTC	)	
850 hPa	"	)	
700 hPa	"	)	
500 hPa	"	)	Parameters: P/H, T, W and R as
300 hPa	"	)	appropriate and applicable
200 hPa	"	)	
100 hPa	00, 12 UTC	)	
50 hPa*	00, 12 UTC*	)	
or 70 hPa*			

Nephanalyses or digitized cloud mosaics	)	
	)	As applicable
Storm alerts (based on satellite picture)		

Area coverage: northern hemisphere, southern hemisphere and selected products for the tropical areas.

2. FORECASTS

Surface	H+24 (00,12 UTC),	H+48 (00, 12 UTC),	H+72,	beyond H+72,			
850 hPa	"	"	"	"	"	"	"
700 hPa	"	"	"	"	"	"	"
500 hPa	"	"	"	"	"	"	"
300 hPa	H+24 (00, 12 UTC) H+48 (00, 12, UTC),						
250/200 hPa	H+24, (00, 12 UTC) H+48, (00, 12 UTC), H+72, beyond H+72						
100 hPa	H+24, (00, 12 UTC) H+48, (00, 12 UTC), H+72						

---

* In accordance with any requirements expressed by regional associations.

Precipitation or vertical motion (twice per day)

Area coverage: northern hemisphere and southern hemisphere middle latitude and sub-tropical areas, and products for the tropical areas

Parameters: P/H, T, W and R as appropriate and applicable

ATTACHMENT II.9

PREFERENCE LIST OF OUTPUT PRODUCTS OF RSMCs TO WHICH HIGHEST PRIORITY SHOULD BE GIVEN FOR PREPARATION

1. ANALYSES

	Surface	00, 06, 12, 18 UTC	)	
	850 hPa	00, 12 UTC	)	
	700 hPa	00, 12 UTC	)	
	500 hPa	00, 12 UTC	)	
	400 hPa	00, 12 UTC	)	
(	300 hPa	00, 12 UTC	)	Parameters: P/H, T, W and R
(	or 250 hPa		)	as appropriate and applicable
	200 hPa	00, 12 UTC	)	
	150 hPa	00, 12 UTC	)	
	100 hPa	00, 12 UTC	)	
	50 hPa*	00, 12 UTC*	)	
	or 70 hPa*		)	

Tropopause and maximum wind or tropopause and vertical wind shear 00, 12 UTC

Sea-surface temperature, as appropriate, but not more than once daily

Nephanalyses

Sea-ice distribution, as appropriate, but not more than once daily

2. FORECASTS

NOTE: The list given below includes products which may also be required by Area Forecast Centres in accordance with ICAO regulations.

* In accordance with any requirements expressed by regional associations.

	Surface	00, 06, 12, 18 UTC, H+24 (once daily), H+48 or H+36 (once daily)
	850 hPa	H+18 (00, 12 UTC*), H+24 (00, 12 UTC), H+48 or H+36 (00, 12 UTC)
	700 hPa	H+18 (00, 12 UTC)*, H+24 (00, 12 UTC)
	500 hPa	H+18, (00, 12 UTC)*, H+24 (00, 12 UTC), H+48 or H+36 (00, 12 UTC)
	400 hPa	H+18 (00, 12 UTC)*, H+24 (00, 12 UTC) H+36 (00, 12 UTC)
(	300 hPa	H+18 (00, 12 UTC)*, H+24 (00, 12 UTC), H+48 or H+36 (00, 12 UTC)
(	or 250 hPa	
(	200 hPa	H+18, (00, 12 UTC)*, H+24 (00, 12 UTC), H+48 or H+36 (00, 12 UTC)
	150 hPa	H+18, (00, 12 UTC)*, H+24 (00, 12 UTC), H+48 or H+36 (00, 12 UTC)
	100 hPa**	H+24 (00, 12 UTC)** H+24 (00, 12 UTC), H+48, or H+36 (00, 12 UTC)
	Parameters:	P/H, T, W and R as appropriate and applicable

Precipitation (quantitative) (twice per day)

Tropopause and maximum wind or tropopause and vertical wind shear - H+18 (00, 12 UTC), H+24 (00, 12 UTC)

Significant weather - 4 times per day*

State of sea - at least once daily

Vertical motion or vorticity - H+24 (00, 12 UTC), H+48 or H+36 (00, 12 UTC)

ATTACHMENT II.10

TRANSMISSION PRIORITIES FOR WMC PRODUCTS

1. FORECASTS BASED ON 00 AND 12 UTC DATA

24-hr 500 hPa

24-hr surface

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* In accordance with any requirements expressed by regional associations.

** To meet aviation demands in accordance with requirements expressed by regional associations.

48-hr 500 hPa

48-hr surface

72-hr 500 hPa

72-hr surface

One of 300, 250 or 200 hPa (24-hr), (48-hr) and (72-hr)

Medium range product (beyond H+72)

Surface

850 hPa

500 hPa

250/200 hPa

2. ANALYSES

Surface, 00 and 12 UTC

500 hPa, 00 and 12 UTC

One of 300, 250 or 200 hPa, 00 and 12 UTC

100 hPa, 00 and 12 UTC*

50 hPa, 00 UTC*

Nephanalyses as available

3. FORECASTS

24-hr 100 hPa, based on 00 and 12 UTC data*

Parameters: P/H, T, W and R as appropriate and applicable

ATTACHMENT II.11

TRANSMISSION PRIORITIES FOR RSMC PRODUCTS

Surface

	Analyses	00 and 12 UTC
	Forecasts	24-hr based on 00 and 12 UTC data

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* In accordance with any requirements expressed by regional associations.

850 hPa, 700 hPa, 500 hPa		
	Analyses	00 and 12 UTC
	Forecasts	24-hr based on 00 and 12 UTC
Either 300, 250 or 200 hPa*		
	Analyses	00 and 12 UTC
	Forecasts	24-hr based on 00 and 12 UTC data
100 hPa** and 50 hPa**		
	Analyses	00 and 12 UTC
	Forecasts	24-hr based on 00 and 12 UTC data
Products beyond H+36 up to and including H+72		
	Surface	
	850 hPa	
	700 hPa	
	500 hPa	
	250/200 hPa	
	100 hPa	
Medium range products (beyond H+72)		
	Surface	
	850 hPa	
	500 hPa	
	250/200 hPa	
Significant weather		
	Forecasts	00/06/12/18 UTC
	Requirements established regionally	
Nephanalyses		One per day as available

* The use of 300 hPa, 250 hPa, or 200 hPa to be decided by regional associations.

** In accordance with any requirements expressed by regional associations.

State of sea		
	Forecasts	24-hr based on 00 and 12 UTC
Tropopause/maximum wind or,		
Tropopause/vertical wind shear analysis		00 and 12 UTC
Precipitation forecasts (quantitative)		As available

Parameters: PH, T, W and R as appropriate and applicable

ATTACHMENT II.12

TRANSMISSION PRIORITIES AFTER OUTAGES

1. OBSERVATIONAL DATA

Storm alerts) Not more than twelve
TEMP, TEMP SHIP (Part A)) hours after the time
Soundings derived from satellite data) of observation

SYNOP and SHIP - not more than six hours for the 06 and 18 UTC observations or 12 hours for the 00 and 12 UTC observations.

2. WMC PRODUCTS

48-hr surface 850,700 and 500 hPa forecasts, 00 or 12 UTC)until new
72-hr surface 850,700 and 500 hPa forecasts, 00 or 12 UTC)products are
)available

3. RMC PRODUCTS

24-hr surface forecast, 00 or 12 UTC)
24-hr 850, 700 and 500 hPa forecast, 00 or 12 UTC)until new
24-hr forecast of one of the 300, 250, or 200 hPa level)products
24-hr 100 hPa forecast, 00 or 12 UTC*)are
24-hr 50 hPa forecast, 00 or 12 UTC*)available

Parameters: P/H, T, W and R as appropriate and applicable

ATTACHMENT II.13

MINIMUM PRODUCT LIST FOR TRANSMISSION IN BOTH ALPHANUMERICAL AND PICTORIAL FORM

1. FORECASTS

24-hr 500 hPa)

24-hr 850 hPa)

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* In accordance with any requirements expressed by regional association.

24-hr 700 hPa	)	
24-hr surface	)	
	)	Based on 00 and 12 UTC data
48-hr 500 hPa	)	
48-hr 700 hPa	)	
48-hr 850 hPa	)	
48-hr surface	)	
72-hr 500 hPa	)	
72-hr 700 hPa	)	Based on 00 <u>or</u> 12 UTC data
72-hr 850 hPa	)	
72-hr surface	)	

One of 300, 250 or 200 hPa (24-hr) based on 00 and 12 UTC data.

2. ANALYSES:

Surface	)	
850 hPa	)	
700 hPa	)	Based on 00 and 12 UTC data
500 hPa	)	
One of 300, 250 or 200 hPa	)	
Nephanalyses as available	)	

Parameters: P/H, T, W and R as appropriate and applicable.

Rec. 3 (CBS-Ext.(90)) - AMENDMENTS TO THE MANUAL ON THE GOS, PART II - REQUIREMENTS FOR OBSERVATIONAL DATA

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) The WMO Technical Regulations, Volume II, Meteorological Services for International Air Navigation, Chapter [C.3.1.] - Standards and Recommended Practices, Section 4.15 - Observations and reports of volcanic activity,

(2) The request of ICAO to obtain real-time observational data on atmospheric evidence of volcanic activity from existing observing networks,

CONSIDERING:

(1) The serious threat to the safety of civil aviation posed by volcanic ash clouds,

(2) That no provision presently exists in the Manual on the GOS for the observing and reporting of volcanic activity,

RECOMMENDS that the Manual on the Global Observing System, Part II - Requirements for Observational Data - be amended as indicated in the annex to this recommendation in order to cover observational requirements in the event of volcanic activity as from 1 July 1991;

REQUESTS the Secretary-General to make the appropriate changes, as given in the annex to this recommendation, in the Manual on the Global Observing System;

AUTHORIZES the president of CBS, in consultation with the Secretary-General, to make any consequent purely editorial amendments as regards the Manual on the Global Observing System.

Annex to Recommendation 3 (CBS-Ext.(90))

AMENDMENTS TO THE MANUAL ON THE GOS, PART II - REQUIREMENTS FOR OBSERVATIONAL DATA

In the opening section of Part II "Requirements for observational data" insert the following paragraph:

"1.5 Requirements in the event of volcanic activities

Requirements in the event of volcanic activity potentially hazardous to aviation should be related to the observational data needed by Members for taking appropriate action; these data are specified in Attachment II.5."

ATTACHMENT II.5

OBSERVATIONAL REQUIREMENTS IN THE EVENT OF VOLCANIC ACTIVITY

Because of the potential hazard to aviation, the occurrence of pre-eruption volcanic activity, volcanic eruptions, and volcanic ash clouds should be reported without delay to the designated meteorological watch office and associated air-traffic services unit. The report in plain language should be made in the form of a volcanic activity report comprising the following information, if available, in the order indicated:

(a) Message type, VOLCANIC ACTIVITY REPORT;

(b) Station identifier, location indicator, or name of station;

(c) Date/time of message;

(d) Location of volcano and name if known;

(e) Concise description of event including, as appropriate, level of intensity of volcanic activity, occurrence of an eruption and its date and time, the existence of a volcanic ash cloud in the area with the direction of ash cloud movement and height as best estimated.

NOTE: Pre-eruption volcanic activity in this context means unusual and/or increasing volcanic activity which could presage an eruption.

Rec. 4 (CBS-Ext.(90)) - AIRCRAFT METEOROLOGICAL DATA REPORTING (AMDAR)

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) The substantial progress being made in the implementation of the ASDAR programme and the strong interest in its further expansion on the part of the participants,

(2) The successful implementation of the VHF ACARS reporting of automated meteorological data reporting in Australia,

(3) The rapid development of the use of commercial satellites for the communication of data from aircraft, including the possibility of transmitting meteorological data,

(4) The value of the data from both the VHF ACARS and the ASDAR to meteorology, particularly the capability to obtain profiles of information on ascent and descent,

(5) The responsibility of the Commission for Aeronautical Meteorology relating to standards and recommended practices for aircraft observations and reports as contained in WMO Technical Regulations, Volume II Meteorological Service for International Air Navigation (C.3.1) 5 - Aircraft observations and reports - and the potential advantages of automating such reports,

CONSIDERING:

(1) The continuing need to provide upper-air data over data sparse areas for both numerical analyses and local forecasting procedures,

(2) The possibility of greatly increasing the availability and accuracy of wind information, especially in tropical areas using automated aircraft reporting,

(3) The need to develop a co-ordinated programme to make the most effective use of the potential of automated aircraft reporting,

(4) The importance of ensuring a compatible data set from the various systems likely to be providing meteorological data from aircraft,

NOTES with appreciation the substantial efforts of the participants in the Consortium for ASDAR Development and the Operating Consortium of ASDAR Participants to bring to fruition the ASDAR and VHF ACARS concepts and their continuing work to implement an operational programme for the automated reporting of meteorological data from aircraft,

RECOMMENDS:

(1) The endorsement of the preparation of a plan for the development of an Aircraft Meteorological Data Reporting (AMDAR) programme based on the use of commercial aircraft;

(2) That Members be invited to consider the use of ASDAR and the VHF ACARS in VCP and similar co-operation programmes;

(3) That consideration be given to inviting OCAP to participate in the development of the AMDAR plan and in the various studies required to determine the accuracy and representativeness of the ASDAR data;

(4) That urgent action be taken to determine the sources of the apparent errors in the accuracy of temperature data from aircraft reporting systems. It encouraged the OCAP in its efforts to examine this issue and asked the president of the CBS to invite ECMWF to assist the OCAP in its analysis of the problem;

(5) That the OCAP provide a report to the Advisory Working Group on the findings of its analysis of the apparent temperature error and on any recommendations it may have on how to resolve any problems identified;

(6) That the presidents of the CBS and the CAeM co-ordinate the activities of their Commissions concerning the implementation of the AMDAR programme, particularly concerning the dialogue required with airline organizations;

(7) That the president of CBS provide appropriate support to the CAeM in developing such dialogue,and that the OCAP be invited to participate actively.

Rec. 5 (CBS-Ext.(90) - IMPLEMENTATION OF THE AUTOMATED SHIPBOARD AEROLOGICAL PROGRAMME IN THE WWW AND WORK OF THE ASAP CO-ORDINATING COMMITTEE (ACC)

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 2 (EC-XXXVII) - Automated shipboard aerological programme (ASAP) - which endorsed the formation of the ASAP Co-ordinating Committee and established its terms of reference,

(2) The substantial progress which has been made to implement the ASAP as part of the WWW,

(3) The decision to not continue the Ocean Weather Ship programme on the North Atlantic and the demonstrated value of the ASAP to analyses in this area,

CONSIDERING:

(1) The need to ensure a continuation of the ASAP and to encourage its expansion,

(2) The need to make the ASAP more accessible to Members and the need to keep the concept current with technological developments, particularly concerning navigational aids,

(3) The interest of some Members in participating in the ASAP programme,

NOTES with great appreciation the work of the ASAP Co-ordinating Committee (ACC) in the implementation of the ASAP and thanks the participants for their substantial support to this programme,

RECOMMENDS:

(1) That the attention of Members be drawn to the value of the ASAP in providing data over ocean areas and the importance of continuing and expanding the ASAP programme;

(2) The expansion of the ASAP and that the ACC be encouraged to work with Members to implement the ASAP particularly in the Indian, South Atlantic and South Pacific oceans;

(3) That the ACC, as a matter of priority, prepare a report for CBS on the possibilities for improving the utility of the ASAP on a variety of different types of ships and, as possible, the ways in which the overall systems costs might be reduced;

(4) That the ACC examine and make recommendations on other technical improvements which could be made to the ASAP, including the potential use of the Global Positioning System;

(5) That the chairmen of the ACC and the Working Group on the GOS co-ordinate the preparation of a revised programme plan for the ASAP, taking into consideration the above technical possibilities, and that such a revised plan be submitted no later than CBS-X, or earlier if possible to the president of the Commission;

(6) That the ACC continues its monitoring programme and reports back to the CBS on the results, and that it provide CBS with any recommendations which might serve to improve the efficiency of the ASAP;

REQUESTS the Secretary-General to give support to the work of the ACC within the resources allocated.

Rec. 6 (CBS-Ext.(90)) - AMENDMENTS TO THE MANUAL ON THE GLOBAL TELECOMMUNICATION SYSTEM - VOLUME I - GLOBAL ASPECTS PART I - ORGANIZATION OF THE GLOBAL TELECOMMUNICATION SYSTEM

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 2 (Cg-X) - World Weather Watch Programme for 1988-1991,

(2) The World Weather Watch Programme for 1988-1997 (WMO Publication No. 691),

RECOMMENDS the adoption of the amendments to the Manual on the Global Telecommunication System - Volume I - Global Aspects, PART I - Organization of the Global Telecommunication System, given in the annex to this recommendation, with effect from 1 September 1991;

REQUESTS the Secretary-General to make the appropriate amendments as given in the annex to this recommendation to the Manual on the Global Telecommunication System - Volume I - Global Aspects, PART I - Organization of the Global Telecommunication System;

AUTHORIZES the president, in consultation with the Secretary- General, to make any consequent purely editorial amendments as regards Volume I of the Manual on the Global Telecommunication System.

Annex to Recommendation 6 (CBS-Ext.(90))

AMENDMENTS TO THE MANUAL ON THE GLOBAL TELECOMMUNICATION SYSTEM - VOLUME I - GLOBAL ASPECTS PART I - ORGANIZATION OF THE GLOBAL TELECOMMUNICATION SYSTEM

A. <u>Amendments are indicated by a bar in the left margin</u>:

1. FUNCTIONS, ORGANIZATION AND PRINCIPLES OF THE GLOBAL TELECOMMUNICATION SYSTEM

1.1 Functions

The functions of the Global Telecommunication System (GTS) shall be to facilitate the flow of data and processed products to meet the WWW requirements in a timely, reliable and cost-effective way, ensuring that all Members have access to data and products in accordance with approved procedures and within the limits of the agreed WWW system.

NOTE: It also gives telecommunications support to other programmes, as decided by the WMO Congress or the Executive Council, within the limits of its primary objectives.

1.2 Organizational principles of the Global Telecommunication System

1.2.1 The Global Telecommunication System shall be so organized as to accommodate the volume of meteorological information and its transmission within the required time limits to meet the needs of World, Regional Specialized and National Meteorological Centres, resulting from the implementation of the WWW.

1.2.2 The GTS shall be organized on a three-level basis, namely:

(a) The Main Telecommunication Network (MTN), linking together the WMCs as well as designated Regional Telecommunication Hubs (RTHs);
(b) The regional telecommunication networks; and
(c) The national telecommunication networks.

1.3 Design principles of the Global Telecommunication System

The design principles for the planning of the Global Telecommunication System shall be as follows:

Principle 1

The Global Telecommunication System shall be designed as an integrated network for the collection, exchange and distribution of information on a world-wide basis, with a view to meeting, efficiently and effectively, the requirements of all national Meteorological Services and also the requirements of World and Regional Specialized Meteorological Centres, within the agreed WWW system.

Principle 2

The system shall comprise an integrated network of point-to-point circuits, point-to-multipoint circuits, broadcast and multipoint-to-point circuits which are reliable and have suitable technical and operational characteristics. These circuits may be composed of a combination of terrestrial and satellite telecommunication links.

Principle 3

The circuits to be provided and the techniques to be employed shall be adequate to accommodate the volume of meteorological and related information and its transmission within the required time limits to meet the needs of World, Regional Specialized and National Meteorological Centres.

Principle 4

In the planning of the circuits and transmission schedules, the daily volume of traffic designed to be passed over any one channel shall not exceed 80 per cent of its theoretical capacity. The channels shall be designed to ensure the highest practicable reliability and availability.

Principle 5

The system shall be based mainly on the interconnection of a number of centres, namely, NMCs, RSMCs, RTHs, and WMCs. The WMCs, RSMCs and RTHs shall be provided with suitable equipment for selection, switching and editing in order to provide NMCs with the data selected to meet the NMCs specified needs.

Principle 6

Provision shall be made for alternative routeings, where practicable, to ensure the reliability and efficiency of the system, particularly the reliability and efficiency of the Main Telecommunication Network.

1.4 Responsibilities for the GTS

1.4.1 General responsibilities of regional associations

The following shall be the general responsibilities of regional associations:

(a) Each regional association shall assume responsibility for the establishment and maintenance of an effective telecommunication system which shall include the optimal and appropriate use of terrestrial and/or via satellite telecommunications means. The system shall be adequate to meet the developing requirements stipulated by the Commission for Basic Systems for the interchange of meteorological and related information within the Region and with adjacent Regions;

(b) To ensure rapid and reliable collection of meteorological data from all observing stations, each regional association shall, when adopting its telecommunication plan, comply with the design and operational principles given in this Manual. These principles apply to those centres and circuits within its Region which are situated on the Main Telecommunication Network;

(c) Each regional association shall decide on the implementation within its Region of the regional options provided for in the global specifications and procedures;

(d) For data dissemination systems (either terrestrial or via satellite), each regional association shall establish, after consultation with known or probable recipients inside and outside the Region and the Member responsible for the operation of such system, the content, schedule, and other co-ordinated aspects of operations.

1.4.2 General responsibilities of Members

(Unchanged)

2. FUNCTIONS AND RESPONSIBILITIES OF THE METEOROLOGICAL TELECOMMUNICATION CENTRES

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

(a) Collecting the observational data originating from their associated NMCs and transmitting such data in the appropriate form on the Main Telecommunication Network, either directly or through the appropriate WMC/RTH;

(b) Relaying selectively on the circuits of the Main Telecommunication Network, as internationally agreed and in the appropriate form, the meteorological and related information which they receive from these circuits and/or from RTHs not situated on the Main Telecommunication Network;

(c) Transmitting over the Main Telecommunication Network, either directly or through a designated RTH, as internationally agreed and in the appropriate form, the processed meteorological information produced by the WMC or RSMC associated with them;

(d) Ensuring the selective distribution, in the appropriate form and at the appropriate speed, of meteorological and related information to the associated NMCs and to the RTHs not situated on the Main Telecommunication Network which they serve;

(e) Checking and making corrections in order to maintain standard telecommunication procedures;

(f) Establishing data dissemination systems (terrestrial and/or via satellite) as required in accordance with regional plans;

(g) Carrying out the monitoring of the operation of the GTS of the WWW.

NOTE: The plan for monitoring the operation of the WWW is given in Attachment I-5.

2.2 Regional Specialized Meteorological Centres not combined with RTHs should ensure distribution of their products by agreement with an appropriate GTS centre or centres.

2.3 With regard to telecommunications, the National Meteorological Centres shall be responsible for:

(a) Collecting observational data from their own territory or that of one or more Members according to bilateral agreements, as well as observational data from aircraft and ships received by centres located within the area of responsibility. This collection shall take place as soon as possible and shall be completed within 15 minutes of the observing station's filing time;

NOTES: (1) The observing station's filing time is defined as the time at which the coded meteorological report is first presented to the telecommunication system. For an aircraft or ship weather report, it is the time when it is received by the appropriate communication station (land station/coast station).
(2) Under normal conditions, the report should be presented to the telecommunication system not later than five minutes after the completion of its coding.

(b) Transmitting such data to the associated Regional Telecommunication Hub or World Meteorological Centre;

NOTE: NMCs may be associated with more than one RTH.

(c) Receiving and distributing for their benefit and that of Members who request them, in accordance with bilateral agreements, observational data and processed meteorological information, to meet the requirements of the Members concerned;

(d) Checking and making corrections in order to ensure that standard telecommunication procedures are applied;

(e) Carrying out the monitoring of the operation of the GTS of the WWW.

2.4 to 2.9 (Unchanged)

3. FUNCTIONS AND CHARACTERISTICS OF THE NETWORKS OF THE GLOBAL TELECOMMUNICATION SYSTEM

3.1 The Main Telecommunication Network (MTN)

3.1.1 The Main Telecommunication Network shall be an integrated system of circuits linking together the WMCs and designated Regional Telecommunication Hubs. The circuits which directly link WMCs and/or RTHs situated on the Main Telecommunication Network may, at the request of Members concerned, be designated as circuits of the Main Telecommunication Network.

NOTE: The names of these centres, together with a diagram indicating the configuration of the Main Telecommunication Network, are given in Attachment I-2.

3.1.2 The Main Telecommunication Network shall be designed in such a way that the traffic originating from each centre (WMC, designated RTH) will be routed selectively towards the addressee centre(s). Each centre on the Main Telecommunication Network shall ensure selective relay of the traffic which it receives towards the circuit(s) which it serves.

3.1.3 The Main Telecommunication Network shall have the function of providing an efficient, reliable communication service between the designated centres, in order to ensure:

(a) Rapid and reliable exchange of observational data required to meet the GDPS requirements;

(b) Exchange of processed information between the World Meteorological Centres, including data received from meteorological satellites;

(c) Transmission of processed information produced by the WMCs, to meet the requirements of RSMCs and NMCs;

(d) Transmission of other observational data and processed information required for interregional exchange.

NOTE: Responsibilities of centres located on the Main Telecommunication Network for the transmission of observational data and processed information are given in Attachment I-3.

3.2 Regional meteorological telecommunication networks (RMTNs)

3.2.1 The regional meteorological telecommunication networks shall consist of an integrated network of point-to-point circuits, point-to-multipoint circuits and multipoint-to-point circuits which interconnects RTHs, NMCs, and in some regions WMCs and/or RSMCs and also, where needed, radio broadcasts in accordance with the regional meteorological telecommunication plans for WWW established by the regional associations. These networks shall be designed so as to enable the WMCs, RTHs and NMCs to perform the functions defined in section 2 above.

NOTE: The centres which are situated on the regional meteorological telecommunication networks are specified by the regional associations (see Volume II of the Manual).

3.2.2 The regional meteorological telecommunication networks comprise the following meteorological transmission facilities:

(a) The circuits of the Main Telecommunication Network which pass through the Region;

(b) The main regional circuits, consisting of point-to-point circuits (either landline or satellite) interconnecting the RTHs in the Region;

(c) The regional circuits, consisting of point-to-point circuits, point-to-multipoint circuits and multipoint-to-point circuits (landline, satellite or radio) connecting the NMCs to the RTHs or other NMCs in the Region;

(d) Interregional circuits, consisting of point-to-point circuits (landline, satellite or radio) interconnecting RTHs or WMCs to RTHs in different Regions;

(e) Supplementary interregional circuits, consisting of point-to-point circuits (landline, satellite or radio) which connect WMCs, RTHs and NMCs to RSMCs or NMCs located in other Regions;

(f) Radio broadcasts and other radio facilities.

3.2.3 Functions specified within the framework of the GTS

In order to obtain rapid collection and distribution of observational data or processed information for all national Meteorological Services, the regional meteorological telecommunication networks shall be engineered so as to ensure:

(a) Exchange and distribution of observational data within the Region, as required to meet the needs of Members of the Region;

(b) Collection of observational data originating in, or being received by, stations located in the Region (e.g. reports from aircraft and ships);

(c) Collection of observational data from associated NMCs in adjacent Regions provided that this is found to be of use to the Global Telecommunication System and provided that this is agreed upon by the Members concerned and the corresponding regional associations;

(d) Exchange and distribution of processed (conventional and satellite) information as required to meet the needs of Members of the Region;

(e) Interchange of observational data and processed information with other Regions.

3.2.4 Contents of meteorological transmission by point-to-point circuits

3.2.4.1 The contents of meteorological transmissions on main regional circuits and regional circuits shall be determined by the regional associations to meet the requirements of the Members of the Region concerned.

3.2.4.2 The contents of meteorological transmissions on interregional circuits and supplementary interregional circuits shall be established by interregional and/or bilateral agreements between Members.

3.3 National meteorological telecommunication networks (NMTNs)

Unchanged

3.4 Satellite-based data collection and dissemination systems

3.4.1 Introduction

Satellite-based data collection and distribution systems are integrated in the GTS as an essential element of the global, regional and national levels of the GTS.

They should comply with the organization and principles of the GTS, particularly with respect to the functions and responsibilities of meteorological telecommunications centres.

They operate through communication functions of meteorological satellites and through public telecommunication services via satellite.

The principles for the planning of satellite-based data distribution should be as follows:

(a) A satellite-based distribution system should be a telecommunication technique complementing the point-to-point GTS circuits;

(b) RSMCs, RTHs and NMCs should have the capability to insert meteorological information (either directly or indirectly) into the regional/multi-regional satellite-based distribution system.

3.4.2 Data-collection systems via meteorological satellite

Data-collection systems and associated data retransmission systems, when available, operated via geostationary or near-polar orbiting meteorological satellites constitute an integral part of the GTS for the collection of observations. Basic meteorological data collected in this way normally requires validation by the National Meteorological Centre before it is disseminated on the GTS for general use. By agreement, data not subject to verification may be inserted onto the GTS via a nominated NMC.

Data-collection platforms (DCPs) shall be maintained by the DCP operators. Quality control of the output from these platforms is the responsibility of the operator and the nominated NMC.

Unless agreed upon otherwise, the meteorological satellite operator shall ensure the prompt transmission of the received DCP message to the NMC responsible for quality control and verification prior to its general dissemination on the GTS.

The data-collection platforms must operate in accordance with the parameters as defined by the meteorological satellite operator.

3.4.3 Data-distribution systems via meteorological satellites

Data-distribution systems operated via geostationary meteorological satellites constitute an integral part of the GTS for the point-to- multipoint transmission of observational data and processed information in character, binary, graphical and pictorial form, within the agreed WWW system.

The point-to-multipoint service to be provided by the meteorological satellite operator shall be subject to agreement between the NMCs concerned and the agencies participating in the programme. The NMC acting as data provider to the meteorological satellite operator whether they originate the data or not shall be responsible for relaying the input data.

The contents and schedules of transmission, as well as frequencies, orbital data and area coverage of meteorological satellites shall be provided by satellite operators.

NOTES: (1) The contents and schedules of transmission by meteorological satellites are published in WMO Publication No. 9, Volume C.

(2) Information on meteorological satellite programmes operated by Members and organizations is published in WMO Publication No. 411.

3.4.4 Point-to-multipoint and multipoint-to-point transmission via telecommunication satellites

Point-to-multipoint telecommunications service via satellite provided by telecommunication administrations/agencies may be used as an integral part of the GTS for the direct distribution to NMCs of observational data and processed information from WMCs, RSMCs and NMCs at the global, multi-regional or regional level.

Multipoint-to-point telecommunications service via satellite provided by telecommunication administrations/agencies may be used as an integral part of the GTS for the implementation of regional meteorological telecommunications networks, in accordance with the plans established by the regional associations.

3.5 HF-radio broadcasts of meteorological information

3.5.1 General

Until the integrated network, as defined in principle 2, is completed, HF-radio-broadcasts may be used in order to meet the requirements of the World Weather Watch for the dissemination of meteorological information.

(Previous sections 3.4.2 and 3.4.3 renumbered 3.5.2 and 3.5.3 respectively.)

B. Attachment I-2 and Attachment I-3, Figure 1

Add: (1) circuit between Bracknell and Moscow

C. Attachment I-3:

(a) Replace the title of figure 1 by the new one:

"figure 1: Plan for routeing observational data on the Main Telecommunication Network."

(b) Delete figure 2.

(c) Replace sub-paragraphs (a), (b), (c), (d), (e), and (f) of paragraph 2.2 of Attachment I-3 by following sub-paragraphs:

" (a) TEMP - Parts A, B, C and D
(b) PILOT - Parts A, B, C and D
(c) TEMP SHIP - Parts A, B, C and D
(d) PILOT SHIP - Parts A, B, C and D
(e) TEMP MOBIL - Parts A, B, C and D
(f) PILOT MOBIL - Parts A, B, C and D "

(d) Renumber old sub-paragraphs (e), (f), (g), (h), (i), (j), (k), (l), (m), and (n) of paragraph 2.2 respectively (g), (h), (i), (j), (k), (l), (m), (n), (o), and (p).

(e) Replace sub-paragraph (a) of paragraph 2.3 by following sub-paragraph:

" (a) TEMP, PILOT, TEMP SHIP, PILOT SHIP, TEMP MOBIL and PILOT MOBIL, as available."

(f) Insert new following paragraph 2.5 and renumber present paragraph 2.5 as paragraph 2.6:

"The transmission schedules on the circuits of the Main Telecommunication Network should include all the observational data described above from the various zones of responsibility of RTHs as given in Figure 1 of paragraph 1 of Attachment I-3. The exceptions to this principle should be notified by the recipient centre to the transmitting centre of the Main Telecommunication Network."

D. Attachment I-5

(a) Amend sub-paragraphs (a), (b) and (d) of paragraph 4.1 of Attachment I-5 as follows:

"(a) TEMP, TEMP SHIP, TEMP MOBIL, Parts A and B
(b) PILOT, PILOT SHIP, PILOT MOBIL, Parts A and B
...
(d) SHIP and AIREP/AMDAR (global exchange)"

(b) Replace table D by the new table attached.

TABLE D

Procedures for internationally
co-ordinated non-real-time monitoring

1. Monitoring periods

The internationally co-ordinated monitoring of data for global exchange will be carried out once a year in October with a view to checking periodically the efficiency of the operation of the WWW. Statistics should be compiled by manually operated and automated centres for the period 1-5 October and the period 1-15 October respectively. In order to facilitate the comparison of results between manually operated and automated centres, automated centres should also provide results for the two periods of 1-5 October and 1-15 October.

NOTE: As regards CLIMAT/CLIMAT TEMP, the monitoring period should be extended to fifteen days, even if (for other observations) a return for a period of only five days is made.

2. Types of data to be monitored

The types of data listed in the following table should be monitored:

Type of data	Abbreviated headings of bulletins $T_1T_2A_1A_2$	Reference format for presentation of results
SYNOP reports	SMA_1A_2	A
Part A and B of TEMP reports	USA_1A_2/UKA_1A_2	B_1/B_2
Part A and B of PILOT reports	UPA_1A_2/UGA_1A_2	B_1/B_2
SHIP reports	SMA_1A_2	C_1/C_2
Part A and B of TEMP SHIP reports	USA_1A_2/UKA_1A_2	$D_1/D_2/D_3/D_4$
Part A and B of PILOT SHIP reports	UPA_1A_2/UGA_1A_2	$D_5/D_6/D_7/D_8$
DRIFTER reports	SSA_1A_2	E
AIREP reports	UAA_1A_2	F
AMDAR reports	UDA_1A_2	G
BATHY/TESAC reports	SOA_1A_2	H
CLIMAT reports	CSA_1A_2	I_1
CLIMAT TEMP reports	CUA_1A_2	I_2

(a) Monitoring of SYNOP reports

For each station monitored identified by the station index number (IIiii), the number of SYNOP reports made at the main standard synoptic hours (00, 06, 12 and 18 UTC) available during the monitoring period within one hour, 2 hours and 6 hours of the standard bulletins times should be inserted in the appropriate columns of format A;

(b) Monitoring of part A and B of TEMP and PILOT reports

For each station monitored identified by the station index number (IIiii), the number of parts A and B of TEMP and PILOT reports made by tracking a free balloon by electronic or optical means at the main standard synoptic hours (00, 06, 12 and 18 UTC) available during the monitoring period within 2 hours and 12 hours of the standard bulletins times should be inserted in the appropriate columns of formats B_1 and B_2;

(c) Monitoring of SHIP reports

The number of bulletins identified by their abbreviated headings ($T_1T_2A_1A_2ii$ CCCC) including SHIP reports made at the main standard synoptic hours (00, 06, 12 and 18 UTC) available during the monitoring period within 2 hours and 12 hours of the standard bulletins times and the number of reports included in these bulletins should be inserted in the appropriate columns of formats C_1 and C_2;

(d) Monitoring of part A and B of TEMP SHIP and PILOT SHIP reports

The number of bulletins identified by their abbreviated headings ($T_1T_2A_1A_2ii$ CCCC) including part A and B of TEMP SHIP and PILOT SHIP reports made at the main synoptic hours (00, 06, 12 and 18 UTC) available during the monitoring period within 12 hours and 24 hours of the standard bulletins times and the number of reports included in these bulletins should be inserted in the appropriate columns of formats D_1 to D_2;

(e) Monitoring of DRIFTER, AIREP AND AMDAR reports

The number of bulletins identified by their abbreviated headings ($T_1T_2A_1A_2ii$ CCCC) including DRIFTER, AIREP and AMDAR reports compiled piled between 21 and 03 UTC, 03 and 09 UTC, 09 and 15 UTC and 15 and 21 UTC and available during the monitoring period respectively before 05, 11, 17 and 23 UTC as well as the number of reports included in these bulletins should be inserted in the appropriate columns of formats E, F, and G;

(f) Monitoring of BATHY/TESAC

The time of receipt of bulletins identified by their complete abbreviated headings ($T_1T_2A_1A_2ii$ CCCC YYGGgg (---)) containing BATHY/TESAC reports as well as the number of reports included in these bulletins should be inserted in the appropriate columns of format H;

(g) Monitoring of CLIMAT and CLIMAT TEMP reports

For each station monitored identified by the station index number (IIiii), "1" should be inserted in the appropriate column of format I_1 if the September CLIMAT report is received between 1st and 5th October or 6th and 15 October, otherwise "0" should be inserted in these columns. The same procedure should be applied for the September CLIMAT TEMP report in format I_2.

3. Global data set to be monitored

3.1 The global data set to be monitored is determined by:

(a) The lists of stations, the observations (SYNOP, TEMP, PILOT, CLIMAT and CLIMAT TEMP reports) of which have to be globally exchanged as included in the Manual on the GTS - Volume I - Attachment I-4;

(b) The list of abbreviated headings of bulletins containing SHIP, TEMP SHIP, PILOT SHIP, DRIFTER, AIREP and BATHY/TESAC which have to be globally exchanged according to the Catalogue of Meteorological Bulletins. For ease of reference, the Secretariat will compile these lists of abbreviated headings which will be attached to each relevant format for each monitoring.

3.2 The references of the lists mentioned (including the references of the relevant amendment to the Manual on the GTS and of the edition of the Catalogue of Meteorological Bulletins) are repeated in the formats prepared by the Secretariat for each monitoring.

4. Geographical area in which data should be monitored

GTS centres should monitor the global data set or part of it as follows:

(a) NMCs or centres with similar functions should at least monitor the availability of data from the zone for which they are responsible for the collection of these data and their insertion into the GTS;

(b) RTHs not located on the MTN should at least monitor the availability of observational data from their zone of responsiblility for collecting observational data as prescribed in Volume II of the Manual on the GTS. RTHs should also monitor the availability of observational data from the Region in which they are located and from any other Region to which they are linked by an inter-regional circuit;

(c) WMCs and RTHs located on the MTN should monitor the availability of the complete set of data for global exchange.

5. Implementation of monitoring procedures and questionnaires

5.1 Questionnaires related to the procedures implemented at the centres, suspension of observing programmes at observing stations and suspension of transmission on circuits are given respectively in Formats J, K and L.

5.2 Monitoring procedures should be implemented at centres in such a way that all replies to the questions included in Format J be positive (reply: Yes).

6. Standard format for statistics

6.1 With a view to enabling the easy comparison of results of internationally co-ordinated monitoring carried out by the different centres, the standard formats attached should be used. All centres carrying out monitoring should state clearly the period covered. In each format, centres should present the results region by region and for the Antarctic and give totals of the number of bulletins or reports received within the specified time region by region and for the Antarctic.

6.2 If the report or bulletin indicated in the first column is not scheduled to be received, N should be inserted in the second column of the format concerned, otherwise S should be inserted.

6.3 The statistics should be sent to the adjacent centres concerned and to the WMO Secretariat at the earliest possible date after the end of the monitoring period but not later than 15 November.

7. Role of the WMO Secretariat

The Secretariat will ensure that the Members are made aware of their respective responsibililities and will collect the statistical results of internationally co-ordinated monitoring from the Members concerned. The Secretariat will make a summary of the statistics and will evaluate the deficiencies and effectiveness of the operation of the WWW as a whole and some parts of it. In this connection, the Secretariat will check the observing programme of individual observing stations. The results of the monitoring will be available to the Executive Council and the CBS by correspondence or at sessions as appropriate. The Secretariat will take up the possibility of remedial action with Members concerned in order to eliminate shortcomings in the operation of the GOS and the GTS as quickly as possible.

8. Special types of non-real-time monitoring of the WWW

If necessary, monitoring of the WWW may be undertaken in different regions and also for various types of observational data. The purpose of such monitoring is to identify, in greater detail, the deficiencies in the collection and exchange of data in different parts of the GTS and the reason for these deficiencies. Special types of monitoring should be initiated by the Secretary-General or by some of the Members concerned. The dates and duration of such monitoring will have to be agreed upon with these Members.

*

*   *

FORMAT A

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING OBSERVATIONAL DATA - SYNOP

Monitoring centre: .... Monitoring period: ....

Station index number IIiii *	S/N **	Number of SYNOP reports received within the specified period after standard bulletin time														
		HH + 1 hour					HH + 2 hours					HH + 6 hours				
		00	06	12	18	Total	00	06	12	18	Total	00	06	12	18	Total

* Reference for the global exchange list: Manual on the GTS - Amendment .....
** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT B_1

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES CONCERNING OBSERVATIONAL DATA - TEMP AND PILOT (PART A)

Monitoring centre: ....   Monitoring period: ....

Station index number IIiii *	S/N **	Number of TEMP reports (part A) received within the specified period after standard bulletin time										Number of PILOT reports (part A) received within the specified period after standard bulletin time									
		HH + 2 hours					HH + 12 hours					HH + 2 hours					HH + 12 hours				
		00	06	12	18	Total	00	06	12	18	Total	00	06	12	18	Total	00	06	12	18	Total

* Reference for the global exchange list: Manual on the GTS - Amendment .....
** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT B_2

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING OBSERVATIONAL DATA - TEMP AND PILOT (PART B)

Monitoring centre: ....   Monitoring period: ....

Station index number IIiii *	S/N **	Number of TEMP reports (part B) received within the specified period after standard bulletin time										Number of PILOT reports (part B) received within the specified period after standard bulletin time									
		HH + 2 hours					HH + 12 hours					HH + 2 hours					HH + 12 hours				
		00	06	12	18	Total	00	06	12	18	Total	00	06	12	18	Total	00	06	12	18	Total

* Reference for the global exchange list: Manual on the GTS - Amendment .....
** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT C_1

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING OBSERVATIONAL DATA - SHIP

Monitoring centre: .... Monitoring period: ....

Abbreviated heading $T_1T_2A_1A_2ii$ CCCC *	S/N **	Number of SHIP bulletins and reports received within 2 hours of the standard bulletin time									
		00 UTC		06 UTC		12 UTC		18 UTC		Total	
		Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports

* See attached list of abbreviated headings of SHIP bulletins for global exchange as prepared by the WMO Secretariat for each monitoring (reference: Catalogue of Meteorological Bulletins - edition ....).

** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT C_2

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING OBSERVATIONAL DATA - SHIP

Monitoring centre: .... Monitoring period: ....

Abbreviated heading $T_1T_2A_1A_2ii$ CCCC *	S/N **	Number of SHIP bulletins and reports received within 12 hours of the standard bulletin time: 00 UTC		06 UTC		12 UTC		18 UTC		Total	
		Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports

* See attached list of abbreviated headings of SHIP bulletins for global exchange as prepared by the WMO Secretariat for each monitoring (reference: Catalogue of Meteorological Bulletins - edition ....).

** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT C_1 and C_2, APPENDIX

List of abbreviated headings of SHIP bulletins for global exchange

(Catalogue of Meteorological Bulletins edition ....)

The WMO Secretariat will include the list of abbreviated headings of SHIP bulletins for global exchange in the letter of invitation to participate in the monitoring.

FORMAT D_1

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING OBSERVATIONAL DATA - TEMP SHIP (PART A)

Monitoring centre: .... Monitoring period: ....

Abbreviated heading $T_1T_2A_1A_2ii$ CCCC *	S/N **	Number of TEMP SHIP bulletins and reports (part A) received within 12 hours of the standard bulletin time									
		00 UTC		06 UTC		12 UTC		18 UTC		Total	
		Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports

* See attached list of abbreviated headings of TEMP SHIP bulletins for global exchange as prepared by the WMO Secretariat for each monitoring (reference: Catalogue of Meteorological Bulletins - edition ....).

** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT D_2

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES CONCERNING OBSERVATIONAL DATA - TEMP SHIP (PART A)

Monitoring centre: .... Monitoring period: ....

Abbreviated heading $T_1T_2A_1A_2ii$ CCCC *	S/N **	Number of TEMP SHIP bulletins and reports received (part A) within 24 hours of the standard bulletin time									
		00 UTC		06 UTC		12 UTC		18 UTC		Total	
		Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports

* See attached list of abbreviated headings of TEMP SHIP bulletins for global exchange as prepared by the WMO Secretariat for each monitoring (reference: Catalogue of Meteorological Bulletins - edition ....).

** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT D_1 and D_2, APPENDIX

List of abbreviated headings of TEMP SHIP bulletins (Part A)
for global exchange

(Catalogue of Meteorological Bulletins edition ....)

The WMO Secretariat will include the list of abbreviated headings of TEMP SHIP bulletins (Part A) for global exchange in the letter of invitation to participate in the monitoring.

FORMAT D_3

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING OBSERVATIONAL DATA - TEMP SHIP (PART B)

Monitoring centre: .... Monitoring period: ....

Abbreviated heading $T_1T_2A_1A_2ii$ CCCC *	S/N **	Number of TEMP SHIP bulletins and reports (part B) received within 12 hours of the standard bulletin time									
		00 UTC		06 UTC		12 UTC		18 UTC		Total	
		Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports

* See attached list of abbreviated headings of TEMP SHIP (part B) bulletins for global exchange as prepared by the WMO Secretariat for each monitoring (reference: Catalogue of Meteorological Bulletins - edition ....).

** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT D_4

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING OBSERVATIONAL DATA - TEMP SHIP (PART B)

<u>Monitoring centre</u>: .... <u>Monitoring period</u>: ....

Abbreviated heading $T_1T_2A_1A_2ii$ CCCC *	S/N **	Number of TEMP SHIP bulletins and reports (part B) received within 24 hours of the standard bulletin time									
		00 UTC		06 UTC		12 UTC		18 UTC		Total	
		Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports

* See attached list of abbreviated headings of TEMP SHIP (part B) bulletins for global exchange as prepared by the WMO Secretariat for each monitoring (reference: Catalogue of Meteorological Bulletins - edition ....).

** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT D_3 and D_4, APPENDIX

List of abbreviated headings of TEMP SHIP bulletins (Part B)
for global exchange

(Catalogue of Meteorological Bulletins edition ....)

The WMO Secretariat will include the list of abbreviated headings of TEMP SHIP bulletins (Part B) for global exchange in the letter of invitation to participate in the monitoring.

FORMAT D_5

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING OBSERVATIONAL DATA - PILOT SHIP (PART A)

Monitoring centre: .... Monitoring period: ....

Abbreviated heading $T_1T_2A_1A_2ii$ CCCC *	S/N **	Number of PILOT SHIP bulletins and reports (part A) received within 12 hours of the standard bulletin time									
		00 UTC		06 UTC		12 UTC		18 UTC		Total	
		Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports

* See attached list of abbreviated headings of PILOT SHIP bulletins (part A) for global exchange as prepared by the WMO Secretariat for each monitoring (reference: Catalogue of Meteorological Bulletins - edition ....).

** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT D_6

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING OBSERVATIONAL DATA - PILOT SHIP (PART A)

Monitoring centre: .... Monitoring period: ....

Abbreviated heading $T_1T_2A_1A_2ii$ CCCC *	S/N **	Number of PILOT SHIP bulletins and reports (part A) received within 24 hours of the standard bulletin time									
		00 UTC		06 UTC		12 UTC		18 UTC		Total	
		Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports

* See attached list of abbreviated headings of PILOT SHIP bulletins for global exchange as prepared by the WMO Secretariat for each monitoring (reference: Catalogue of Meteorological Bulletins - edition ....).
** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT D_5 and D_6, APPENDIX

List of abbreviated headings of PILOT SHIP bulletins (Part A)
for global exchange

(Catalogue of Meteological Bulletins edition ....)

The WMO Secretariat will include the list of abbreviated headings of PILOT SHIP bulletins (Part A) for global exchange in the letter of invitation to participate in the monitoring.

FORMAT D_7

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING OBSERVATIONAL DATA - PILOT SHIP (PART B)

Monitoring centre: .... Monitoring period: ....

Abbreviated heading $T_1T_2A_1A_2ii$ CCCC *	S/N **	Number of PILOT SHIP bulletins and reports (part B) received within 12 hours of the standard bulletin time									
		00 UTC		06 UTC		12 UTC		18 UTC		Total	
		Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports

* See attached list of abbreviated headings of PILOT SHIP bulletins (part B) for global exchange as prepared by the WMO Secretariat for each monitoring (reference: Catalogue of Meteorological Bulletins - edition ....).

** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT D_8

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES CONCERNING OBSERVATIONAL DATA - PILOT SHIP (PART B)

<u>Monitoring centre</u>: .... <u>Monitoring period</u>: ....

Abbreviated heading $T_1T_2A_1A_2ii$ CCCC *	S/N **	Number of PILOT SHIP bulletins and reports (part B) received within 24 hours of the standard bulletin time									
		00 UTC		06 UTC		12 UTC		18 UTC		Total	
		Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports	Bulletins	Reports

* See attached list of abbreviated headings of PILOT SHIP (part B) bulletins for global exchange as prepared by the WMO Secretariat for each monitoring (reference: Catalogue of Meteorological Bulletins - edition ....).

** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT D_7 and D_8, APPENDIX

List of abbreviated headings of PILOT SHIP bulletins (Part B) for global exchange

(Catalogue of Meteorological Bulletins edition ....)

The WMO Secretariat will include the list of abbreviated headings of PILOT SHIP bulletins (Part B) for global exchange in the letter of invitation to participate in the monitoring.

FORMAT E

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING OBSERVATIONAL DATA - DRIFTER

Monitoring centre: ....   Monitoring period: ....

Abbreviated heading $T_1T_2A_1A_2ii$ CCCC **	S/N ***	Bulletins compiled between 21* and 03* UTC and received before 05 UTC		Bulletins compiled between 03* and 09* UTC and received before 11 UTC		Bulletins compiled between 09* and 15* UTC and received before 17 UTC		Bulletins compiled between 15* and 21* UTC and received before 23 UTC		Total	
		Number of bulletins	Number of reports	Number of bulletins	Number of reports	Number of bulletins	Number of reports	Number of bulletins	Number of reports	Number of bulletins	Number of reports

* Hour of compilation = GGgg included in the abbreviated heading.

** See attached list of abbreviated headings of DRIFTER bulletins for global exchange as prepared by the WMO Secretariat for each monitoring (reference: Catalogue of Meteorological Bulletins - edition ....).

*** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT E, APPENDIX

List of abbreviated headings of DRIFTER bulletins for global exchange

(Catalogue of Meteorological Bulletins edition ....)

The WMO Secretariat will include the list of abbreviated headings of DRIFTER bulletins for global exchange in the letter of invitation to participate in the monitoring.

FORMAT F

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING OBSERVATIONAL DATA - AIREP

Monitoring centre: .... Monitoring period: ....

Abbreviated heading $T_1T_2A_1A_2ii$ CCCC **	S/N ***	Bulletins compiled between 21* and 03* UTC and received before 05 UTC		Bulletins compiled between 03* and 09* UTC and received before 11 UTC		Bulletins compiled between 09* and 15* UTC and received before 17 UTC		Bulletins compiled between 15* and 21* UTC and received before 23 UTC		Total	
		Number of bulletins	Number of reports	Number of bulletins	Number of reports	Number of bulletins	Number of reports	Number of bulletins	Number of reports	Number of bulletins	Number of reports

* Hour of compilation = GGgg included in the abbreviated heading.

** See attached list of abbreviated headings of AIREP bulletins for global exchange as prepared by the WMO Secretariat for each monitoring (reference: Catalogue of Meteorological Bulletins - edition ....).

*** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT F, APPENDIX

List of abbreviated headings of AIREP bulletins for global exchange

(Catalogue of Meteorological Bulletins edition ....)

The WMO Secretariat will include the list of abbreviated headings of AIREP bulletins for global exchange in the letter of invitation to participate in the monitoring.

FORMAT G

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING OBSERVATIONAL DATA - AMDAR

Monitoring centre: .... Monitoring period: ....

Abbreviated heading $T_1T_2A_1A_2ii$ CCCC **	S/N ***	Bulletins compiled between 21* and 03* UTC and received before 05 UTC		Bulletins compiled between 03* and 09* UTC and received before 11 UTC		Bulletins compiled between 09* and 15* UTC and received before 17 UTC		Bulletins compiled between 15* and 21* UTC and received before 23 UTC		Total	
		Number of bulletins	Number of reports	Number of bulletins	Number of reports	Number of bulletins	Number of reports	Number of bulletins	Number of reports	Number of bulletins	Number of reports

* Hour of compilation = GGgg included in the abbreviated heading.
** See attached list of abbreviated headings of AMDAR bulletins for global exchange as prepared by the WMO Secretariat for each monitoring (reference: Catalogue of Meteorological Bulletins - edition ....).
*** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT G, APPENDIX

List of abbreviated headings of AMDAR bulletins for global exchange

(Catalogue of Meteorological Bulletins edition ....)

The WMO Secretariat will include the list of abbreviated headings
of AMDAR bulletins for global exchange
in the letter of invitation to participate in the monitoring.

FORMAT H

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING OBSERVATIONAL DATA - BATHY/TESAC

Monitoring centre: .... Monitoring period: ....

BATHY/TESAC				BATHY/TESAC			
Abbreviated heading $T_1T_2A_1A_2ii$ CCCC YYGGgg(BBB) *	S/N **	Date/Time of receipt	Number of reports	Abbreviated heading $T_1T_2A_1A_2ii$ CCCC YYGGgg(BBB) *	S/N **	Date/Time of receipt	Number of reports

** See attached list of abbreviated headings of BATHY/TESAC bulletins for global exchange as prepared by the WMO Secretariat for each monitoring (reference: Catalogue of Meteorological Bulletins - edition ....).

*** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT H, APPENDIX

List of abbreviated headings of BATHY/TESAC bulletins
for global exchange

(Catalogue of Meteorological Bulletins edition ....)

The WMO Secretariat will include the list of abbreviated headings
of BATHY/TESAC bulletins for global exchange
in the letter of invitation to participate in the monitoring.

FORMAT I_1

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING CLIMAT

Monitoring centre: .... Monitoring period: ....

CLIMAT				CLIMAT			
Station Index number IIiii *	S/N **	received from 1st to 5th October	received from 6th to 15th October	Station index number IIiii *	S/N **	received from 1st to 5th October	received from 6th to 15 October

* Reference for the global exchange list: Manual on the GTS - Amendment .....
** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT I2

STATISTICS ON GLOBAL EXCHANGE DATA RECEIVED AT CENTRES
CONCERNING CLIMAT TEMP

Monitoring centre: ....   Monitoring period: ....

CLIMAT TEMP				CLIMAT TEMP			
Station Index number IIiii *	S/N **	received from 1st to 5th October	received from 6th to 15th October	Station index number IIiii *	S/N **	received from 1st to 5th October	received from 6th to 15 October

* Reference for the global exchange list: Manual on the GTS - Amendment .....
** S = if data are scheduled to be received; N = if data are not scheduled to be received.

FORMAT J

QUESTIONNAIRE RELATED TO THE IMPLEMENTATION OF PROCEDURES AT CENTRES FOR THE MONITORING

Monitoring centre: ....   Monitoring period: ....

Questions	Is the monitoring automated?	Is the counting of bulletins & reports performed before quality control?	Are bulletins & reports counted only if received or transmitted on the GTS channels?	Are duplicated bulletins disregarded?	Are bulletins including only NIL reports counted?	Are bulletins including COR or CCx counted in addition to bulletins to be corrected?	Are duplicated reports included in bulletins having the same abbreviated heading disregarded?	Are duplicated reports included in bulletins having different abbreviated heading disregarded?	Are NIL reports disregarded?	Are reports included in bulletins including the indicator COR or CCx disregarded in addition to reports to be corrected?	Are all AIREP/ASDAR reports made at different positions during the flight counted as different reports?
Reply Yes or No											

Comments or remarks:

FORMAT K

SUSPENSION OF OBSERVING PROGRAMMES AT OBSERVING STATIONS

Monitoring centre: ____________________

Station index number (IIiii)	Details of suspension and reasons	Number of reports (SYNOP, TEMP or PILOT) not made for each observation time					
		Type of report	00	06	12	18	UTC

Example of entry:

Station index number (IIiii)	Details of suspension and reasons	Number of reports (SYNOP, TEMP or PILOT) not made for each observation time					
		Type of report	00	06	12	18	UTC
IIiii	Delayed delivery of balloons	TEMP	2		1		
IIiii	Delayed delivery of caustic soda	PILOT	5	5	5	4	
	Lack of manpower	SYNOP	7	7	7	7	

FORMAT L

SUSPENSION OF TRANSMISSION ON CIRCUITS

Monitoring centre: ____________________

Circuit between - - - - - - - and - - - - - - -	Duration of suspension	Remarks

Example of entry:

Circuit between - - - - - - - and - - - - - - -	Duration of suspension	Remarks
A) IIiii - NMC	48 hrs. from 0645 UTC, 2 Oct.	failure of transmitter
B) NMC - NMC (NMC - RTH) (RTH - RTH)	15 hrs. from 0900 UTC, 3 Oct.	poor HF propagation

NOTE: In cases where reasons of suspension are known, details should be given in column "Remarks".

Rec. 7 (CBS-Ext.(90) - AMENDMENTS TO THE MANUAL ON THE GLOBAL TELECOMMUNICATION SYSTEM - VOLUME I - GLOBAL ASPECTS, PART II - OPERATIONAL PROCEDURES FOR THE GLOBAL TELECOMMUNICATION SYSTEM

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 2 (Cg-X) - World Weather Watch Programme for 1988-1991,

(2) The World Weather Watch Programme for 1988-1997 (WMO Publication No. 691),

RECOMMENDS the adoption of the amendments to the Manual on the Global Telecommunication System - Volume I - Global Aspects, PART II - Operational Procedures for the Global Telecommunication System, given in the annex to this recommendation, with effect from 1 November 1991;

REQUESTS the Secretary-General to make appropriate amendments as given in the annex to this recommendation to the Manual on the Global Telecommunication System - Volume I - Global Aspects, PART II - Opererational Procedures for the Global Telecommunication System;

AUTHORIZES the president, in consultation with the Secretary-General, to make any consequent purely editorial amendments as regards Volume I of the Manual on the Global Telecommunication System.

Annex to Recommendation 7 (CBS-Ext.(90))

AMENDMENTS TO THE MANUAL ON THE GLOBAL TELECOMMUNICATION SYSTEM - VOLUME I - GLOBAL ASPECTS PART II - OPERATIONAL PROCEDURES FOR THE GLOBAL TELECOMMUNICATION SYSTEM

A. Amendments relating to the deletion of the groups CLLLL and CFFFF

1. In sub-paragraph (a) of paragraph 2.3.1.1, delete "(→CLLLL)" and note.

2. In sub-paragraph (b) of paragraph 2.3.1.1, delete "$\begin{smallmatrix}\boxed{S}\\\boxed{P}\end{smallmatrix}$ CLLLL".

3. Delete end of the paragraph 2.3.1.2 from: "CLLLL - classification and identification ......" to the end of the note.

4. In paragraph 2.4.2.1, delete "(→↑$CL_1L_2L_3L_4$).

5. In paragraph 2.4.2.2, delete "$\begin{smallmatrix}\boxed{S}\\\boxed{P}\end{smallmatrix}$ $CL_1L_2L_3L_4$".

6. Replace paragraph 2.4.2.3 by the new one:

   2.4.2.3 Specifications of $TTAAL_1L_2$ and CCCC in the abbreviated heading of addressed messages (Alphabets No. 2 and No. 5)

TT - Service messages: BB
Request-for-repetition messages: RR
Administrative messages: AA
Data messages: MM

AA - Geographical designator of the addressed centre, as included in Table C1 of Attachment II-6.

L_1L_2 - Denotes the addressed centre using the same figures allocated in the Catalogue of Meteorological Bulletins.

CCCC - International four-letter location indicator of station originating the message.

7. Delete paragraph 2.4.2.4.

8. Delete paragraph 2.5.3.2 and renumber the following paragraphs accordingly.

9. Replace the end of paragraph 2.5.5.2 "but using CFFFF as the identifier" by "using the abbreviated heading as the identifier".

10. Delete sub-paragraphs (a), (b) and (c) of paragraph 3.1.

11. Attachment II-4:

(i) Paragraph 1(a): delete "→19805" from starting line;

(ii) Paragraph 1(b): delete "SP 19805" from starting line;

(iii) Paragraph 2(a): delete "→14800" from starting line;

(iv) Paragraph 2(b): delete "SP 14800" from starting line;

(v) Paragraph 3(a): delete "→39405" from starting line;

(vi) Paragraph 3(b): delete "SP 39405" from starting line;

(vii) Paragraph 4(a): delete "17200" from first line of Example;

(viii) Paragraph 4(b): delete "18700" from first line of Example.

12. Delete Attachment II-5 and II-9.

13. Renumber previous Attachment II-6, II-7, II-8, II-10, II-11, II-12, II-13, II-14 and II-15 as II-5, II-6, II-7, II-8, II-9, II-10, II-11, II-12 and II-13 respectively.

14. In new Attachment II-5, delete column CL_3 in Table B.

15. New Attachment II-6:

(i) Delete paragraph 1.(b);

(ii) Renumber paragraph 1.(c) as 1.(b);

(iii) Delete paragraph 2.(b);

(iv) Renumber paragraph 2.(c) as 2.(b);

(v) Paragraph 3: delete "→07510" from first line of example.

16. New Attachment II-9:

(i) Paragraph I.2: delete "SP CLLLL" from third line;

(ii) Paragraph I.6: delete "SP 99999" from first line example;

(iii) Paragraph II.2.4: delete "SP CFFFF" from third line and line "CFFF equals 99999, ... format;";

(iv) Paragraph II.2.5: delete "SP $CL_1L_2L_3L_4$" from third line.

(v) Paragraph II.2.5(a): delete "and CL_3 = 04" from second line.

B. <u>Amendments relating to new Attachment II-5</u>

1. Replace Tables A, B2, C3, C5 and D by new Tables A, B2, C3, C5 and D.

2. Insert in Table B1:

Data type	Code form (name)	$M_iM_iM_jM_j$	T_1T_2
Oceanographic data	FM 65-IX (WAVEOB)	MMXX	SO
Upper-wind reports	FM 34-IX (PILOT MOBIL)	) EEAA, EEBB) EEAA, EEDD	)UP (Part A))UG (Part B))UM (Part C))UQ (Part D)
Upper level pressure, temperature, humidity and wind	FM 38-IX (TEMP MOBIL)	) IIAA, IIBB) IICC, IIDD	)US (Part A))UK (Part B))UL (Part C))UE (Part D)
Aircraft reports	FM 42-IX (AMDAR)		UD
Satellite data T_1 = T	FM 86-VIII EXT (SATEM)	) VVAA VVBB) VVCC VVDD	TT
	FM 87-VII EXT (SARAD)	) WWXX	TR
	FM 88-VI EXT (SATOB)	) YYXX	TX
Satellite analyses	FM 85-IX (SAREP)	) CCAA CCBB) DDAA DDBB	AT
Data related to nuclear accident			WN

3. Add new Tables B3, B4, B5, D1 and E1.

TABLE A

Data designators $T_1T_2A_1A_2ii$

T_1	Data type	Priority	Length limit in characters or octets (1)	T_2	A_1	A_2	ii
A	Analyses	3	3800	Table B1	Table C1		Para 2.3.2.2
	Administrative messages	4	3800	A	Table C1		L_1L_2
B	Service messages	1	3800	B	Table C1		L_1L_2
C	Climatic data	4	3800	Table B1	Table C1		Para 2.3.2.2
D	Grid-point information (GRID)	3	3800	Table B2	Table C3	Table C4	Table D
E	Satellite imagery data	3	(2)	Table B5	(2)	(2)	(2)
F	Forecasts	3	3800	Table B1	Table C1		(2)
G	Grid-point information (GRID)	3	3800	Table B2	Table C3	Table C4	Table D
H	Binary grid-point information (GRID)	3	15.000	Table B2	Table C3	Table C4	Table D
I	Binary observational data (BUFR)	2	15.000	Table B3	Table E1	Table C3	Para 2.3.2.2
J	Binary forecast data (BUFR)	3	15.000	Table B3	Table E1	Table C3	Para 2.3.2.2
K	-		-				
L	-		-				
M	Data messages	2	3800	M	Table C1		L_1L_2
N	METNO/WIFMA	4	3800	O	Table C1		Para 2.3.2.2
O	Oceanographic products (GRIB)	3	15.000	Table B4	Table C3	Table C4	Table D1
P	Pictorial information	3	(2)	Table B2	Table C3	Table C4	Table D
Q	Pictorial information for regional use	3	(2)	Table B2	Table C3	Table C5	Table D
R	Request for repetition	2	3800	R	Table C1		L_1L_2
S	Surface data	2/4 (3)		Table B1	Table C1/C2		Para 2.3.2.2
T	Alphanumerical satellite data	2	3800	Table B1	Table C3	Table C4	Table 2.3.2.2
U	Upper-air data	2	3800	Table B1	Table C1/C2		Para 2.3.2.2
V	National data	(4)	3800	(5)	Table C1		Para 2.3.2.2
W	Warnings	1	3800	Table B1	Table C1		Para 2.3.2.2
X	GRID for regional use	3	3800	Table B2	Table C3	Table C5	Table D
Y	GRIB for regional use	3	15.000	Table B2	Table C3	Table C5	Table D
Z	-		-				

(1) The limit of length of binary-oriented code bulletins should be 15.000 octets.
(2) To be defined later.
(3) Level 4 is allocated to seismologic data (T_1T_2 = SE).
(4) Priority levels to be determined by national authorities for use on their national meteorological telecommunication network only.
(5) Table B2 or national table.

TABLE B2

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

Instructions for the proper application of the data type designators

1. The designators 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 data type is contained in the text, the designators for only 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 used.

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

TABLE C3

Geographical area designator

Instructions for the proper application of the geographical area designators

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

2. Where the geographical area of the data does not correspond exactly with the designator, the designator for the area most closely approximating that of the data may be used.

3. When the table does not contain a suitable designator for the geographical area, an alphabetic designator which is not assigned in the table should be used and the WMO Secretariat notified.

Designator	Geographical area
A	0° = 90°W northern hemisphere
B	90°W = 180° northern hemisphere
C	180° = 90°E northern hemisphere
D	90°E = 0° northern hemisphere
E	0° = 90°W tropical belt
F	90°W = 180° tropical belt
G	180° = 90°E tropical belt
H	90°E = 0° tropical belt
I	0° = 90°W southern hemisphere
J	90°W = 180° southern hemisphere
K	180° = 90°E southern hemisphere
L	90°E = 0° southern hemisphere
M...U	National designation for regional and global dissemination (*)
V	for national purpose
W...Z	Not assigned

TABLE C5

Reference time designator A_2
(when T_1 = X, Y or Q)

Designator	Reference
A	Analysis (00 hour)
B	3 hours forecast
C	6 hours forecast
D	9 hours forecast
E	12 hours forecast
F	15 hours forecast
G	18 hours forecast
H	21 hours forecast
I	24 hours forecast
J	27 hours forecast
K	30 hours forecast
L	33 hours forecast
M	36 hours forecast
N	39 hours forecast
O	42 hours forecast
P	45 hours forecast
Q	48 hours forecast

* Allocations of designations M to U should be notified to WMO Secretariat which will include the relevant information in WMO Publication No. 9 - Volume C.

TABLE D

Level designator ii
(when T_1 = D, G, H, P, Q, X or Y)

Instructions for the proper application of the level designators

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

2. When data at more than one level are contained in the text, the designator for only one of the levels should be used.

3. When the table does not contain a suitable designator for the level, a designator which is not assigned in the table should be used.

Level	Designator
00 =	surface
01 = 19	pressure levels at 50 hPa intervals from 1000 hPa to 100 hPa
20 = 29	remaining standard levels above 100 hPa
30 = 39	could be used for trops, max winds, etc.
40 = 59	spare (e.g. for use for mesoscale model levels)
60 = 79	for regional use
80 = 99	for national use

TABLE B3

Data type designator T_2
(when T_1 = I or J)

Instructions for the proper application of the data type designators

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

2. Where more than one data type is contained in the bulletin, the designators for only 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
S	Surface/sea level
U	Upper air
O	Oceanographic/limnographic (water properties)
P	Pictorial
T	Text (plain language information)
X	Other data types
Z	Mixed data types

TABLE B4

Data type designator T_2
(when T_1 = O)

Instructions for the proper application of the data type designators

1. The designators specified in this table should be used to the greatest extent possible to indicate the type of data contained within the body of the BUFR bulletin for oceanographic products.

2. Where more than one data type is contained in the bulletin, the designators for only 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
D	Depth
E	Ice concentration
F	Ice thickness
G	Ice drift
H	Ice growth
I	Ice convergence/divergence
Q	Temperature anomaly
R	Depth anomaly
S	Salinity
T	Temperature
U	Current component
V	Current component
W	Temperature warming
X	Mixed data

TABLE B5

Data type designator T_2
(when T_1 = E)

Designator	Data type
C	Cloud top temperature
F	Fog
I	Infra-red
S	Surface temperature
V	Visible
W	Water vapour
Y	User specified
Z	Unspecified

TABLE D1

Level designator ii
(when T_1 = O)

Instructions for the proper application of level designators for ocean depths

The designators specified in this table should be used to the greatest extent possible to indicate the levels below the ocean surface in the body of the GRIB bulletin for oceanographic products.

Designator	Depth (in metres)
98	Surface
96	2.5
94	5.0
92	7.5
90	12.5
88	17.5
86	25.0
84	32.5
82	40.0
80	50.0
78	62.5
76	75.0
74	100
72	125
70	150
68	200
66	300
64	400
62	500
60	600
58	700
56	800
54	900
52	1000
50	1100
48	1200
46	1300
44	1400
42	1500
40	1750
38	2000
36	2500
34	3000
32	4000
30	5000
01	Primary layer depth

TABLE E1

Data type designator A_1

Instructions for the proper application of the data type designators

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

2. Where more than one data type is contained in the bulletin, the designators for only 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.

when T_1 = I

(OBSERVATIONAL DATA)

and T_2 = S SURFACE

Designator	Data type
A	Land based hourly reports
C	Climatic reports
I	Land intermediate synoptic reports
M	Land based main synoptic reports
N	Asynoptic intermediate reports
P	Land based hourly specials
S	Floating platform (ship, buoy, etc.)
R	Hydrologic reports
X	Other surface data
Z	Bulletins with mixed data type reports

and T_2 = U UPPER AIR

Designator	Data type
A	Single level aircraft reports
B	Single level balloon reports
C	Single level satellite derived reports
D	Dropsondes/dropwindsondes
N	Rocketsondes
P	Profilers
S	Radiosondes/pibals reports
T	Satellite derived sondes
X	Other upper air reports
Z	Mixed upper air data type reports
R	Radiance data

TABLE E1 (contd.)

Data type designator A_1

when T_1 = I

(OBSERVATIONAL DATA)

T_2 = T TEXT

Designator	Data type
A	Administrative messages
B	Service messages
R	Request for data (inclusive of type)
X	Other text messages or information
Z	Mixed text types

T_2 = P PICTORIAL

Designator	Data type
I	Satellite imagery data
R	Radar reports
X	Not defined
Z	Mixed data types

when T_1 = I or J

(OBSERVATIONAL DATA/FORECAST PRODUCTS)

and T_2 = O OCEANOGRAPHIC/LIMNOGRAPHIC

Designator	Data type
I	Sea ice
S	Sea surface and below soundings
T	Sea surface temperature
W	Sea surface waves
X	Other sea environmental
Z	Mixed collection of oceanographic types

when T_1 = J

(FORECAST PRODUCTS)

and T_2 = S SURFACE/SEA LEVEL

Designator	Data type
A	Surface area forecast (e.g. airways)
M	Surface foreasts (e.g. MDS)
P	Forecast amendments (airways)
R	Hydrologic forecasts
S	Forecast amendments (TAF)
T	Aerodrome forecasts (TAF)
X	Other surface forecasts
Z	Mixed collection of forecasts

TABLE E1 (contd.)

Data type designator A_1
when T_1 = J

(FORECAST PRODUCTS)

and T_2 = U UPPER AIR

Designator	Data type
A	Forecast at single levels
S	Forecast soundings
X	Other upper air forecasts
Z	Mixed collection of forecasts

T_2 = T TEXT WARNINGS/NOTICES

Designator	Data type
E	Tsunami
H	Hurricane, Typhoon, Tropical storm warnings
S	Severe weather, SIGMET
T	Tornado warnings
X	Other warnings
Z	Mixed collection of warnings

C. <u>Amendments relating to the paragraph 2.12.3.3 and new attachment II-9</u>

1. Amend paragraph 2.12.3.3 as follows:

"2.12.3.3 Network layer (CCITT Recommendation X.25, packet level, sections 3, 4, 5.1 to 5.5/OSI layer 3)

The packet level of CCITT Recommendation X.25 shall be used in accordance with procedures for permanent virtual circuit (PVC) and virtual call (VC) services.

The maximum length of the user data field shall be 256 octets or optionally 128 octets.

Window size W:$2 \leq W \leq 7$ depending on type of communication circuit and system equipment.

One more logical channels (PVC and/or VC) should be established between two adjacent centres.

NOTE: One or more PVC and/or VC could be used between non-adjacent centres by multi-lateral agreement."

2. In Part II, new Attachment II-9, Table A:

(a) In column S_1, delete the text referring to the value 3;

(b) Replace the text of the note by:

NOTE: Procedures for transmission of coded digital fax according to the CCITT group 4 standards are for further study.

D. Miscellaneous amendments

1. Replace paragraph 3.1 by new paragraph 3.1.

"3.1 Format of meteorological information in pictorial form.

The details which should appear in the panel for identification of pictorial information (to be placed in the lower left-hand corner of the chart and also, if possible, in the upper right-hand corner) are determined nationally. They should be easy to identify, read and understand and should therefore include at least the abbreviated heading of the pictorial information."

2. Replace paragraph 2.7.1 by new paragraph 2.7.1.

2.7.1 The length of messages should never exceed following limits but, where practicable and convenient, should preferably be as close as possible to these limits. These limits are (see also Table A of new Attachment II-5):

(a) 3800 characters for messages in character-oriented code forms;

(b) 15 000 octets for messages in bit-oriented code forms.

3. Amend paragraph 2.11 as follows:

" 2.11.1 Priorities for store-and-forward data transmission

2.11.1.1 (content of previous paragraph 2.11.1)
2.11.1.2 (content of previous paragraph 2.11.2)
2.11.1.3 (content of previous paragraph 2.11.3)

2.11.2 Detection and cancellation of duplicated messages

Duplicated messages received at least within three hours after the original message should be detected and eliminated where cost effective and operationally necessary."

4. Amend paragraph 2.3.2.2 - description of time group GGgg - as follows:

"GGgg - For bulletins containing meteorological reports intended for standard times of observation, the time shall be the standard time of observation in UTC.

- For aerodrome, route and area (aeronautical) forecasts; the full hour in UTC (the last two digits shall be 00) preceding the transmission time; for other forecasts and analyses: standard time of observation in UTC on which forecast or analysis is based.

- For other messages the time shall be the time of compilation in UTC."

5. Amend paragraph 2.3.2.2 - description of ii - as follows:

"ii - When used to differentiate two or more bulletins which contain data in the same code and which originate from the same geographical area and have the same originating centre, it shall be a number with two digits.

The following sets of ii numbers shall be used for indicating the bulletins for global, interregional, regional and national distribution.

ii = 01-19 inclusive for global distribution;
ii = 20-39 inclusive for regional and interregional distribution;
ii = 40-89 inclusive for national and bilaterally agreed distribution;
ii = 90-99 reserved.

In the case of bulletins containing observational data and climatic data (surface and upper-air) from land stations, one ii number shall be allocated to one bulletin containing a fixed list of stations. This list may be different at different hours, provided it is known, and that it is given in the Catalogue of Meteorological Bulletins.

In the case of bulletins containing ships' weather reports and aircraft reports, the number ii should be used for facilitating the selective distribution of ships' weather reports and aircraft reports (surface and upper-air). Whenever practicable, a fixed number of ii should be allocated to the bulletins for those reports which are collected from a certain area within each Region (e.g. southern Indian Ocean in Region I, southern Atlantic in Region III, etc.), and separate bulletins should be prepared for northern and southern hemispheres, respectively.

Special provisions apply to the use of ii in respect of bulletins containing satellite data, processed information, and pictorial information in digital form (see Tables A and D2 of new Attachment II-5).

The use of ii is mandatory in both International Telegraph Alphabet No. 2 and International Alphabet No. 5 for all bulletins using the data designators.

All information concerning the number ii and the contents of bulletins shall be published in the Catalogue of Meteorological Bulletins.

NOTE: The Catalogue of Meteorological Bulletins is given in WMO Publication No. 9, Volume C."

6. Insert the following paragraph between paragraphs 2.3.3.2.4 and 2.3.3.2.5, and renumber accordingly the paragraphs 2.3.3.2.5 to 2.3.3.2.8:

"2.3.3.2.5 AMDAR and AIREP reports shall correspond to the information relating to each single point of observation during a flight."

Rec. 8 (CBS-Ext.(90) - AMENDMENTS TO THE MANUAL ON THE GLOBAL TELECOMMUNICATION SYSTEM - VOLUME I - GLOBAL ASPECTS, PART III - TECHNICAL CHARACTERISTICS AND SPECIFICATIONS OF THE GLOBAL TELECOMMUNICATION SYSTEM

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 2 (Cg-X) - World Weather Watch Programme for 1988-1991,

(2) The World Weather Watch Programme for 1988-1997 (WMO Publication No. 691),

RECOMMENDS the adoption of the amendments to the Manual on the Global Telecommunication System - Volume I - Global Aspects, PART III - Technical characteristics and specifications for the Global Telecommunication System, given in the annex to this recommendation with effect from 1 November 1991;

REQUESTS the Secretary-General to make appropriate amendments as given in the annex to this recommendation to the Manual on the Global Telecommunication System - Volume I - Global Aspects, PART III - Technical characteristics and specifications for the Global Telecommunication System;

AUTHORIZES the president, in consultation with the Secretary-General, to make any consequent purely editorial amendments as regards Volume I of the Manual on the Global Telecommunication System.

Annex to Recommendation 8 (CBS-Ext.(90))

AMENDMENTS TO THE MANUAL ON THE GLOBAL TELECOMMUNICATION SYSTEM - VOLUME I - GLOBAL ASPECTS PART III - TECHNICAL CHARACTERISTICS AND SPECIFICATIONS FOR THE GLOBAL TELECOMMUNICATION SYSTEM

Replace the text of paragraph 8.1.3 by the following:

> "The CCITT group 4 (G4) standards (recommendation T.6) may be used as required."

Rec. 9 (CBS-Ext.(90)) - AMENDMENTS TO THE MANUAL ON THE GDPS, PART II - ATTACHMENT 4

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) The abridged final report of CBS-IX, general summary, paragraph 6.4.56,

(2) The report of the seventh session of the CBS Working Group on the GDPS, general summary, paragraph 9.2,

(3) The report of the first session of the CBS Working Group on Data Management, general summary, paragraph 8.5,

(4) The Manual on the GDPS, Part II - Attachment 4,

CONSIDERING:

(1) That there is a need to update the Manual on the Glob Data-processing System arising from the adoption of Recommendation (CBS-Ext.(85)) and Recommendation 15 (CBS-87) in respect of station level pressure and present and past weather reported from both manned and automati stations,

(2) That there is a need to include in the Manual on the Glo Data-processing System, updated standard procedures for plotting sur information,

RECOMMENDS that the amendments to the Manual on the Glob Data-processing System, Part II - Attachment 4, given in the annex to th recommendation, be adopted for inclusion in the Manual on the GDPS, for use with effect from 1 July 1991;

REQUESTS the Secretary-General to make appropriate changes, as given in the annex to this recommendation, in the Manual on the Global Data-processing System;

AUTHORIZES the president of CBS, in consultation with the Secretary-General, to make any consequent purely editorial amendments as regards the Manual on the Global Data-processing System.

Annex to Recommendation 9 (CBS-Ext.(90))

ATTACHMENT II-4

First page to be replaced by:

GRAPHICAL REPRESENTATION OF DATA, ANALYSES AND FORECASTS

1. THE SURFACE PLOTTING MODEL

If it is required to plot the elements shown in the model, they should be placed in the relative positions shown. Any of the elements may be omitted.

T_gT_g	$T_xT_xT_x$ or $T_nT_nT_n$	C_H	E or E'sss	
	TTT	C_M	$PPPP/P_oP_oP_oP_o$ or $a_3hhh/P_oP_oP_oP_o$	
VV	ww/W_1W_1 or w_aw_a/W_1W_1	N	PPP	a
	$T_dT_dT_d$	C_LN_h h or hh	W_1W_2/W_1W_1 or $W_{a1}W_{a2}/W_1W_1$	GG or GG_{gg}
	$T_wT_wT_w$	$P_{wa}P_{wa}H_{wa}H_{wa}$ or $P_wP_wH_wH_w$	RRR/t_R D_sv_s	

$d_{w1}d_{w1}P_{w1}P_{w1}H_{w1}H_{w1}$
$d_{w2}d_{w2}P_{w2}P_{w2}H_{w2}H_{w2}$

he "boxes" are included in the diagram simply to fix the relative positions : the elements and are not included in the actual plot. The wind plot is not nown in the model. SHIP identification letters or buoy identifiers should be plotted above the model. In the case of automatic weather stations, an equilateral triangle should be plotted round the station circle so that the apex of the triangle (△) points towards the position of the medium cloud symbol.

2. GRAPHIC REPRESENTATION OF DATA ON WEATHER CHARTS

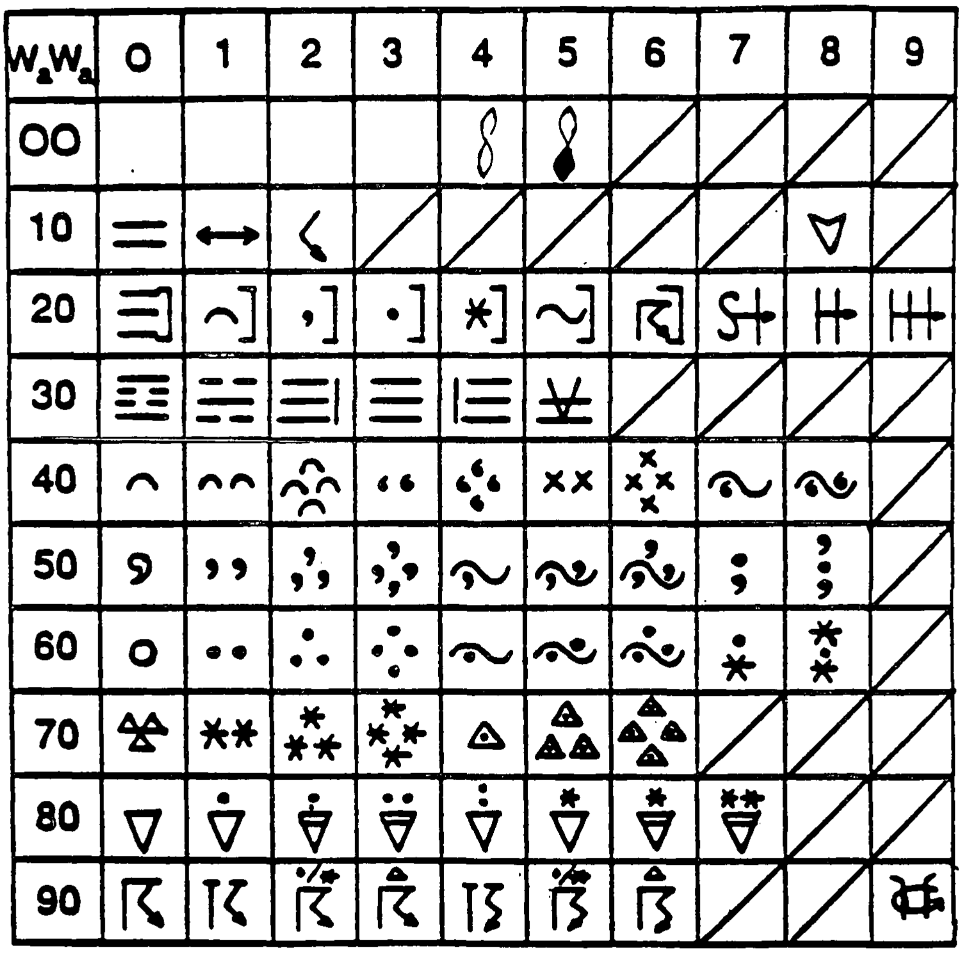
2.1 Amend specification of ww to read:

ww Present weather reported from a manned weather station. (See Note 1)

Add after Note 2 to ww new specification for w_aw_a as follows:

w_aw_a Present weather reported from an automatic weather station. (See Note 2)

The symbols for the appropriate code figures are given in the following table:



The symbols 30, 50 , 60 and 70 represent the generic form of weather phenomena and may be plotted in an enlarged form.

The symbol can specify any form of precipitation, specifies rain or drizzle, X specifies solid precipitation.

The symbols in row 80 represent intermittent precipitation, including showers.

NOTES: (1) The meaning of the code figures for present weather reported from an automatic station are given in Code 4680 in the Manual on Codes (Publication No. 306) (Annex II to the Technical Regulations).

(2) When present weather and past weather are not included because:

(a) They are not significant (i_x = 5), the squares for w_aw_a and $W_{a1}W_{a2}$ are left blank;

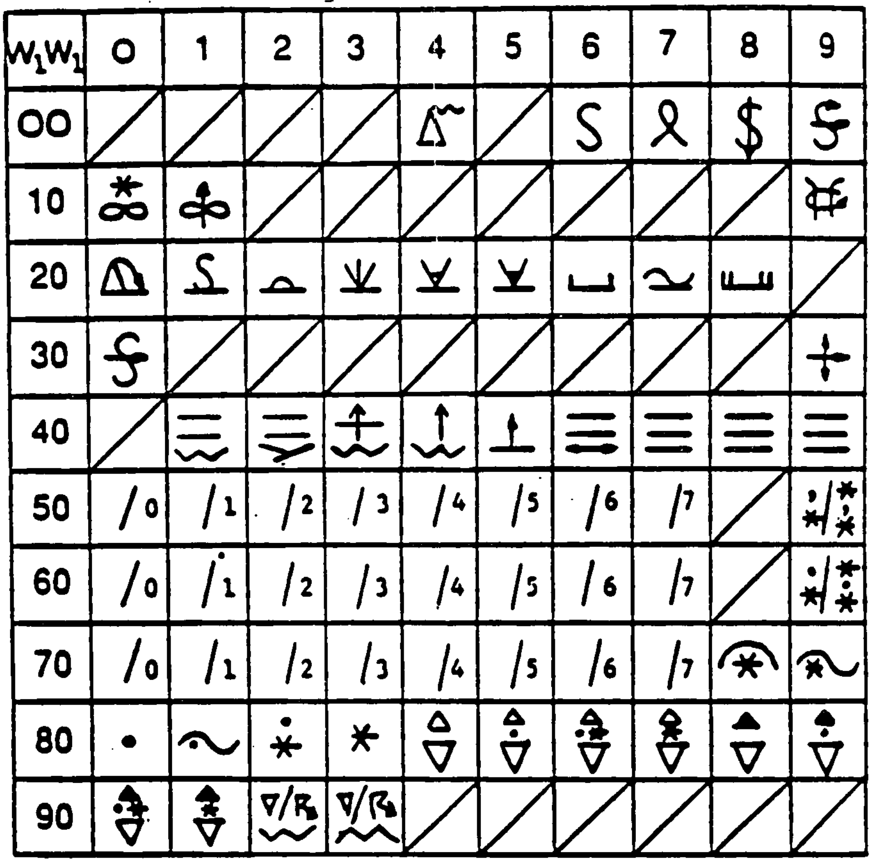
(b) No observation was made (i_x = 6) or the data are missing (i_x = 7 but no 7-group in the message); w_aw_a and $W_{a1}W_{a2}$ are both plotted as //.

2. GRAPHIC REPRESENTATION OF DATA ON WEATHER CHARTS

2.1 Add new specification

w_1w_1 Present weather (in addition to ww or w_aw_a)

The symbols for the appropriate code figures are given in the following table:



The pairs of symbols are alternatives according to the observation.

The symbol /2 means drizzle, rain or snow whose rates of fall are indicated by code figures 52, 62, and 72 respectively. The symbols are plotted in conjunction with ww, present weather, or w_aw_a or W_1W_2 or $W_{a1}W_{a2}$. (e.g. /2)

Symbol means over sea, on sea, lake or river. (Over water)

Symbol means on or over mountains.

Symbol means in or over valleys.

NOTE: The meanings of code figures for present weather are given in code table 4687 in the Manual on Codes (Publication No. 306) (Annex II to the Technical Regulations).

W_1W_2 Amend to read: Past weather reported from a manned station. Add the following after the NOTE to W_1W_2 - Past weather.

$W_{a1}W_{a2}$ Past weather reported from an automatic station.

Code		Symbol
1	VISIBILITY REDUCED	
2	Blowing phenomena, visibility reduced	
3	FOG	
4	PRECIPITATION	
5	Drizzle	
6	Rain	
7	Snow or ice pellets	
8	Snow shower(s) or intermittent precipitation	
9	Thunderstorm	

NOTE: The meaning of the code figures for past weather reported from an automatic station are given in Code 4531 in the Manual on Codes (Publication No. 306) (Annex II to the Technical Regulations).

Rec. 10 (CBS-Ext.(90)) - PROPOSED CODE FM 18-IX EXT. - DRIFTER - REPORT OF A DRIFTING BUOY OBSERVATION TO REPLACE FM 14-VIII DRIBU

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 5 (CBS-IX) - Working Group on Data Management (DM),

(2) The final report of the first session of the CBS Working Group on Data Management Sub-group on Codes, general summary, paragraph 3.1,

(3) The final report of the first session of the CBS Working Group on Data Management, general summary, paragraph 4.2.3,

CONSIDERING that there is a need to introduce changes to the DRIBU code in order to re-structure its presentation and incorporate new data types now becoming available from drifting buoys,

RECOMMENDS that the revised code, renamed FM 18-IX Ext. DRIFTER, as given in the annex to this recommendation be adopted to replace the current DRIBU code for use as from 1 November 1991;

REQUESTS the Secretary-General to arrange for the inclusion of the new code and deletion of the DRIBU code in Volume I of the Manual on Codes.

Annex to Recommendation 10 (CBS-Ext.(90))

PROPOSED CODE FM 18-IX EXT. - DRIFTER -
REPORT OF A DRIFTING BUOY OBSERVATION TO REPLACE FM 14-VIII DRIBU

FM 18-IX Ext. - DRIFTER - Report of a drifting buoy observation

CODE FORM:

Section 0 $M_iM_iM_jM_j$ $A_1b_wn_bn_bn_b$ YYMMJ $GGggi_w$ $Q_cL_aL_aL_aL_aL_a$ $L_oL_oL_oL_oL_oL_o$

Section 1 0ddff $1s_nTTT$ 2PPPP 3appp

Section 2 222 $0s_nT_wT_wT_w$ $1P_{wa}P_{wa}H_{wa}H_{wa}$ $20P_{wa}P_{wa}P_{wa}$ $21H_{wa}H_{wa}H_{wa}$

Section 3 333 $8887k_2$ $2z_0z_0z_0z_0$ $3T_0T_0T_0T_0$ $4S_0S_0S_0S_0$

.....

$2z_nz_nz_nz_n$ $3T_nT_nT_nT_n$ $4S_nS_nS_nS_n$

$66k_69k_3$ $2z_0z_0z_0z_0$ $d_0d_0c_0c_0c_0$

.....

$2z_nz_nz_nz_n$ $d_nd_nc_nc_nc_n$

Section 4 444 $(1Q_PQ_2Q_{TW}Q_4)$ $(2Q_NQ_L//)$
$((Q_cL_aL_aL_aL_aL_a\ L_oL_oL_oL_oL_oL_o)$ or $(H_LV_BV_Bd_Bd_B))$
$(8V_iV_iV_iV_i)$ $(9i_dZ_dZ_dZ_d)$

NOTES:

(1) DRIFTER is the name of the code for reporting drifting buoy observations.

(2) A DRIFTER report, or a bulletin of DRIFTER reports, is identified by the group $M_iM_iM_jM_j$ = ZZXX.

(3) The inclusion of the group $9i_dZ_dZ_dZ_d$ is strongly recommended for buoys which have been deployed with drogues.

(4) The group $9i_dZ_dZ_dZ_d$ should not be used in reports from a buoy on which a drogue has never been installed.

(5) The code is divided into five sections, the first being mandatory in its entirety and the remainder optional as data are available.

Section number	Symbolic figure group	Contents
0	---	Identification, time and position data
1	---	Meteorological and other non-marine data
2	222	Surface marine data
3	333	Temperature, salinity, and current (when available) at selected depths
4	444	Information on engineering and technical parameters, including quality control data

REGULATIONS:

18.1

General

The code name DRIFTER shall not be included in the report.

18.2

Section 0

18.2.1

All groups in section 0 are mandatory and shall be included in each report, even if no other data are reported. A minimum DRIFTER report shall consist of all groups in section 0.

18.2.2

Each individual DRIFTER report, even if included in a bulletin of such reports, shall contain as the first group the identification group $M_iM_iM_jM_j$ = ZZXX

18.2.3

Group $A_1b_wn_bn_bn_b$

In the case of a drifting buoy, 500 shall be added to the original $n_bn_bn_b$ number.

NOTES:

(1) A_1b_w normally corresponds to the maritime zone in which the buoy was deployed. The WMO Secretariat allocates to Members, who request and indicate the maritime zone(s) of interest, a block or blocks of serial numbers ($n_bn_bn_b$) to be used by their environmental buoy stations.

(2) The Member concerned registers with the WMO Secretariat the serial numbers actually assigned to individual stations together with their geographical positions of deployment.

(3) The Secretariat informs all concerned of the allocation of serial numbers and registrations made by individual Members.

18.2.4

Groups $Q_cL_aL_aL_aL_aL_a$ $L_oL_oL_oL_oL_oL_o$
Position shall be reported in hundredths or thousandths of degrees, depending on the capability of the positioning system. When the position is in hundredths of degrees the groups shall be encoded as $Q_cL_aL_aL_aL_a$/ $L_oL_oL_oL_oL_o$/.

18.3

Section 1

18.3.1

Each of the groups in section 1 shall be included for all parameters that have been measured, when data are available.

18.3.2

When data are missing for all groups the entire section shall be omitted from the report.

18.4

Section 2

18.4.1

Each of the groups in section 2 shall be included for all parameters that have been measured, when data are available.

18.4.2

When data are missing for all groups the entire section shall be omitted from the report.

18.5

Section 3

18.5.1

General

Section 3 is in two parts. The first part, identified by the indicator group $8887k_2$, is used to report temperature and/or salinity at selected depths. The second part, identified by the indicator group $66k_69k_3$, is used to report current at selected depths.

18.5.2

Temperatures shall be reported in hundredths of degrees. When accuracy is limited to tenths of degrees data shall be encoded using the general form $3T_nT_nT_n/$.

18.6

Section 4

General

Additional groups in this section shall be included as data is available or required.

18.6.1

Group $1Q_PQ_2Q_{TW}Q_4$

When Q_P, Q_2, Q_{TW}, and Q_4 = 0, the corresponding group shall not be transmitted. Its absence thus indicates a satisfactory general operation.

Example: Water temperature too high (or too low).

18.6.2

Group $2Q_NQ_L//$

When Q_N and $Q_L = 0$, the corresponding group shall not be transmitted.

Example: Several identical reports have been received by the satellite; it is not required to calculate the mean value, the location was not possible over this pass.

18.6.3

Group $H_LV_BV_Bd_Bd_B$

This group shall be transmitted only when $Q_L = 1$.

Example: Last location made six hours before; at this instant, the true direction of the buoy is 47° and its speed 13 cm s^{-1} – the group is coded 61304.

18.6.4

Group $Q_CL_aL_aL_aL_aL_a$

This group shall be transmitted only when $Q_L = 2$ (location over one pass only). It gives the latitude of the second possible solution (symmetrical to the satellite sub-track).

NOTE: Same coding as in Section 0.

18.6.5

Group $L_oL_oL_oL_oL_oL_o$

This group shall be transmitted only when $Q_L = 2$ and it gives the longitude of the second possible position, the latitude being indicated by the previous group.

NOTE: Same coding as in Section 0.

18.6.6

Group $8V_iV_iV_iV_i$

The number of groups $8V_iV_iV_iV_i$ containing information on the engineering status of the buoy shall not exceed three.

NOTES:

(1) The physical equivalent of the value $V_iV_iV_iV_i$ will be different from one buoy to another.

(2) Interpretation of these groups will not be necessary to permit use of the meteorological data.

SPECIFICATION OF SYMBOLIC LETTERS

$P_{wa}P_{wa}P_{wa}$ Period of waves, obtained by instrumental methods, in tenths of seconds.

(FM 18-IX Ext.)

(1) $P_{wa}P_{wa}P_{wa}$ shall be reported in addition to $P_{wa}P_{wa}$ when the following conditions have been met:

(a) The sea is not calm (i.e. $P_{wa}P_{wa}H_{wa}H_{wa}$ has not been reported as 0000);

(b) $P_{wa}P_{wa}$ has not been reported as //;

(c) The station has the capability of accurately measuring instrumental wave period in units of 0.1 seconds.

(2) See Notes (1) and (2) under P_wP_w.

CODE TABLES:

Change in code table 2582, FM 14-VIII to FM 18-IX Ext. - DRIFTER.

Rec. 11 (CBS-Ext.(90) - PROPOSED AMENDMENTS TO FM 35-IX TEMP, FM 36-IX TEMP SHIP, FM 37-VIII TEMP DROP AND FM 38-IX TEMP MOBIL

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 5 (CBS-IX) - Working Group on Data Management (DM),

(2) The final report of the first session of the CBS Working Group on Data Management Sub-group on Codes, general summary, paragraphs 3.2, 3.3 and 3.12,

(3) The final report of the first session of the CBS Working Group on Data Management, general summary, paragraph 4.2.3,

CONSIDERING:

(1) That since all the regional associations and the Antarctic have adopted or have no objection to the inclusion of 925 hPa data in Part A of TEMP code reports, it is appropriate to include 925 hPa as a standard level,

(2) That there is need to re-order and number the groups of Section 7 of TEMP to facilitate automatic processing,

(3) That there was a need to specify the need and contents of Code Tables 3685, 3849, 0265 and 3872 resulting from Recommendations 13 and 20 CBS-IX,

RECOMMENDS that the proposed amendments to FM 35-IX TEMP, FM 36-IX TEMP SHIP, FM 37-VIII TEMP DROP and FM-IX TEMP MOBIL as given in the annex to this recommendation be adopted for use as from 1 November 1991;

REQUESTS the Secretary-General to arrange for the inclusion of the amendments in Volume I of the Manual on Codes and the deletion of 925 hPa reporting procedures in Volume II of the Manual on Codes.

Annex to Recommendation 11 (CBS-Ext.(90))

PROPOSED AMENDMENTS TO FM 35-IX TEMP, FM 36-IX TEMP SHIP, FM 37-VIII TEMP DROP AND FM 38-IX TEMP MOBIL

CODE FORM.

Amend the group YYGG/ in Part B, Section 1 to read:

$YYGGa_4$

Amend Part B Section 7 to read:

Part B

Section 7 - (31313 $s_r r_a r_a s_a s_a$ 8GGgg $9s_n T_w T_w T_w$)

1. REGULATIONS

Amend Regulation 35.3.3 to read:

Section 7 - Sounding system indication, radiosonde, system status, launch time, sea-surface temperature groups.

In TEMP SHIP reports, Section 7 when included shall report the solar or infra-red radiation correction, sounding system identification, radiosonde type, system status, actual time of launch and sea-surface temperature. In TEMP and TEMP MOBIL reports, Section 7 when included shall report only the solar or infra-red radiation correction, sounding system, identification, radiosonde type, system status and actual time of launch.

2. SPECIFICATION OF THE SYMBOLIC LETTERS

The symbolic letters of the new groups to be specified as follows:

$r_a r_a$	Radiosonde/sounding system used (Code table 3685, BUFR table 002011)
s_r	Solar and infra-red radiation correction (Code table 3849, BUFR table 002012)
$s_a s_a$	Tracking technique/status of system used (Code table 3872, BUFR table 002013)
GGgg	Time of observation in hour and minute UTC FM 35-IX Ext., FM 36-IX Ext., FM 38-IX Ext.: Actual time of launching the radiosonde

3. NEW CODE (BUFR) TABLES

3685 (002011)

$r_a r_a$ - Radiosonde/sounding system used.

Code figure (8 bits)	
00	Not used
01	Not used
02	No radiosonde/passive target (e.g. balloon plus reflector, etc.)
03	No radiosonde/active target (e.g. balloon plus transponder)
04	No radiosonde/passive temperature-humidity profiler
05	No radiosonde/active temperature-humidity profiler
06	No radiosonde/radio-acoustic sounder
07	No radiosonde/...)reserved
08	No radiosonde/...)
09	No radiosonde/sounding system not specified or unknown
10	RS VIZ Type A
11	RS VIZ Type B
12	RS SDC
13	Astor
14	Beukers/VIZ Microsonde
15	EEC Company type 23
16	Elin
17	Graw G.
18	Reserved for allocation of radiosondes
19	Graw M60
20	Indian Met. Service MK3
21	Jinyang
22	Meisei RS2-80
23	Mesural FMO 1950A
24	Mesural FMO 1945A
25	Mesural MH73A
26	Meteolabor Basora
27	AVK-MRZ
28	Meteorit Marz2-1
29	Meteorit Marz2-2
30	Oki RS2-80
31	Sangamo
32	Shanghai Radio
33	UK Met. Office MK3
34	Vinohrady
35	Vaisala RS18
36	Vaisala RS21
37	Vaisala RS80
38	Beukers LOCATE (LORAN-C)
39	Sprenger E076
40	Sprenger E084
41	Sprenger E085
42	Sprenger E086
43	Air IS - 4A - 1630
44	Air IS - 4A - 1680 X
45)	Reserved for allocation of radiosondes
..)	
59)	

Code figure (8 bits)			
60	Vaisala RS80/MicroCora		
61	Vaisala RS80/DigiCora or Marwin		
62	Vaisala RS80/PCCora		
63	Vaisala RS80/Star		
64)	Reserved for allocation of automated sounding systems		
..)			
89)			
90	Radiosonde not specified or unknown		
91	Pressure-only radiosonde		
92	Pressure-only radiosonde plus transponder		
93	Pressure-only radiosonde plus radar-reflector		
94	No-pressure radiosonde plus transponder		
95	No-pressure radiosonde plus radar-reflector		
96	Descending radiosonde		
97)			
98)	Reserved for allocation of sounding systems with incomplete sondes		
99)			
(100)		)	
(...)	Reserved	)	(BUFR table 002011 only)
(...)		)	
(254)		)	
(255	Missing value	)	

3849 (002012)

s_r – Solar and infra-red radiation correction

Code figure (4 bits)	
0	No correction
1	CIMO solar corrected and CIMO infra-red corrected
2	CIMO solar corrected and infra-red corrected
3	CIMO solar corrected only
4	Solar and infra-red corrected automatically by radiosonde system
5	Solar corrected automatically by radiosonde system
6	Solar and infra-red corrected as specified by country
7	Solar corrected as specified by country

Code figure (8 bits)			
8)	Not used		
9)			
(10)		)	
(...)	Reserved	)	(BUFR table 002012 only)
(14)		)	
(15	Missing value	)	

0265 (002003)

a_4 – Type of measuring equipment used

Code figure (4 bits)		
0	Pressure instrument associated with wind-measuring equipment	
1	Optical theodolite	
2	Radio theodolite	
3	Radar	
4	Pressure instrument associated with wind measuring equipment but pressure element failed during ascent	
5	VLF-Omega	
6	Loran-C	
7	Wind profiler	
8	Satellite navigation	
9	Reserved	
(10)	)	
(..)	Reserved)	(BUFR table 002003 only)
(14)	)	
(15	Missing value)	

3872 (002013)

$s_a s_a$ – Tracking technique/status of system used

Code figure (7 bits)		
00	No windfinding	
01	Automatic with auxiliary optical direction finding	
02	Automatic with auxiliary radio direction finding	
03	Automatic with auxiliary ranging	
04	Not used	
05	Automatic with multiple VLF Omega frequencies	
06	Automatic cross chain Loran-C	
07	Automatic with auxiliary wind profiler	
08	Automatic satellite navigation	
09)		
..)	Reserved	
..)		
18)		
19	Tracking technique not specified	
20-29	Ship systems)	
30-39	Sounding systems)	
40-49	Launch facilities)	
50-59	Data acquisition systems)	Reserved for ASAP
60-69	Communications)	
70	All systems in normal operation)	
71-98	Reserved	
99	Status of system and its components not specified	
(100)	)	
(...)	Reserved)	
(...)	)	(BUFR table 002013 only)
(126)	)	
(127	Missing value)	

PROPOSED AMENDMENTS

Replace or modify Regulations 35.3.1.1, 35.3.1.2, 35.3.1.3, 35.3.1.6 and 35.3.2 with the following:

35.3

Parts B and D

35.3.1

Section 5 - Significant levels with respect to temperature and/or relative humidity

35.3.1.1

If, in the determination of significant levels with respect to specified criteria for changes in air temperature and/or relative humidity, the criteria for either variable are satisfied at a particular point in altitude, data for both variables (as available) shall be reported for that level.

Dew-point data shall be derived using the function (or a near equivalent) for the relationship between saturation vapour pressure over water and air temperature (specified in WMO-No. 49 - Technical Regulations). Dew-point data shall not be reported when the air temperature is outside the range stated by WMO for the application of the function, a lesser range may be used as a national practice.

The highest level for which a dew-point is reported shall be one of the levels selected in accordance with Regulations 35.3.1.2 and 35.3.1.3.

The reported significant levels alone shall make it possible to reconstruct the air temperature and humidity profiles within the limits of the criteria specified.

35.3.1.2

The following shall be included as "mandatory significant levels":

(a) Surface level and the highest level of the sounding, or aircraft reference level and termination level for descent soundings;

(b) A level between 110 and 100 hPa;

(c) Bases and tops of inversions and isothermal layers which are at least 20 hPa thick, provided that the base of the layer occurs below the 300 hPa level or the first tropopause, whichever is the higher;

(d) Bases and tops of inversion layers which are characterized by a change in temperature of at least 2.5° C or a change in relative humidity of at least 20 per cent, provided that the base of the layer occurs below the 300 hPa level or the first tropopause, whichever is the higher.

NOTE: The inversion layers of (c) and (d) may be comprised of several thinner inversion layers separated by thin layers of temperature lapse. To allow for this situation, the tops of the inversion layers of (c) and (d) shall each be at a level such that no further inversion layers, whether thick or thin, shall occur for at least 20 hPa above the level.

35.3.1.3

The following shall be included as "additional" levels. They shall be selected in the order given, thereby giving priority to representing the temperature profile. As far as possible, these additional levels shall be the actual levels at which prominent changes in the lapse rate of air temperature occur:

(a) Levels which are necessary to ensure that the temperature obtained by linear interpolation (on a T-log P or essentially similar diagram) between adjacent significant levels shall not depart from the observed temperature by more than 1°C below the first significant level reported above the 300 hPa level or the first tropopause, whichever level is the lower, or by more than 2°C thereafter;

(b) Levels which are necessary to ensure that the relative humidity obtained by linear interpolation between adjacent significant levels shall not depart by more than 15 per cent from the observed values (the criterion of 15 per cent refers to an amount of relative humidity and NOT to the percentage of the observed value, e.g. if an observed value is 50 per cent, the interpolated value shall lie between 35 per cent and 65 per cent);

(c) Levels which are necessary to limit the interpolation error on diagrams other than T-log P. These levels shall be such that the pressure at one significant level divided by the pressure of the preceding significant level shall exceed 0.6 for levels up to the first tropopause and shall be determined by use of the method for selecting additional levels but with application of tighter criteria.

35.3.1.4 (Unchanged)

35.3.1.5 (Unchanged)

35.3.1.6

In Parts B and D, a layer for which data are missing shall be indicated by reporting the boundary levels of the layer and a level of solidii (/////) to indicate the layer of missing data, provided that the layer is at least 20 hPa thick. The boundary levels are the levels closest to the bottom and the top of the layer for which the observed data are available. The boundary levels are not required to meet "significant level" criteria. The boundary levels and the missing data level groups will be identified by appropriate nn numbers. For example:

$33P_3P_3P_3$	$T_3T_3T_{a3}D_3D_3$
44///	/////
$55P_5P_5P_5$	$T_5T_5T_{a5}D_5D_5$

where the levels 33 and 55 are the boundary levels and 44 indicates the layer for which data are missing.

35.3.2

Section 6 - Significant levels with respect to wind

DELETE the last three words of the Note which should then end with:

"..... in Regulation 32.3.1."

Proposed amendments to

FM 35-IX TEMP, FM 36-IX TEMP SHIP, FM 37-VII TEMP DROP and FM 38-IX TEMP MOBIL

1. REGULATION

Regulation 35.2.2.1 to read: "In Section 2, the data groups for the surface level and the standard isobaric surfaces of 1000, 925, 850, 700, 500, 400, 300, 250, 200, 150 and 100 hPa in Part A, and of 70, 50, 30, 20 and 10 hPa in Part C shall appear in ascending order with respect to altitude."

2. SPECIFICATIONS OF SYMBOLIC LETTERS

P_1P_1

P_2P_2 ... P_nP_n	Pressure of standard isobaric surfaces (1000 hPa = 00, 925 hPa = 92) (FM 35-IX, FM 36-IX, FM 37-IX, FM 38-IX)

Rec. 12 (CBS-Ext.(90)) - PROPOSED AMENDMENTS TO FM 47-V GRID, FM 49-VII GRAF

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 5 (CBS-IX) - Working Group on Data Management (DM),

(2) The final report of the first session of the CBS Working Group on Data Management Sub-group on Codes, general summary, paragraph 3.4,

(3) The final report of the first session of the CBS Working Group on Data Management, general summary, paragraph 4.2.3,

CONSIDERING that there is a need to harmonize the types of parameters defined in GRIB Table 2 with the type of parameter $a_1a_1a_2a_2$ group in GRID/GRAF code and corresponding updated Code Table 0291 - Type of parameters,

RECOMMENDS that the proposed amendments to FM 47-V GRID, FM 49-VII GRAF and corresponding Code Table 0291 - Type of parameter - as given in the annex to this recommendation be adopted for use as from 1 November 1991;

REQUESTS the Secretary-General to arrange for the inclusion of the amendments in Volume I of the Manual on Codes.

Annex to Recommendation 12 (CBS-Ext.(90))

PROPOSED AMENDMENTS TO
FM 47-V GRID, FM 49-VII GRAF

1. Proposed amendments to FM 47-V GRID:

(a) CODE FORM

Add to Section 0 and Section 5 the optional group ($2n_Tn_Ta_1a_2$)

Note (5), 6th line: End of sentence to continue with: "and an indication (n_Tn_T) whether the type of parameter of the following analysis or prognosis is given by the international code table 0291 or by a national code table."

Note (6), 3rd line: "...parameters ($a_1a_1a_1$, $a_2a_2a_2$);"

(b) REGULATIONS

Reg. 47.1.1, to read: "The groups GRID F_1F_2NNN $1nnn_tn_t$ ($2n_Tn_Ta_1a_2$) shall be included as the first line of the text of the coded meteorological analysis or forecast."
NOTE: when in the optional group ($2n_Tn_Ta_1a_2$) $n_Tn_Ta_1a_2$ is 0000, the group shall be omitted

Reg. 47.2.1, 8th line: "...parameters $a_1a_1a_1/a_2a_2a_2$ = 080 to 089 ..., etc."

Reg. 47.4.1 (a) and (b)
"last line to read: "...code table $a_1a_1a_1/a_2a_2a_2$ (0291)."

Reg. 47.4.2, 1st line: "When $a_1a_1a_1/a_2a_2a_2$ represent weather phenomena (Code figures 080-089 ..., etc."

Table associated with Reg. 47.4.4: Change "a_1a_1" to "$a_1a_1a_1$" and "a_2a_2" to "$a_2a_2a_2$" in text 2nd and 5th column.

2. Proposed amendments to FM 49-VII GRAF:

(a) CODE FORM

Add to Section 0 and Section 5 group $2n_Tn_Ta_10$

Note (6), 6th line: End of sentence to continue with: "and an indication (n_Tn_T) whether the type of parameter of the following analysis or prognosis is given by the international code table 0291 or by a national code table."

Note (7), 3rd line: "...parameter ($a_1a_1a_1$);"

(b) REGULATIONS

Reg. 49.1.1, to read: "The group GRAF F_1F_2NNN $1nnn_tn_t$ $2n_Tn_Ta_10$ shall be included as the first line of the text of the coded meteorological analysis or prognosis."

NOTE: when in the optional group ($2n_Tn_Ta_1a_2$) $n_Tn_Ta_1a_2$ is 0000, the group shall be omitted

Reg. 49.2.1, 5th line: "...parameters $a_1a_1a_1$ = 080-089..., etc."

Reg. 49.3.5, 1st line: "When $a_1a_1a_1$ represents a weather phenomenon (Code figures 080-089) ..., etc."

3. SYMBOLIC LETTERS

Specification "a_1a_1)" to read "$a_1a_1a_1$)"
a_2a_2) $a_2a_2a_2$)

(n_Tn_T) Indicator of reference code table for type of parameter $a_1a_1a_1$, $a_2a_2a_2$ (Code table 2890)

a_1) ($a_1a_1a_1$
) hundreds figure of (
a_2) ($a_2a_2a_2$

(FM 47-IX GRID, FM 49-IX Ext. GRAF)

a_1a_1) ($a_1a_1a_1$
) tens and units figures of (
a_2a_2) ($a_2a_2a_2$

(FM 47-IX GRID, FM 49-IX Ext. GRAF)

0291

$a_1a_1a_1$, $a_2a_2a_2$—Type of parameter

Code figure	Field parameter(s)	Reference value	Unit	Occurrence and/ or intensity of phenomenon	Remarks
000	–	–	–		Indicates missing parameter
001	Pressure	0 hPa	1 hPa		
002	Geopotential height	0 m'	10 m'		
003	Geometrical height	0 m	10 m'		
004	Temperature	0°C	1°C		
005	Maximum temperature	0°C	1°C		Surface level only
006	Minimum temperature	0°C	1°C		Surface level only
007	Temperature deviation from normal	0°C	1°C		
008	Potential temperature	0°C	1°C		
009	Pseudo-adiabatic potential temperature	0°C	1°C		
010	Dew-point temperature	0°C	1°C		
011	Dew-point depression (or deficit)	0°C	1°C		
012	Specific humidity	0 g kg^{-1}	0 g kg^{-1}		
013	Relative humidity	0%	1%		
014	Humidity mixing ratio	0 g kg^{-1}	0 g kg^{-1}		
015	Stability index	0°C	1°C		See Code table 2677 for specific parameters
016	Saturation deficit	0 hPa (for a specific level) 0 m' (for a specific layer)	0.1 hPa 10 m'		
017	4-layer lifted index	0°C	1°C		
018) 019)					Reserved

Code figure	Field parameter(s)	Reference value	Unit	Occurrence and/ or intensity of phenomenon	Remarks
020	Wind direction	0°	10°		
021	Wind speed	0 m s^{-1}	1 m s^{-1}		
022	Wind direction and speed	0°,0 m s^{-1}	5°,0 m s^{-1}		TEMP code form
023) 024)	Wind components	0 m s^{-1}	1 m s^{-1}		Relative to co-ordinate system used
025	Wind speed	0 kt	1 kt		
026	Wind direction and speed	0°,0 kt	5°,1 kt		
027) 028)	Wind components	0 kt	1 kt		TEMP code form Relative to co-ordinate system used
029	Stream function	0 m^2 s^{-1}	10^5 m^2 s^{-1}		
030	Relative vorticity	0 s^{-1}	10^{-5} s^{-1}		
031	Absolute vorticity	0 s^{-1}	10^{-5} s^{-1}		
032	Relative vorticity advection	0 s^{-2}	10^{-9} s^{-2}		
033	Absolute vorticity advection	0 s^{-2}	10^{-9} s^{-2}		
034	Hor. velocity divergence	0 s^{-1}	10^{-5} s^{-1}		
035	Hor. moisture divergence	0 g $kg^{-1}s^{-1}$	0.1 g $kg^{-1}s^{-1}$		
036	Geostrophic vorticity	0 s^{-1}	10^{-5} s^{-1}		
037	Geostrophic vorticity advection	0 s^{-2}	10^{-2} s^{-2}		
038					Reserved
039	Velocity potential	0 m^2 s^{-1}	10^3 m^2 s^{-1}		
040	Vertical velocity ($\downarrow$)	0 cb s^{-1}	10^{-1} cb s^{-1}		
041	Vertical velocity ($\downarrow$)	0 cb/12 h	1 cb/12 h		
042	Vertical Velocity ($\downarrow$)	0 hPa h^{-1}	1 hPa h^{-1}		
043	Vertical velocity ($\uparrow$)	0 mm s^{-1}	1 mm s^{-1}		
044	Vertical wind shear	0 m s^{-1}/1000 m	1 m s^{-1}/1000 m		
045	Vertical wind shear	0kt/1000 m	1 kt/1000 m		
046	Lapse rate	0°C/100 m	0.1°C/100 m		
047	Precipitable water	0 mm	1 mm		
048	Convective prec. amount	0 mm	1 mm		
049	Precipitation rate	0 mm h^{-1}	1 mm h^{-1}		
050	Precipitation amount	0 mm	1 mm		Surface level only

Code figure	Field parameter(s)	Reference value	Unit	Occurrence and/ or intensity of phenomenon	Remarks
051	Snow depth	0 cm	1 cm		Surface level only
052	Outgoing long-wave radiation	0 joule	0.1 joule ($1 J = 10^7$ ergs)		Integrated over 24 hours
053	Outgoing short-wave radiation	0 joule	0.1 joule		Integrated over 24 hours
054	Incoming short-wave radiation	0 joule	0.1 joule		Integrated over 24 hours
055	Non-convective prec. amount	0 mm	1 mm		
056) 057)					Reserved
058	Afternoon SST warming	0°C	0.01°C		
059	Temperature anomaly	0°C	0.01°C		
060	Deviation of sea-level from mean	0 cm	1 cm		
061	Sea temperature	0°C	0.1°C		
062	Salinity	0‰			
063	Density				
064	Significant height of combined wind waves and swell	0 m	0.5 m		Threshold value of 0.5 m
065	Direction of swell	0°	10°		
066	Significant height of swell	0 m	0.5 m		Threshold value of 0.5 m
067	Mean period of swell	0 s	1 s		
068	Direction of wind waves	0°	10°		
069	Signif. height of wind waves	0 m	0.5 m		Threshold value of 0.5 m
070	Mean period of wind waves	0 s	1 s		
071	Direction of current	0°	10°		
072	Speed of current	0 cm s^{-1}	1 cm s^{-1}		
073) 074)	Current components	0 cm s^{-1}	1 cm s^{-1}		Relative to co-ordinate system used
075	Primary wave direction	0°	10°		
076	Primary wave period	0 s	1 s		
077	Secondary wave direction	0°	10°		
078	Secondary wave period	0 s	1 s		
079	Cloud cover		0, 1, 2, 3, 4, 5, 6, 7, 8		Cloud amount in oktas (see Code table 2677 for specific parameters)

Code figure	Field parameter(s)	Reference value	Unit	Occurrence and/or intensity of phenomenon	Remarks
080	Thunderstorm			0, 1	0 = absent, 1 = occurring
081	Tropical revolving storm			0, 1	0 = absent, 1 = occurring
082	Line squall			0, 1	0 = absent, 1 = occurring
083	Hail			0, 1	0 = absent, 1 = occurring
084	Turbulence (generally associated with cloud)			0, 1, 2	0 = nil or slight, 1 = moderate, 2 = severe
085	Clear-air turbulence			0, 1, 2	0 = nil or slight, 1 = moderate, 2 = severe
086	Icing			0, 1, 2	0 = nil or slight, 1 = moderate, 2 = severe
087	Mountain waves			0, 1	0 = absent, 1 = occurring
088	Sandstorm/duststorm			0, 1	0 = absent, 1 = occurring
089	Freezing rain			0, 1	0 = absent, 1 = occurring
090	Ice concentration			0, 1	0 = no sea ice, 1 = occurrence of sea ice
091	Ice thickness	0 m	1 m		
092	Ice drift u-component	0 km/day	1 km/day		
093	Ice drift v-component	0 km/day	1 km/day		
094	Ice growth	0 dm	1 dm		
095	Ice convergence/divergence	0 s^{-1}	1 s^{-1}		
096)					
097)					
098)					Reserved
099)					
100	Pressure	0 dPa	1 dPa		
101	Geopotential thickness	0 gpm	1 gpm		
102	Geopotential height	0 gpm	1 gpm		
103	Geometrical height	0 m	1 m		
104	Temperature	0°C	0.1°C		
105)					
106)					
107)					Reserved
108)					
109)					
110)					
111)					
112	Specific humidity	0 $kgkg^{-1}$	1 $kgkg^{-1}$		
113	Relative humidity	0%	0.1%		
114	Humidity mixing ratio	0 $kgkg^{-1}$	1 $kgkg^{-1}$		

Code figure	Field parameter(s)	Reference value	Unit	Occurrence and/or intensity of phenomenon	Remarks
115	Stability (lifted) index	0°C	0.1°C		
116	Saturation deficit	0 hPa	1 hPa		
		0 gpm	1 gpm		
117)					
118)					Reserved
119)					
120	Wind direction	0°	1°		
121)					
122)					
123)					
124)					Reserved
125)					
126)					
127)					
128)					
129	Stream function	0 m^2 s^{-1}	1 m^2 s^{-1}		
130	Relative vorticity	0 s^{-1}	10^{-5} s^{-1}		
131	Absolute vorticity	0 s^{-1}	10^{-5} s^{-1}		
132	Relative vorticity advection	0 s^{-2}	1 s^{-2}		
133	Absolute vorticity advection	0 s^{-2}	1 s^{-2}		
134	Hori. vorticity advection	0 s^{-1}	1 s^{-1}		
135	Hori. moisture divergence	0 $kgkg^{-1}s^{-1}$	1 $kgkg^{-1}s^{-1}$		
136	Geostrophic vorticity	0 s^{-1}	1 s^{-1}		
137	Geostrophic vorticity advection	0 s^{-2}	1 s^{-2}		
138					Reserved
139	Velocity potential	0 m^2 s^{-1}	1 m^2 s^{-1}		
140	Vertical velocity (↓)	0 hPa s^{-1}	1 hPa s^{-1}		
141	Vertical velocity (↓)	0 dPa s^{-1}	1 dPa s^{-1} (1 microbar s^{-1})		
142					Reserved
143	Vertical velocity (↑)	0 m s^{-1}	1 m s^{-1}		
144	Vertical wind shear	0 m s^{-1}/1 m	1 m s^{-1}/1 m		
145					Reserved
146	Lapse rate	0°C/1 m	1°C/1 m		
147	Precipitable water	0 m	1 m		
148					Reserved
149	Precipitation rate	0 m s^{-1}	1 m s^{-1}		

Code figure	Field parameter(s)	Reference value	Unit	Occurrence and/ or intensity of phenomenon	Remarks
150	Precipitation amount	0 m	1 m		
151	Snow depth	0 m	1 m		
152	Outgoing long-wave radiation	0 joule	1 joule (1 joule = 10^7 ergs)		
153	Outgoing short-wave radiation	0 joule	1 joule		
154	Incoming short-wave radiation	0 joule	1 joule		
155)					
156)					
157)					Reserved
158)					
159)					
160	Deviation of sea-level from mean	0 m	1 m		
161	Sea temperature	0°C	1°C		
162	Sea-surface temperature	0°C	0.01°C		
163	SST anomaly	0°C	0.01°C		
164	Significant height of combined wind waves and swell	0 m	1 m		
165	Direction of swell	0°	1°		
166	Significant height of swell	0 m	1 m		
167					Reserved
168	Direction of wind waves	0°	1°		
169	Significant height of wind waves	0 m	1 m		
170					Reserved
171	Direction of current	0°	1°		
172	Speed of current	0 m s^{-1}	1 m s^{-1}		
173)					Reserved
174)	Current components	0 cm s^{-1}	1 cm s^{-1}		
175)					
176)					
177)					Reserved
178)					
179)					
180	Mixed layer depth	0 cm	1 cm		
181	Transient thermocline depth	0 cm	1 cm		
182	Main thermocline depth	0 cm	1 cm		
183	Main thermocline depth anomaly	0 cm	1 cm		

Code figure	Field parameter(s)	Reference value	Unit	Occurrence and/ or intensity of phenomenon	Remarks
184) ...) 201)					Reserved
202	Pressure reduced to MSL	0 hPa	1 hPa		
203	Pressure tendency	0 hPa/3h	0,1 hPa/3h		
204) ...) 211)					Reserved
212	Virtual temperature	0°C	1°C		
213) ...) 220)					Reserved
221	Radar spectra				Direction and frequency
222	Radar spectra				Direction and radial no.
223	Radar spectra				Radial no. and radial no.
224-225					Reserved
226	Pressure anomaly	0 hPa	1 hPa		
227	Geopotential height anomaly	0 m'	1 m'		
228	Wave spectra				Direction and frequency
229	Wave spectra				Direction and radial no.
230	Wave spectra				Radial no. and radial no.
231-237					Reserved
238	Sigma co-ord. vertical velocity	0 s^{-1}	1 s^{-1}		
239) 240) 241)					Reserved
242	Absolute divergence	0 s^{-1}	1 s^{-1}		
243					Reserved
244	Relative divergence	0 s^{-1}	1 s^{-1}		
245	Vertical u-component shear	0 s^{-1}	1 s^{-1}		
246	Vertical v-component shear	0 s^{-1}	1 s^{-1}		
247) ...) 254)					Reserved

Code figure	Field parameter(s)	Reference value	Unit	Occurrence and/ or intensity of phenomenon	Remarks
255	Vapour pressure	0 hPa	1 hPa		
256					Reserved
257	Evaporation	0 mm	1 mm		
258-259					Reserved
260	Thunderstorm probability	0%	1%		
261-263					
264	Snowfall rate water equivalent	0 kg m^{-2}	1 kg m^{-2}		
265	Water equivalent of acc. snow depth	0 kg m^{-2}	1 kg m^{-2}		
266-271					Reserved
272	Convective cloud cover	0%	1%		
273	Low cloud cover	0%	1%		
274	Medium cloud cover	0%	1%		
275	High cloud cover	0%	1%		
276	Cloud water	0 mm	1 mm		
277) ...) 280)					Reserved
281	Land-sea mask			0,1	0 = sea 1 = land
282					Reserved
283	Surface roughness	0 m	1 m		
284	Albedo	0%	1%		
285	Soil temperature	0°C	1°C		
286	Soil moisture content	0 mm	1 mm		
287	Vegetation	0%	1%		
288) ...) 292)					Reserved
293	Direction of ice drift	0°	10°		
294	Speed of ice drift	0 km/day	1 km/day		
295) ...) 310)					Reserved

Code figure	Field parameter(s)	Reference value	Unit	Occurrence and/ or intensity of phenomenon	Remarks
311	Net shortwave radiation (surface)	0 joule	0,1 joule		
312	Net longwave radiation (surface)	0 joule	0,1 joule		
313	Net shortwave radiation (top of atmosphere)	0 joule	0,1 joule		
314	Net longwave radiation (top of atmosphere)	0 joule	0,1 joule		
315	Longwave radiation	0 joule	0,1 joule		
316	Shortwave radiation	0 joule	0,1 joule		
317	Global radiation	0 joule	0,1 joule		
318) ...) 320)					Reserved
321	Latent heat flux	0 joule	0,1 joule		
322	Sensible heat flux	0 joule	0,1 joule		
323	Boundary layer dissipation	0 joule	0,1 joule		
324) ...) 326)					Reserved
327	Image data				
328-454					Reserved for use by originating centre
455) ...) 998)					Reserved
999	Reserved for totally fixed formats 999000 to 999999 for example 999001 TTdddfffTTdddfffTTdddfffTTdddfffhh TTdddfff = temperature, wind direction and wind speed for 400-hPa, 300-hPa, 250-hPa, 200-hPa levels hh = height of tropopause in 300-metre units Spaces between data groups omitted				Where applicable, the indication of all groups specifying the level of reference is to be omitted

Code figure	Field parameter(s)	Reference value	Unit	Occurrence and/ or intensity of phenomenon	Remarks
	Note: Code figures 999000 to 999999 for $a_1a_1a_1a_2a_2a_2$ do not represent parameters. These code figures are used to indicate various standard formats in which the data content is given and which will be defined in an appropriate publication.				

NOTES:

(1) The code figures 000 to 326 are used to represent parameters which are exchanged between a number of centres; since the products generated by centres can be extremely diverse, code figures 327 to 454 are reserved for definition by the originating centre, and may differ from centre to centre.

(2) Where it is necessary for a centre to re-define this table completely, a code figure n_Tn_T = 01-99 shall indicate the relevant re-defined code table. The code figures $a_1a_1a_1a_2a_2a_2$ shall then refer to the appropriate re-defined code table.

(3) The first part of code table 0291 (code figures 000-099) shall be used without the inclusion in the report of the optional group ($2n_Tn_Ta_1a_2$). Parameters in the latter part of the code table (100-999) can only be used with the inclusion in the report of the optional group ($2n_Tn_Ta_1a_2$).

Code table 2890 to read:

n_Tn_T—Indicator of reference code table of parameter $a_1a_1a_1$, $a_2a_2a_2$

Code figure	
00	Code table 0291
01) ..) 99)	Reserved

Rec. 13 (CBS-Ext.(90)) - PROPOSED MODIFICATIONS TO FM 12-IX SYNOP AND FM 13-IX SHIP AND MINOR MODIFICATIONS TO REGULATIONS OF FM 63-IX BATHY AND FM 64-IX TESAC

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 5 (CBS-IX) - Working Group on Data Management (DM),

(2) The final report of the first session of the CBS Working Group on Data Management Subgroup on Codes, general summary, paragraphs 3.5, 3.6, 3.7, 3.8, 3.9 and 3.11,

(3) The final report of the first session of the CBS Working Group on Data Management, general summary, paragraph 4.2.3,

CONSIDERING:

(1) That there is a need to reflect in the SYNOP and SHIP regulations the pressure tendency algorithms for synoptic automatic weather stations adopted by Recommendation 7 (CIMO-IX) and further standardize procedures for reporting station level pressure,

(2) That there is a need to update global regulations with respect to the use of group ($7R_{24}R_{24}R_{24}R_{24}$) in Section 3 of SYNOP,

(3) That there is a need to clarify interpretation of regulations 63.2.2 and 64.2.2 of FM 63-IX BATHY and FM 64-IX TESAC,

(4) That there is a need for reporting in SYNOP other types of solar radiation in addition to net solar radiation,

(5) That there is a need for indication of actual time of observation in SYNOP/SHIP code,

RECOMMENDS that the modifications to FM 12-IX SYNOP, FM 13-IX SHIP and minor modifications to regulations of FM 63-IX BATHY and FM 64-IX TESAC as given in the annex to this recommendation be adopted for use as from 1 November 1991;

REQUESTS the Secretary-General to arrange for the inclusion of the modifications in Volume I of the Manual on Codes.

Annex to Recommendation 13 (CBS-Ext.(90))

PROPOSED MODIFICATIONS TO FM 12-IX SYNOP AND FM 13-IX SHIP AND MINOR MODIFICATIONS TO REGULATIONS OF FM 63-IX BATHY AND FM 64-IX TESAC

FM 12-IX SYNOP and FM 13-IX SHIP

1. Amend the code form as follows:

Section 3 ...($7R_{24}R_{24}R_{24}R_{24}$)...

2. Replace Regulations 12.2.3.5.2, 12.2.3.5.3 and 12.2.4 with the following:

12.2.3.5.2

The pressure tendency over the past three hours, a, shall wherever possible, be determined on the basis of pressure sampled at equi-spaced intervals not exceeding one hour.

Note:

Algorithms for selecting the appropriate code figure are included in publication WMO-No. 8, Guide to Meteorological Instruments and Methods of Observation.

12.2.3.5.3

Where it is not possible to apply the algorithms specified in Regulation 12.2.3.5.2 in reports from automatic weather stations, a shall be coded as 2 when the tendency is positive; 7 when the tendency is negative; and 4 when the atmospheric pressure is the same as three hours before.

12.2.4

Group $3P_oP_oP_oP_o$

This group shall be included in reports for global exchange from land stations, together with either group 4PPPP or, in accordance with Regulation 12.2.3.4.2, the group $4\ a_3hhh$.

Note:

Inclusion of this group at other times is left to the decision of individual members.

3. Replace Regulations 12.4.1 and 12.4.2 and add new Regulation 12.4.9 and renumber present Regulation 12.4.9 to 12.4.10 as 12.4.10 to 12.4.11 as follows:

12.4.1

The inclusion of groups with indicator figures 1 up to and including 9 shall be decided regionally.

12.4.2

The symbolic form of the group with indicator figure 0 shall be developed regionally, as well as the rules for their inclusion in Section 3.

12.4.9

Group $(7R_{24}R_{24}R_{24}R_{24})$

This group shall be used to report total amount of precipitation during the 24-hour period ending at the time of the observation, in tenths of millimetre (encoded 9998 for 999.8 mm or more and 9999 for trace).

Renumber Regulation 12.4.9 to 12.4.10 as 12.4.10 to 12.4.11

CODE TABLES

Under Code table 0200

Change reference to Regulation to 12.2.3.5.3

FM 63-IX BATHY and FM 64-IX TESAC

Replace Regulations 63.2.2 and 64.2.2 with the following:

63.2.2

For the reporting of the value of the direction and speed of the wind, regulations for FM 13-IX SHIP shall apply.

NOTE: The unit of wind speed is indicated by i_u (code table 1853).

64.2.2

For the reporting of the value of the direction and speed of the wind, regulations for FM 13-IX SHIP shall apply.

NOTE: The unit of wind speed is indicated by i_u (code table 1853).

Proposed amendment to SYNOP/SHIP

Code Regulation 12.4.7.1.1

12.4.7.1.1

When the group $5j_1j_2j_3j_4$ is used in the form $55j_2j_3j_4$ or $553j_3j_4$ the supplementary group $j_5j_6j_7j_8j_9$ shall be added to report net solar radiation, global solar radiation, diffused solar radiation, longwave radiation, short-wave radiation, net short-wave radiation or direct solar radiation if data are available. The group shall be repeated as often as necessary.

NOTE: If sunshine duration is not available the group shall be reported as 55/// or 553// whenever the group $j_5j_6j_7j_8j_9$ is required to report radiation data.

12.4.7.1.2

When the group $5j_1j_2j_3j_4$ is used, one or more of the following symbolic expressions shall be adopted:

(a) $5EEEi_E$

to report the daily amount of either evaporation or evapotranspiration;

(b) $54g_os_nd_T$

to report temperature change data in period covered by W_1W_2;

(c) 55SSS

to report daily hours of sunshine;

(d) 553SS

to report the duration of sunshine in the past hour

Increment headings on sub-paragraphs (d), to (g), to become (e) to (h)

12.4.7.2

Daily evaporation or evapotranspiration.

12.4.7.2.1

The symbolic expression $5EEEi_E$ shall be used to report either daily evaporation or evapotranspiration.

Delete Regulation 12.4.7.2.3

Regulation 12.4.7.4 to read as follows:

12.4.7.4

Duration of sunshine and radiation data

12.4.7.4.1

The symbolic expression SSS shall be used to report the daily sunshine in hours and tenths of an hour. The symbolic expression SS (in group 553SS) shall be used to report duration of sunshine in the past hour in tenths of an hour.

Add new Regulations 12.4.7.4.3, 12.4.7.4.4 and 12.4.7.4.5 as follows:

12.4.7.4.3

When the group $5j_1j_2j_3j_4$ has the form 553SS the supplementary group(s) j_5FFFF may take one or more of the following forms:

$j_5 = 0$: FFFF = Positive net radiation during the previous hour in KJ m^{-2}.

$j_5 = 1$: FFFF = Negative net radiation during the previous hour in KJ m^{-2}.

$j_5 = 2$: FFFF = Global solar radiation during the previous hour in KJ m^{-2}.

$j_5 = 3$: FFFF = Diffuse solar radiation during the previous hour in KJ m^{-2}

$j_5 = 4$: FFFF = Downward long-wave radiation during the previous hour in KJ m^{-2}.

$j_5 = 5$: FFFF = Upward long-wave radiation during the previous hour in KJ m^{-2}.

$j_5 = 6$: FFFF = Short-wave radiation during the previous hour in KJ m^{-2}.

$j_5 = 7$: FFFF = Net short-wave radiation during the previous hour in KJ m^{-2}.

$j_5 = 8$: FFFF = Direct solar radiation during the previous hour in KJm^{-2}.

12.4.7.4.4

When the group $5j_1j_2j_3j_4$ has the form 55SSS the supplementary group(s) $j_5F_{24}F_{24}F_{24}F_{24}$ may take one or more of the following forms:

$j_5 = 0$: $F_{24}F_{24}F_{24}F_{24}$ = Positive net radiation during the preceding 24 hours in Jcm^{-2}.

$j_5 = 1$: $F_{24}F_{24}F_{24}F_{24}$ = Negative net radiation during the preceding 24 hours in Jcm^{-2}.

$j_5 = 2$: $F_{24}F_{24}F_{24}F_{24}$ = Global solar radiation during the preceding 24 hours in Jcm^{-2}.

$j_5 = 3$: $F_{24}F_{24}F_{24}F_{24}$ = Diffuse solar radiation during the preceding 24 hours in Jcm^{-2}.

$j_5 = 4$: $F_{24}F_{24}F_{24}F_{24}$ = Downward long-wave radiation during the preceding 24 hours in Jcm^{-2}.

$j_5 = 5$: $F_{24}F_{24}F_{24}F_{24}$ = Upward long-wave radiation during the preceding 24 hours in Jcm^{-2}.

$j_5 = 6$: $F_{24}F_{24}F_{24}F_{24}$ = Short-wave radiation during the preceding 24°hours in Jcm^{-2}.

$j_5 = 7$: $F_{24}F_{24}F_{24}F_{24}$ = Net short-wave radiation during the preceding 24 hours in Jcm^{-2}.

$j_5 = 8$: $F_{24}F_{24}F_{24}F_{24}$ = Direct solar radiation during the preceding 24 hours in Jcm^{-2}.

12.4.7.4.5

FFFF shall indicate the absolute value of the amount of solar or terrestial radiation as appropriate in KJm^{-2} during the preceding hour. $F_{24}F_{24}F_{24}F_{24}$ shall indicate the absolute value of the amount of solar or terrestial radiation as appropriate in Jcm^{-2} during the preceding 24 hours at either 0000, 0600, 1200 or 1800 UTC.

Specification of Symbolic Letters

FFFF Amount of radiation, in kilo joules per square metres over a 1 hour period.
(FM 12-IX Ext., FM 13-IX Ext.)

$F_{24}F_{24}F_{24}F_{24}$ Amount of radiation, in joules per square centimetre over a 24 hour period.
(FM 12-IX Ext., FM 13-IX Ext.)

SS Duration of sunshine, in the past hour in tenths of an hour.
(FM 12-IX Ext., FM 13-IX Ext.)

CODE TABLES

Code table 2061 (a)

Under j_1 = 5 delete ...."daily hours of"

Code table 2061 (b)

Against Code figure 5:

Under j_5 change - Indicator of type of solar or terrestial radiation (Code figures 0 - 8 used, 9 not used).

Under j_6 add - Thousands figure of solar or terrestial radiation.

Under j_7 add - Hundreds figure of solar or terrestial radiation.

Under j_8 add - Tens figure of solar or terrestial radiation.

Under j_9 add - Units figure of solar or terrestial radiation.

Change footnote to read "in case of j_1 = 5, see Regulation 12.4.7.4".

CODE FORM

Replace group 9hh// in Section 1 of SYNOP/SHIP code with group 9GGgg

Regulations

12.2.8

Change Regulation 12.2.8 to read as follows:

Group 9GGgg

This group shall be included:

(a) When the actual time of observation differs by more than ten minutes from the standard time GG reported in Section 0.

(b) When additionally specified by regional decision.

NOTE: See note to Regulation 12.1.6.

PROPOSED AMENDMENTS TO FM 12-IX SYNOP RELATED
CODE TABLES 0264 AND 3778

(1) Proposed minor amendments to Specification of Code Tables 0264 and 3778.

Add the following new specifications under the relevant code tables.

3778

$S_PS_Ps_ps_p$ - Supplementary information.

.
.
.
.

Decile 20-29: State of the sea, icing phenomena and snow cover

.
.
.
.

$925T_wT_w$ Water temperature at resorts during the bathing season

.
.
.
.

0264

a_3- Standard isobaric surface for which the geopotential is reported

Code figure

.
.
.
.

2 925 hPa

Rec. 14 (CBS-Ext.(90)) - PROPOSED RENAMING AND EXTENSION OF FM 42-ASDAR TO FM 42-AMDAR - AIRCRAFT REPORT (AIRCRAFT METEOROLOGICAL DATA RELAY) WITH A NEW SECTION 3

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 5 (CBS-IX) - Working Group on Data Management (DM),

(2) The final report of the first session of the CBS Working Group on Data Management Sub-group on Codes, general summary, paragraphs 4.3,

(3) The final report of the first session of the CBS Working Group on Data Management, general summary, paragraph 4.2.3,

CONSIDERING that there is a need for expansion of the ASDAR code, to transmit automatic reports from aircraft by VHF relay and other satellite or communications system,

RECOMMENDS that the FM 42-ASDAR code be renamed FM 42-AMDAR - Aircraft report (Aircraft Meteorological Data Relay) with a new Section 3 as given in the annex* to this recommendation, be adopted for use from 1 November 1991;

REQUESTS the Secretary-General to arrange for the inclusion of renamed Code FM 42-AMDAR in Volume I of the Manual on Codes.

Annex to Recommendation 14 (CBS-Ext.(90))

PROPOSED RENAMING AND EXTENSION OF FM 42-ASDAR TO FM 42-AMDAR AIRCRAFT REPORT (AIRCRAFT METEOROLOGICAL DATA RELAY) WITH A NEW SECTION 3

Code form FM 42-AMDAR

Delete brackets around $(SST_dT_dT_d$
$(or$
$(UUU$

Add new Section 3, to read:

"Section 3 333 $\underline{F}h_dh_dh_d$ $\underline{VG}f_gf_gf_g$"

1. Replace code word ASDAR by AMDAR (Aircraft Meteorological Data Relay)

2. Code form, note (1) to read: "AMDAR is the name of a code for an automatic meteorological report from an aircraft."

3. Code form, note (2) to read: "Observations are made at specified levels, time intervals or when the highest wind is encountered, and shall be included in individual reports."

4. Regulation 42.1.2.1, to read: "Subject to Regulation 42.1.2.2, an AMDAR report shall include Section 2 containing at least the phase of flight indicator, the aircraft identifier, its geographical location and the time of observation, as well as the observed temperature and wind."

5. New Regulation 42.1.2.2, to read: "An AMDAR report from an ASDAR system shall include all data groups contained in Section 2, "and shall not include Section 3."

6. New Regulation 42.1.2.3, to read: An AMDAR report from an ACARS system shall include Section 3.

7. Renumber current Regulation 42.1.2.2 to 42.1.2.4.

8. Regulation 42.2, to read: "Section 2".

9. Regulation 42.2 to be renumbered Regulation 42.2.1, and following regulations accordingly.

10. In Regulation 42.2.2.3 (old 42.3.3), first line after "observation" insert "from an ASDAR system".

11. Add new regulations:

42.3

Section 3

42.3.1

Group $\underline{F}h_dh_dh_d$

This group shall be used in an AMDAR report from an ACARS system to report the pressure altitude

Note: Reports up to and including 700 hPa are considered to be above the aerodrome with height derived from the QNH - value and the elevation of the aerodrome concerned. Heights above 700 hPa are included in accordance with the ICAO standard atmosphere.

42.3.2

Group $\underline{VG}f_gf_gf_g$

This group shall be used in an AMDAR report from an ACARS system to report the maximum derived equivalent vertical gust.

Notes: (1) The qualitative severity of turbulence can be related approximately to values of derived equivalent gust velocity as follows:

U_{de}	< 2m/s	2-4.5m/s	4.5-9m/s	> 9m/s
Severity	Nil	Light	Heavy	Severe

(2) The derived equivalent vertical gust, U_{de}, is defined by aircraft design codes such as the US Federal Aviation Regulations part 25.341, or the Engineering Sciences Data Unit (London, United Kingdom), Data Item 69023.

Part B.a

F (2nd specification) Indicator letter for flight level in hundreds of feet (FM 42-IX Ext.)

VG Indicator letters for vertical gust

Part C

Change first specification s_2, to read:

"Type of system used. (Code table 3867) (FM 42-IX Ext.)"

Insert following specification:

"$h_dh_dh_d$ flight level in hundreds of feet

$f_gf_gf_g$ maximum derived equivalent vertical gust, in tenths of ms^{-1}"

Part D

Code table 3867, to read:

s_2 – Type of system used

Code figure	System used
0	ASDAR
1	ASDAR (ACARS also available but not operative)
2	ASDAR (ACARS also available and operative)
3	ACARS
4	ACARS (ASDAR also available but not operative)
5	ACARS (ASDAR also available and operative)

Rec. 15 (CBS-Ext.(90)) – PROPOSED FM 15-IX EXT. METAR, FM 16-IX EXT. SPECI, FM 51-IX EXT. TAF, FM 53-IX EXT. ARFOR AND FM 54-IX EXT. ROFOR

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 5 (CBS-IX) – Working Group on Data Management (DM),

(2) The final report of the first session of the CBS Working Group on Data Management Sub-group on Codes, general summary, paragraphs 5.1,

(3) The final report of the first session of the CBS Working Group on Data Management, general summary, paragraph 4.2.3,

CONSIDERING:

(1) That with the development of the aviation industry the operational requirements of aviation have likewise been changing,

(2) That ICAO has submitted updated operational requirements which require general revision of aeronautical codes,

(3) That proposals for general revision of aeronautical codes have been extensively reviewed by CAeM and CBS expert groups with participation and endorsement of aeronautical user organizations,

RECOMMENDS that the proposed codes FM 15-IX Ext. METAR, FM 16-IX Ext. SPECI, FM 51-IX Ext. TAF, FM 53-IX Ext. ARFOR and FM 54-IX Ext. ROFOR, given in the annex to this recommendation be adopted for use as from 1 July 1993 in lieu of existing aeronautical codes;

REQUESTS the Secretary-General to arrange for the inclusion of the revised aeronautical codes in Volume I of the Manual on Codes.

Annex to Recommendation 15 (CBS-Ext.(90))

PROPOSED FM 15-IX EXT. METAR, FM 16-IX EXT. SPECI
FM 51-IX EXT. TAF, FM 53-IX EXT. ARFOR AND FM 54-IX EXT. ROFOR

<u>FM 15-IX EXT. METAR - Aviation routine weather report (with or without trend forecast)</u>

<u>FM 16-IX EXT. SPECI - Aviation selected special weather report (with or without trend forecast)</u>

CODE FORM

(<u>METAR</u> (or (<u>SPECI</u>	CCCC	GGgg<u>Z</u>	$dddffGf_mf_m$	(<u>KMH</u> or (<u>KT</u> or (<u>MPS</u>	$d_nd_nd_n\underline{V}d_xd_xd_x$

$(VVVVD_v$ (or (<u>CAVOK</u>	$V_xV_xV_xV_xD_v$	$(\underline{R}D_RD_R/V_RV_RV_RV_Ri$ (or $(\underline{R}D_RD_R/V_RV_RV_RV_R\underline{V}V_RV_RV_RV_Ri$	w'w'	(ww)	$(N_sN_sN_sh_sh_sh_s$ (or $(\underline{VV}h_sh_sh_s$

$T'T'/T'_dT'_d$	$QP_HP_HP_HP_H$	(<u>WS</u> <u>TKOF</u> $\underline{RWY}D_RD_R$ (and/or (<u>WS</u> <u>LDG</u> $\underline{RWY}D_RD_R$	<u>RE</u>w'w'

((TTTTT ((or ((<u>NOSIG</u>)	TTGGgg	$dddff\underline{G}f_mf_m$	(<u>KMH</u> or (<u>KT</u> or (<u>MPS</u>	(VVVV (or (<u>CAVOK</u>	(w'w' (or (<u>NSW</u>	$(N_sN_sN_sh_sh_sh_s$ (or $\underline{VV}h_sh_sh_s$ (or <u>SKC</u>

NOTES:

(1) METAR is the name of the code for an aviation routine weather report SPECI is the name of the code for an aviation selected special weather report. A METAR report and a SPECI report may have a trend forecast appended.

(2) The groups contain a non-uniform number of characters. When an element or phenomenon does not occur, the corresponding group, or the extension of a group is omitted from a particular report. Detailed instructions are given for each group in the following Regulations. The groups enclosed in brackets are used in accordance with regional or national decisions. Groups may have to be repeated in accordance with the detailed instructions for each group.

(3) The code form includes a section containing the trend forecast identified either by a change indicator (TTTTT = BECMG or TEMPO as the case may be), or by the code word NOSIG.

(4) The governing criteria for issuing SPECI reports are specified in publication WMO-No. 49, Technical Regulations [C.3.1.].

REGULATIONS

15.1

General

15.1.1

The code name METAR or SPECI shall be included at the beginning of an individual report followed by the location indicator of the observing station and the time of observation. In the case of a meteorological bulletin, which may consist of more than one METAR report, the code name METAR followed by standard time of observation shall be included in the first line of the text of the bulletin.

15.1.2

When a deterioration of one weather element is accompanied by an improvement on another element (for example, lowering of clouds and an improvement in visibility), a single SPECI report shall be issued.

15.2

Group CCCC

The identification of the reporting station in each individual report shall be indicated by means of the ICAO location indicator.

15.3

Group GGgg$\underline{Z}$

15.3.1

The time of observation in hours and minutes UTC followed without a space by the letter indicator Z shall be included in individual METAR reports within a bulletin of more than one report:

(a) If the actual time of observation deviates by more than 10 minutes from the official time of observation included as the first line of the text of the bulletin; or

(b) In accordance with the requirements established by the authorities concerned.

15.3.2

This group shall always be included in individual SPECI reports within a bulletin of more than one report. In SPECI reports this group shall indicate the time of occurrence of the change(s) which justified the issue of the report.

15.4

	(KMH or	
Group dddff$\underline{G}f_mf_m$	(KT or	$d_nd_nd_n\underline{V}d_xd_xd_x$
	(MPS	

15.4.1

The mean true direction in degrees rounded off to the nearest ten degrees from which the wind is blowing and mean speed of the wind over the ten-minute period immediately preceding the observation shall be reported for dddff followed, without a space, by one of the abbreviations KMH, KT or MPS, to specify the unit used for reporting wind speed. Values of wind direction less than 100° shall be preceded by 0 and a wind from true north shall be reported as 360. Values of wind speed less than ten units shall be preceded by 0. However, when the ten-minute period includes a marked discontinuity in the wind characteristics, only data after the discontinuity shall be used for obtaining mean wind speed and maximum gust values and mean wind direction and variations of the wind direction hence the time interval in these circumstances shall be correspondingly reduced.

NOTES:

(1) KMH, KT and MPS are the standard ICAO abbreviations for kilometres per hour, knots and metres per second, respectively.

(2) The unit of wind speed used is determined by national decision. However, the primary unit prescribed in ICAO Annex 5 for wind speed is the kilometre per hour (KMH), with the knot (KT) permitted for use as a non-SI alternative unit until a termination date is decided - subject to a decision which is currently under review by ICAO.

(3) A marked discontinuity occurs when there is a sustained change in wind direction of 30 or more, with a wind speed of 20 km/h (10 kt) before or after the change, or a change in wind speed of 20 km/h (10 kt) or more, lasting at least two minutes.

15.4.2

In the case of variable wind direction, ddd shall be encoded as VRB when the mean wind speed is 3kts (2 m s^{-1} or 6 km h^{-1}) or less. A variable wind at higher speeds shall be reported only when it is impossible to determine a single wind direction, for example when a thunderstorm passes over the aerodrome.

15.4.3

If during the ten-minute period preceding the observation, the total variation in wind direction is 60° or more and the mean wind speed is greater than 3kts (2 m s^{-1} or 6 km h^{-1}), the observed two extreme directions between which the wind has varied shall be given for $d_nd_nd_n\underline{V}d_xd_xd_x$ in clock-wise order. Otherwise this group shall not be included.

15.4.4

"Calm" shall be coded as 00000 followed immediately, without space, by one of the abbreviations KMH, KT or MPS to specify the unit, used normally for reporting wind.

15.4.5

If, during the ten-minute period preceding the observation, the maximum wind gust speed exceeds the mean speed by 10 knots (5 m s^{-1} or 20 km h^{-1}) or more, this maximum speed shall be reported as $\underline{G}f_mf_m$ immediately after dddff, followed immediately, without space, by one of the abbreviations KMH, KT or MPS to specify the units used for reporting wind speed. Otherwise the element $\underline{G}f_mf_m$ shall not be included.

NOTE:

It is recommended that the wind measuring systems should be such that peak gusts should represent a three second average.

15.4.6

For wind speeds of 100 units or greater, the exact number of wind speed units shall be given in lieu of the two-figure code ff or f_mf_m.

15.5

Groups $VVVVD_v$ $V_xV_xV_xV_xD_v$

15.5.1

When no marked directional variation in the horizontal visibility is observed, visibility shall be given as VVVV and D_v shall not be included.

NOTE:

Directional variations of visibility are not considered to be marked unless the differences are at least 50% of the minimum visibility and are not required to be indicated when the minimum value is 5000 metres or more.

15.5.2

When the horizontal visibility is not the same in all directions, the minimum visibility shall be given for VVVV followed without a space by D_v consisting of one or two letters to indicate the general direction of the visibility reported as one of the eight points of the compass (N, NE etc.). If the lowest visibility is observed in more than one direction, then D_v shall represent the most operationally significant direction. Significant directional differences from the reported visibility shall be reported in accordance with Regulation 15.5.3.

15.5.3

Directional variation in visibility $V_xV_xV_xV_xD_v$

When minimum visibility, reported in accordance with Regulation 15.5.2 and the note to Regulation 15.5.1, is less than 1500 metres while visibility in another direction is more than 5000 metres, the group $V_xV_xV_xV_xD_v$ shall be used to report the value and direction of the maximum visibility. Otherwise this group shall not be included.

15.5.4

Horizontal visibility shall be reported using the following reporting steps:

(a) Up to 500 metres rounded down to the nearest 50 metres;

(b) Between 500 and 3000 metres rounded down to the nearest 100 metres;

(c) Between 3000 and 5000 metres rounded down to nearest 500 metres;

(d) Between 5000 metres up to 9999 metres rounded down to nearest 1000 metres;

(e) With 9999 indicating 10 km and above.

15.5.5

Letter group CAVOK;
Regulation 15.10 shall apply.

15.6

Groups $(\underline{R}D_RD_R/V_RV_RV_RV_Ri$

(or

$(\underline{R}D_RD_R/V_RV_RV_RV_R\underline{V}V_RV_RV_RV_Ri$

15.6.1

During periods when either the horizontal visibility or the runway visual range for one or more runways available for landing is observed to be less than 1500 metres, one or more groups under Regulation 15.6 shall be included in the report. The letter indicator R followed immediately without a space by the runway designator D_RD_R shall always precede the RVR reports.

15.6.2

The groups shall be repeated to report runway visual range values for each runway which is available for landing and for which runway visual range is determined.

15.6.3

Runway designator D_RD_R

15.6.3.1

The designator of each runway for which runway visual range is reported shall be indicated by D_RD_R. Parallel runways should be distinguished by appending to D_RD_R letters L, C or R indicating the left, central or right parallel runway, repectively. A suitable combination of these letters is used for up to, and including, five parallel runways (i.e. LL, L, C, R, RR). The letter(s) shall be appended to D_RD_R as necessary in accordance with the standard practice for runway designation, as laid down by ICAO.

15.6.4

Mean value and tendency of runway visual range over the ten-minute period immediately preceding the observation $V_RV_RV_RV_Ri$.

15.6.4.1

The runway visual range values to be reported shall be representative of the touchdown zone of the runway concerned.

15.6.4.2

The mean value of the runway visual range over the ten-minute period immediately preceding the observation shall be reported for $V_RV_RV_RV_R$. However, when the ten-minute period includes a marked discontinuity in the RVR (for example sudden advection of fog, rapid onset or cessation of an obscuring snow shower), only data after the discontinuity shall be used for obtaining mean RVR values and variations thereof, hence the time interval in these circumstances shall be correspondingly reduced.

NOTES:

(1) See Regulation 15.6.5.1.

(2) Any observed value which does not fit the reporting scale in use should be rounded down to the nearest lower step in the scale.

(3) A marked discontinuity occurs when there is a sustained change in runway visual range, lasting at least two minutes, consistent with the issuance of selected special reports given in Technical Regulation [C.3.1.] 4.3.3.

15.6.4.3

If the runway visual range values during the ten-minute period preceding the observation show a distinct increasing or decreasing tendency such that the mean during the first five minutes varies by 100 m or more from the mean during the second five minutes of the period. This shall be indicated by i = U for increasing and i = D for decreasing runway visual range values. When no distinct change in runway visual range is observed i = N shall be used. When it is not possible to determine the tendency, i shall be omitted.

NOTE:

Normally RVR tendency U and D should be reported only when the general change over the ten-minute period is 50 metres or more.

15.6.5

Significant variations of runway visual range
$\underline{R}D_RD_R/V_RV_RV_RV_R\underline{V}V_RV_RV_RV_Ri$

15.6.5.1

When the RVR at a runway varies significantly and when during the ten-minute period preceding the nominal observation time the one-minute mean extreme values assessed vary from the mean value by more than 50 metres or more than 20% of the mean value, whichever is greater, the one-minute mean minimum and the one-minute mean maximum values shall be given in that order in the form $\underline{R}D_RD_R/V_RV_RV_RV_R\underline{V}V_RV_RV_RV_Ri$ instead of the ten-minute mean. Extreme RVR values shall be reported in accordance with Regulation 15.6.6.1 and the tendency shall be indicated in accordance with Regulation 15.6.4.3.

15.6.6

Extreme values of runway visual range

15.6.6.1

When actual RVR values are outside the measuring range of the observing system in use, the following procedure shall apply:

(a) When the RVR, to be reported in accordance with the Technical Regulations, is greater than the maximum value which can be assessed with the system in use, the group $V_RV_RV_RV_R$ shall be preceded by the letter indicator $\underline{P}$ ($\underline{P}V_RV_RV_RV_R$) in which $V_RV_RV_RV_R$ is the highest value which can be assessed. When the RVR is assessed to be more than 1600 metres it shall be reported as P1600;

(b) When the RVR is below the minimum value which can be assessed with the system in use, the group $V_RV_RV_RV_R$ shall be preceded by the letter indicator $\underline{M}$ ($\underline{M}V_RV_RV_RV_R$) in which $V_RV_RV_RV_R$ is the lowest value which can be assessed. When the RVR is assessed to be less than 50 metres it shall be reported as M0050.

15.7

Group w'w'

15.7.1

One or more groups w'w', but not more than three, shall be used to report all present weather phenomena observed at or near the aerodrome and of significance to aeronautical operations in accordance with Code Table 4678.

Appropriate intensity indicators and letter abbreviations (Code table 4678) shall be combined in groups of two to nine characters to indicate present weather phenomena.

15.7.2

If the observed present weather cannot be reported by use of Code table 4678, the group w'w' shall be omitted from the report.

15.7.3

The w'w' groups shall be ordered as follows:

(a) First, if appropriate, the qualifier for intensity <u>or</u> for proximity, followed without a space by;

(b) If appropriate, the abbreviation for the descriptor followed without a space by;

(c) The abbreviation for the observed weather phenomenon or combinations thereof.

15.7.4

If the intensity of the phenomena reported in the group is either light or heavy, this shall be indicated by the appropriate sign (Code table 4678). No indicator shall be included in the group:

(a) When the intensity of the reported phenomenon is moderate;

(b) When an intensity indication is not relevant.

15.7.5

The intensity of present weather phenomena reported in the group w'w' shall be determined by the intensity at the time of observation.

15.7.6

If more than one significant weather phenomenon is observed, separate w'w' groups shall be included in the report in accordance with Code table 4678. However, if more than one form of precipitation is observed, the appropriate letter abbreviations shall be combined in a single group with the dominant type of precipitation being reported first. In such a single group, the intensity shall refer to the total precipitation and be reported with one or no indicator as appropriate.

15.7.7

The qualifier SH shall be used to indicate precipitation of the shower type. When associated with the indicator VC, the type and intensity of precipitation shall not be specified.

NOTE: Showers are produced by convective clouds. They are characterized by their abrupt beginning and end and by the generally rapid and sometimes great variations in the intensity of the precipitation. Drops and solid particles falling in a shower are generally larger than those falling in non-showery precipitation. Between showers, openings may be observed unless stratiform clouds fill the intervals between the cumuliform clouds.

15.7.8

The qualifier TS shall be used to report the occurrence of a thunderstorm whenever thunder is heard within the ten-minute period preceding the time of the report. When appropriate, TS shall be followed immediately, without space, by relevant letter abbreviations to indicate any precipitation observed. The letter abbreviation TS on its own shall be used to report a thunderstorm at the aerodrome but no precipitation observed.

NOTE: A thunderstorm shall be regarded as being at the aerodrome from the time thunder is first heard, whether or not lightning is seen or precipitation is observed at the aerodrome. A thunderstorm shall be regarded as having ceased or being no longer at the aerodrome at the time thunder is last heard, and the cessation is confirmed if thunder is not heard for ten minutes after this time.

15.7.9

The qualifier FZ shall be used only to indicate supercooled water droplets or supercooled precipitation.

NOTES:

(1) Any fog consisting predominantly of water droplets at temperatures below 0°C shall be reported as freezing fog (FZFG) whether it is depositing rime ice or not.

(2) Whether or not the supercooled precipitation is of the shower type shall not be specified.

15.7.10

The qualifier VC shall be used to indicate the following significant weather phenomena observed in the vicinity of the aerodrome: FG, FC, SH, PO, BLDU, BLSA and BLSN. Regulations referring to the combination of VC and FG are given in 15.7.17.

NOTES:

(1) Such weather phenomena should be reported with the qualifier "VC" only when observed within 8 kilometres of the aerodrome but not at the aerodrome.

(2) See Regulation 15.7.7.

15.7.11

The letter abbreviation GR shall be used to report hail only when the diameter of the largest hailstones observed is 5 mm or more. The letter abbreviation GS shall be used to report small hail (diameter of the hailstones less than 5 mm) and/or snow pellets.

15.7.12

The letter abbreviation IC shall be used to indicate the phenomenon diamond dust (ice crystals). For w'w' = IC to be reported, the visibility shall be reduced by this phenomenon to 3000 metres or less.

15.7.13

The letter abbreviations FU, HZ, DU and SA (except DRSA) shall be used only when the obstruction to vision consists predominantly of lithometeors and the visibility is reduced by the reported phenomenon to 3000 metres or less.

15.7.14

The letter abbreviation BR shall be used when the obstruction to vision consists of water droplets or ice crystals; for w'w' = BR to be reported the visibility shall be at least 1000 metres but not more than 3000 metres.

15.7.15

The letter abbreviation FG shall be used when the obstruction to vision consists of water droplets or ice crystals (fog or ice fog). For w'w' = FG to be reported without the qualifiers MI, BC or VC the visibility shall be less than 1000 metres.

15.7.16

For w'w' = MIFG to be reported; the visibility at two metres above ground level shall be 1000 metres or more and the apparent visibility in the fog layer shall be less than 1000 metres.

15.7.17

The letter abbreviation VCFG shall be used to report any type of fog observed in the vicinity of the aerodrome.

15.7.18

The letter abbreviation BCFG shall be used to report fog patches or fog covering part of the aerodrome; the apparent visibility in the fog patch or bank shall be less than 1000 metres, the fog extending to at least two metres above ground level.

NOTE: BCFG should be used only when the visibility in parts of the aerodrome is 1000 metres or more although when the fog is close to the observing point, the minimum visibility reported by $VVVV/D_v$ will be less than 1000 metres.

15.7.19

The letter abbreviation SQ shall be used to report squalls when a sudden increase in wind speed is observed of at least 16 knots (32 km h^{-1}, 8 m s^{-1}), the speed rising to 22 knots (44 km h^{-1}, 11 m s^{-1}) or more and lasting for at least one minute.

15.7.20

Regulation 15.10 applies

15.8

Group (ww)

15.8.1

To meet basic meteorological data requirements the optional group ww may be included by national decision, to report the present weather as it would be coded in a surface synoptic observation, using Code table 4677.

NOTE: As ww meets basic data requirements and w'w' aeronautical requirements they may stress different aspects of the observed weather.

15.9

Group ($N_sN_sN_sh_sh_sh_s$
(or
($\underline{VV}h_sh_sh_s$

15.9.1

Cloud amount and cloud height $N_sN_sN_sh_sh_sh_s$

The cloud amount $N_sN_sN_s$ shall be reported as scattered (1 to 4 oktas), broken (5 to 7 oktas) or overcast (8 oktas), using the three letter abbreviations 'SCT', 'BKN' and 'OVC' followed without a space by the height of the base of the cloud layer (mass) $h_sh_sh_s$.

15.9.2

The amount of each cloud layer (mass) shall be determined as if no other clouds were existing.

15.9.3

The cloud group shall be repeated to report different layers or masses of cloud. The number of groups shall not exceed three, except that significant convective clouds, when observed, shall always be reported.

NOTE: The following clouds shall be reported as significant convective clouds:

(a) Cumulonimbus cloud (CB)

(b) Cumulus congestus of great vertical extent (TCU). The contraction TCU, taken from the term "towering cumulus" is an ICAO abbreviation used in aeronautical meteorology to describe this cloud.

15.9.4

The selection of layers or masses of cloud to be reported shall be made in accordance with the following criteria:

1st group: The lowest individual layer (mass) of any amount, to be reported as SCT, BKN or OVC.

2nd group: The next individual layer (mass) covering more than two oktas, to be reported as SCT, BKN or OVC.

3rd group: The next higher individual layer (mass) covering more than four oktas, to be reported as BKN or OVC.

Additional groups: Significant convective clouds (CB or TCU) when observed and not already reported in one of the three groups above.

The order of reporting the groups shall be from lower to higher levels.

15.9.5

The height of the base of the cloud layer (mass) shall be reported in increments of 30 metres (100 ft) in the form of $h_sh_sh_s$.

NOTE: See note (2) to Regulation 15.6.4.2

15.9.6

At mountain stations, when the cloud base is below station level, the cloud group shall read $N_sN_sN_s$///.

15.9.7

Types of cloud other than significant convective clouds shall not be identified. Significant convective clouds, when observed, shall be identified by appending the letter abbreviations CB (cumulonimbus) or TCU (cumulus congestus of great vertical extent), as appropriate, to the cloud group without a space.

NOTE: When an individual layer mass of cloud is composed of cumulonimbus and towering cumulus clouds with a common cloud base, the type of cloud should be reported as cumulonimbus only.

15.9.8

Vertical visibility $\underline{VV}h_sh_sh_s$.

When the sky is obscured and information on vertical visibility is available, the group $\underline{VV}h_sh_sh_s$ shall be reported, where $h_sh_sh_s$ is the vertical visibility in units of 30 m (hundreds of feet). When information on vertical visibility is not available, the group shall read $\underline{VV}$///.

NOTES:

(1) The vertical visibility is defined as the vertical visual range into an obscuring medium.

(2) See note (2) to Regulation 15.6.4.2

15.9.9

Regulation 15.10 shall apply.

15.10

Code word CAVOK

The code CAVOK shall be included in place of the groups under Regulations 15.6, 15.7 and 15.9 when the following conditions occur simultaneously at the time of observation:

(a) Visibility: 10 km or more;

(b) No cloud below 1500 metres (5000 ft) or below the highest minimum sector altitude, whichever is greater, and no Cumulonimbus;

(c) No precipitation, thunderstorm, sandstorm, duststorm, shallow fog or low drifting dust, sand or snow.

NOTE: Highest minimum sector altitude is defined in ICAO PANS-OPS, Part 1 - Definitions, as the lowest altitude which may be used under emergency conditions which will provide a minimum clearance of 300 metres (1000 ft) above all objects located in an area contained within a sector of a circle of 46 km (25 nautical miles) radius centred on a radio aid to navigation.

15.11

Group $T'T'/T'_dT'_d$

15.11.1

The observed air temperature and dew-point temperature rounded to the nearest whole degree Celsius shall be given for $T'T'/T'_dT'_d$. Observed values involving .5°C shall be rounded up to the next higher Celsius degree.

15.11.2

Rounded whole degree values of air temperature and dew-point temperature of -9°C to +9°C shall be preceded by 0; for example +9°C shall be reported as 09.

15.11.3

Temperatures below 0°C shall be immediately preceded by M, that is minus; for example -9°C shall be reported as M09 and -0.5°C shall be reported as M00.

15.12

Group $QP_HP_HP_HP_H$

15.12.1

The observed QNH value rounded down to the nearest whole hectopascal shall be given for $P_HP_HP_HP_H$ preceded without a space by the letter indicator Q.

15.12.2

If the value of QNH is less than 1000 hPa, it shall be preceded by 0; for example, QNH 995.6 shall be reported as Q0995.

NOTES:

(1) When the first digit following the letter indicator Q is either 0 or 1 the QNH value is reported in the unit hectopascal (hPa).

(2) The unit prescribed by ICAO Annex 5 for pressure is the hectopascal. However, if by national decision and in accordance with requirements established by the authorities concerned, inches of mercury are used as the unit for QNH, the group shall be preceded by the letter A (instead of Q), followed by the value in inches, tens and hundreds of inches but without the decimal point. For example QNH 29.91 ins shall be given as A2991, QNH 30.27 ins shall be given as A3027. When the QNH value is reported in the unit of inches of mercury the first digit following the letter indicator A is either 2 or 3.

15.13

Supplementary information

	(WS TKOF RWYD_RD_R ((and/or ((WS LDG RWYD_RD_R	
Groups		REw'w'

15.13.1

For international dissemination, the section on supplementary information shall be used only to report available information on wind shear in the lower layers and recent weather phenomena of operational significance.

15.13.2

Wind shear in the lower layers	(WS TKOF RWYD_RD_R ((and/or ((WS LDG RWYD_RD_R

Recent information on the existence of wind shear along the take-off path or approach path between runway level and 500 metres (1600 ft) significant to aircraft operations shall be reported whenever available and local circumstances so warrant using either or both of the two sets of these groups.

NOTE: Concerning runway designator D_RD_R, Regulation 15.6.3.1 applies.

15.13.3

Recent weather phenomena of operational significance REw'w'.

15.13.3.1

Information on recent weather shall be given by the indicator letters "RE" followed without a space by the appropriate abbreviations in accordance with Regulation 15.7 if the following weather phenomena were observed during the hour since the last routine report, but not at the time of observation:

- Freezing precipitation;
- Moderate or heavy rain or snow;
- Moderate or heavy ice pellets, hail, small hail or snow pellets;
- Moderate or heavy blowing snow;
- Sandstorm or duststorm;
- Thunderstorm;
- Volcanic ash.

15.13.3.2 Weather shall only be included as recent weather if the same phenomenon (disregarding character of precipitation) of the same or greater intensity is not reported as present weather. For example a heavy rainshower 20 minutes before the time of observation, with moderate rain at the time of observation, shall be coded RERA. However, moderate rain 20 minutes before the time of observation, with a moderate rainshower at the time of observation, shall not be reported as recent weather.

15.13.4

Supplementary information other than specified by Regulations 15.13.2 and 15.13.3 shall be added only in accordance with regional decision.

15.14

Trend forecasts

NOTE: The governing criteria for issuing trend forecasts are specified in publication WMO-No. 49 - Technical Regulations [C.3.1.].

15.14.1

When included in METAR or SPECI reports, the trend forecast shall be in coded form.

15.14.2

When a change, required to be indicated in accordance with the governing criteria for significant changes, is expected for one or several of the observed elements, wind, horizontal visibility, present weather, clouds or vertical visibility, one of the following change indicators shall be used for TTTTT: BECMG or TEMPO.

NOTE: Where possible, values corresponding to the local operating minima should be selected to indicate changes.

15.14.3

The time group GGgg, preceded without a space by one of the letter indicators TT = FM (from) TL (until) or AT (at), shall be used as appropriate, to indicate the beginning (FM) or the end (TL) of a forecast change, or the time (AT) at which specific forecast condition(s) are expected.

15.14.4

The change indicator BECMG shall be used to describe expected changes to meteorological conditions which reach or pass specified threshold criteria at either a regular or irregular rate.

15.14.5

Changes in meteorological conditions which reach or pass specified threshold criteria for trend forecasts shall be indicated as follows:

(a) When the change is forecast to begin and end wholly within the trend forecast period: by the change indicator BECMG followed by the letter indicators FM and TL respectively with their associated time groups, to indicate the beginning and end of the change (for example, for a trend forecast period from 1000 to 1200 in the form: BECMG FM1030 TL1130);

(b) When the change is forecast to occur from the beginning of the trend forecast period and be completed before the end of that period: by the change indicator BECMG followed only by the letter indicator TL and its associated time group (the letter indicator FM and its associated time group being omitted), to indicate the end of the change (for example: BECMG TL1100);

(c) When the change is forecast to begin during the trend forecast period and be completed at the end of that period: by the change indicator BECMG followed only by the letter indicator FM and its associated time group (the letter indicator TL and its associated time group being omitted), to indicate the beginning of the change (for example: BECMG FM1100);

(d) When the change is forecast to occur at a specific time during the trend forecast period: by the change indicator BECMG followed by the letter indicator AT and its associated time group, to indicate the time of the change (for example: BECMG AT1100);

(e) When changes are forecast to take place at midnight UTC the time shall be indicated:

(i) By 0000 when associated with FM and AT;

(ii) By 2400 when associated with TL.

15.14.6

When the change is forecast to commence at the beginning of the trend forecast period and be completed by the end of that period, or when the change is forecast to occur within the trend forecast period but the time of the change is uncertain (possibly shortly after the beginning of the trend forecast period, or midway or near the end of that period), the change shall be indicated by only the change indicator BECMG (letter indicator(s) FM and TL or AT and associated time group(s) being omitted).

15.14.7

The change indicator TEMPO shall be used to describe expected temporary fluctuations to meteorological conditions which reach or pass specified threshold criteria and last for a period of less than one hour in each instance and in the aggregate cover less than half of the forecast period during which the fluctuations are expected to occur.

15.14.8

Periods of temporary fluctuations to meteorological conditions which reach or pass specified threshold criteria shall be indicated as follows:

(a) When the period of temporary fluctuations is forecast to begin and end wholly within the trend forecast period: by the change indicator TEMPO followed by the letter indicators FM and TL respectively with their associated time groups, to indicate the beginning and end of the fluctuations (for example, for a trend forecast period from 1000 to 1200 in the form: TEMPO FM1030 TL1130);

(b) When the period of temporary fluctuations is forecast to occur from the beginning of the trend forecast period but cease before the end of that period: by the change indicator TEMPO followed only by the letter indicator TL and its associated time group (the letter indicator FM and its associated time group being omitted), to indicate the cessation of the fluctuations (for example: TEMPO TL1130);

(c) When the period of temporary fluctuations is forecast to begin during the trend forecast period and cease by the end of that period: by the change indicator TEMPO followed only by the letter indicator FM and its associated time group (the letter indicator TL and its associated time group being omitted), to indicate the beginning of the fluctuation (for example: TEMPO FM1030).

15.14.9

When the period of temporary fluctuations to meteorological conditions is forecast to occur from the beginning of the trend forecast period and cease by the end of that period, the temporary fluctuations shall be indicated by only the change indicator TEMPO (letter indicators FM and TL and associated time groups being omitted).

15.14.10

Following the change groups TTTTT (TTGGgg) only the group(s) referring to the element(s) which is/are forecast to change significantly, shall be included. However, in the case of significant changes of the clouds all cloud groups including any significant layer(s) or masses not expected to change, shall be given.

15.14.11

Inclusion of significant forecast weather w'w', using the appropriate abbreviations in accordance with Regulation 15.7, shall be restricted to indicate the onset, cessation or change in intensity of the following weather phenomena:

- Freezing precipitation;
- Moderate or heavy rain, snow, ice pellets, hail, small hail, or snow pellets, rain and snow mixed;
- Drifting dust, sand or snow;
- Blowing dust, sand or snow (including duststorm or sandstorm);
- Thunderstorm (with rain, ice pellets, hail or soft hail or snow or combinations thereof);
- Squall;
- Funnel cloud (tornado or waterspout);
- Other weather phenomena given in Code table 4678 which are expected to cause a significant change in visibility).

15.14.12

To indicate the end of significant weather phenomena w'w' the abbreviation NSW (no significant weather) shall replace the group w'w'.

15.14.13

To indicate a change to clear sky the abbreviation SKC (sky clear) shall replace the groups $N_sN_sN_sh_sh_sh_s$ or $\underline{VV}h_sh_sh_s$.

15.14.14

When none of the elements listed in 15.14.2 is expected to change significantly as to require a change to be indicated, this shall be indicated by the code-word NOSIG. NOSIG (no significant change) shall be used to indicate meteorological conditions which do not reach or pass specified threshold criteria.

FM 51-IX Ext. TAF - Aerodrome Forecast

CODE FORM:

$\underline{TAF}$ $YYGGg\underline{Z}$ CCCC $G_1G_1G_2G_2$ $dddff\underline{G}f_mf_m$ ($\underline{KMH}$ or ($\underline{KT}$ or ($\underline{MPS}$

(VVVV (or ($\underline{CAVOK}$ (w'w' (or ($\underline{NSW}$ ($N_sN_sN_sh_sh_sh_s$ (or ($\underline{VV}h_sh_sh_s$ (or ($\underline{SKC}$ or $\underline{NSC}$

($\underline{T}T_FT_F/G_FG_F\underline{Z}$) ($6I_ch_ih_ih_it_L$) ($5Bh_sh_sh_st_L$)

$\underline{PROB}C_2C_2$ GGG_eG_e (TTTTT GGG_eG_e (or (TTGG

NOTES:

(1) TAF is the name of the code for an aerodrome forecast.

(2) Owing to the variability of meteorological elements in space and time, to limitations of forecasting techniques and to limitations caused by the definitions of some of the elements, the specific value of any of the elements given in a forecast shall be understood by the recipient to be the most probable value which the element is likely to assume during the period of the forecast. Similarly, when the time of occurrence or change of an element is given in a forecast, this time shall be understood to be the most probable time.

(3) The groups enclosed in brackets are used in accordance with regional air navigation agreements.

(4) Aerodrome forecasts are dealt with in publication WMO-No. 49 - Technical Regulations [C.3.1.].

REGULATIONS

51.1.1

The code name TAF shall be included at the beginning of an individual aerodrome forecast; in case of a meteorological bulletin which may consist of one or more than one aerodrome forecast, the code name TAF shall be included at the beginning of the text of the bulletin.

51.1.2

The group YYGGggZ shall be included in each individual forecast to report the date and time of origin of forecast.

51.1.3

The description of forecast conditions shall contain at least information about wind, visibility, weather and cloud or vertical visibility.

51.1.4

The forecast shall cover the period G_1G_1 to G_2G_2. The forecast period may be divided into two or more self-contained parts by the use of the time indicator group TTGG in the form of FMGG. A complete description of the forecast prevailing conditions shall be given at the beginning of the forecast or the self-contained parts designated by FMGG. If any element is expected to change significantly during the forecast period or a self-contained part thereof, one or more sets of change groups TTTTT GGG_eG_e shall be added after the complete description of the conditions prevailing before the change. Each change group shall be followed by the modified elements subject to Regulation 51.1.4.

NOTES:

(1) The governing criteria for inclusion of change groups are specified in publication WMO-No. 49 - Technical Regulations [C.3.1.].

(2) See Regulation 51.11.1.

51.1.5

The group w'w' and/or the group $N_sN_sN_sh_sh_sh_s$ or $\underline{VV}h_sh_sh_s$ shall be omitted if the corresponding element(s) is (are) expected to be absent or not significant. After change groups TTTTT GGG_eG_e, elements shall be omitted if they are not expected to differ significantly from the preceding values they possessed in the coded forecast (see Regulations 51.5.2, 51.6.7 and 51.6.9). However, in the case of a significant reduction in visibility, the weather phenomenon forecast to cause the deterioration shall also be indicated and in the case of a significant change of the clouds all cloud groups including any significant layer(s) or masses not expected to change, shall be given.

51.2

Group CCCC

51.2.1

ICAO location indicators shall be used.

51.2.2

When the same forecast in a TAF bulletin applies to more than one aerodrome, a separate forecast shall be issued for each aerodrome concerned. Only one indicator CCCC shall prefix each coded forecast.

51.3

Group dddff$\underline{G}f_mf_m$ (KMH or
(KT or
(MPS

51.3.1

The mean direction and speed of the forecast wind shall be indicated by dddff immediately followed, without a space, by one of the letter code indicators KMH, KT or MPS, as the case may be.

NOTES:

(1) KMH, KT and MPS are the standard ICAO abbreviations for kilometres per hour, knots and metres per second, respectively.

(2) The unit of wind speed used is determined by national decision. However, the primary unit prescribed in ICAO Annex 5 for wind speed is the kilometre per hour (KMH), with the knot (KT) permitted for use as a non-SI alternative unit until a termination date is decided - subject to a decision which is currently under review by ICAO.

51.3.2

Regulations 15.4.2 and 15.4.4 shall apply.

51.3.3

ddd shall normally be encoded as VRB only when the mean wind speed is 3 kts (2 m s^{-1} or 6 km h^{-1}) or less. A variable wind at higher speeds shall be indicated only when it is impossible to forecast a single wind direction.

51.3.4

When it is forecast that the maximum wind speed will exceed the mean speed by 10 knots (5 m s^{-1} or 20 km h^{-1}) or more, the maximum wind speed shall be indicated by adding $\underline{G}f_mf_m$ immediately after dddff.

NOTE: If after a change group the wind is reported again, $\underline{G}f_mf_m$ should be included, or not, in accordance with these same criteria.

51.3.5

Regulation 15.4.6 shall apply.

51.4

Group VVVV

When the horizontal visibility is forecast not to be the same in different directions, the minimum visibility shall be given for VVVV.

51.4.1

Regulation 51.7 shall apply.

51.4.2

Values to indicate forecast visibility shall be in conformity with those set out in Regulation 15.5.4.

51.5

Group w'w'

51.5.1

Inclusion of significant forecast weather w'w', using the appropriate abbreviations in accordance with Regulation 15.7, shall be restricted to indicate the occurrence of the following weather phenomena:

- Freezing precipitation;
- Moderate or heavy rain, snow, ice pellets, hail, small hail or snow pellets, rain and snow mixed;
- Low drifting dust, sand or snow;
- Blowing dust, sand or snow (including duststorm or sandstorm);
- Thunderstorm (with rain, snow, ice pellets, hail or small hail or snow pellets or combinations thereof);

- Squall;
- Funnel cloud (tornado or waterspout);
- Other weather phenomena given in Code table 4678 which are expected to cause a significant change in visibility).

51.5.2

To indicate the end of significant weather phenomena w'w' the abbreviation NSW (no significant weather) shall replace the group w'w'.

NOTE: See Regulation 51.11.3.

51.5.3.

Regulation 51.7 shall apply.

51.6

Group
(**$N_sN_sN_sh_sh_sh_s$**
(or
(VV**$h_sh_sh_s$**
(or
(SKC or NSC

51.6.1

Cloud amount and cloud height $N_sN_sN_sh_sh_sh_s$

The cloud amount $N_sN_sN_s$ shall be given as scattered (1 to 4 oktas), broken (5-7 oktas) and overcast (8 oktas), using the three letter abbreviations "SCT", "BKN" and "OVC" followed without a space by the height of the base of the cloud layer (mass) $h_sh_sh_s$.

51.6.2

Subject to Regulation 51.6.4, in any cloud group $N_sN_sN_s$ shall be the total amount of cloud that the forecaster expects to be at the level given by $h_sh_sh_s$.

51.6.3

The cloud group shall be repeated to indicate different layers or masses of cloud forecast. The number of groups shall not exceed three except that cumulonimbus clouds, when forecast, shall always be included.

51.6.4

The selection of forecast layers or masses of cloud to be included shall be made in accordance with the following criteria:

1st group: The lowest individual layer (mass) of any amount, to be indicated as SCT, BKN or OVC.

2nd group: The next individual layer (mass) covering more than two oktas, to be indicated as SCT, BKN or OVC.

3rd group: The next higher individual layer (mass) covering more than four oktas, to be indicated as BKN or OVC.

Additional groups: Cumulonimbus clouds (CB), when forecast if not already included in one of the three groups above.

The order of inclusion of the groups shall be from lower to higher levels.

51.6.5

The height of the base of forecast cloud layer (mass) shall be coded in units of 30 metres (100 ft) in the form $h_sh_sh_s$.

51.6.6

Types of forecast clouds other than cumulonimbus clouds shall not be given. Cumulonimbus clouds when expected shall be indicated by appending the letter abbreviations CB to the cloud group without a space.

51.6.7

When clear sky is forecast, the cloud group shall not be used except after a change group when the abbreviation SKC shall be used.

51.6.8

Vertical visibility $\underline{VV}h_sh_sh_s$

When the sky is expected to be obscured and information on vertical visibility is available, the group $\underline{VV}h_sh_sh_s$ shall be used in lieu of $N_sN_sN_sh_sh_sh_s$, where $h_sh_sh_s$ shall be the vertical visibility in units of 30 metres (hundreds of feet).

NOTE: See note (1) to Regulation 15.9.8.

51.6.9

When so determined by regional air navigation agreement, cloud information shall be limited to cloud of operational significance, i.e. cloud below 1500 metres (5000 ft) or the highest minimum sector altitude, whichever is greater, and cumulonimbus whenever forecast. In applying this limitation, when no cumulonimbus and no cloud below 1500 m (5000 ft) or below the highest minimum sector altitude, whichever is greater, are forecast, and CAVOK or SKC are not appropriate, the abbreviation NSC shall be used.

51.6.10

Regulation 51.7 shall apply.

51.7

Code word CAVOK

When it is expected that the following conditions will apply simultaneously, the code word CAVOK shall be included in place of the groups VVVV, w'w' and $N_sH_sN_sh_sh_sh_s$ or $\underline{VV}h_sh_sh_s$:

(a) Visibility: 10 km or more;

(b) No cloud below 1500 metres or below the highest minimum sector altitude, whichever is greater and no cumulonimbus;

(c) No precipitation, thunderstorm, duststorm, sandstorm, shallow fog or low drifting dust, sand or snow.

NOTE: See note under Regulation 15.10.

51.8

Group ($\underline{T}T_FT_F/G_FG_F\underline{Z}$)

51.8.1

To indicate forecast temperature(s) at the time indicated by $G_FG_F\underline{Z}$, one or more groups $\underline{T}T_FT_F/G_FG_F\underline{Z}$ shall be used, if required. The letter indicator $\underline{T}$ shall precede T_FT_F without a space.

51.8.2

Temperatures between -9°C and 9°C shall be preceded by 0; temperatures below 0°C shall be preceded by the letter M, that is minus.

51.9

Group ($6I_ch_ih_ih_it_L$)

51.9.1

If required, this group shall be repeated as often as necessary to indicate more than one type or more than one layer of icing.

51.9.2

If the thickness of the layer for any one type of icing is greater than 2 700 metres, the group shall be repeated and the base indicated in the second group shall coincide with the top of the layer as given in the preceding group.

51.10

Group ($5Bh_sh_sh_st_L$)

Regulations 51.9.1 and 51.9.2 regarding icing shall equally apply to turbulence.

51.11

Groups (TTTTT GGG_eG_e
(or
(TTGG

51.11.1

These groups shall be used when, during the period G_1G_1 to G_2G_2, a change in some or all of the elements forecast is expected to occur at some intermediate time GG or during the period GG to G_eG_e. Such groups shall not be introduced until all the data groups necessary to describe the elements forecast in the period G_1G_1 to GG have been given.

NOTES:

(1) If the end of the forecast period is midnight, G_eG_e should be indicated as 24.

(2) See note (1) to Regulation 51.1.4.

51.11.2

The time indicator group TTGG in the form of FMGG (from GG) shall be used to indicate the beginning of a self-contained part of the forecast indicated by GG. When the group FMGG is used, all forecast conditions given before the group FMGG are superseded by the conditions indicated after the group.

51.11.3

The change groups TTTTT GGG_eG_e in the form of BECMG GGG_eG_e shall indicate a change to forecast meteorological conditions expected to occur at either a regular or irregular rate at an unspecified time within the period GG to G_eG_e. The duration of the period GG to G_eG_e shall normally not exceed two hours and in any case shall not exceed four hours. The change groups shall be followed by a description of all the elements for which a change is forecast. When an element is not described in data groups which follow the change groups, the description of this element for the period between G_1G_1 and G_2G_2 shall be considered to remain valid subject to Regulation 51.1.5.

NOTE: The conditions described after the groups BECMG GGG_eG_e are those expected to prevail from G_eG_e until G_2G_2 unless a further change is expected, in which case a further set of change groups BECMG GGG_eG_e or FMGG must be used.

51.11.4

The change groups TTTTT GGG_eG_e in the form of TEMPO GGG_eG_e shall indicate frequent or infrequent temporary fluctuations to forecast meteorological conditions which are expected to last less than one hour in each instance and in the aggregate cover less than half of the period indicated by GGG_eG_e.

NOTES:

(1) If the modified forecast condition is expected to last one hour or more, Regulation 51.11.2 or 51.11.3 applies, i.e. the change groups BECMG GGG_eG_e or FMGG must be used at the beginning and end of the period during which conditions are expected to depart from those forecast prior to GG.

(2) To keep forecasts clear and unambiguous the use of change indicators should be carefully considered and kept to a minimum. In particular the overlapping of change periods should be avoided. At any time during the period of validity of the TAF, only one possible variation to the prevailing forecast conditions should normally be indicated. The sub-division of the forecast period by FMGG should be used to avoid too complex forecasts in cases where many significant changes to weather conditions are expected to occur throughout the forecast period.

51.12

Groups PROBC_2C_2 GGG_eG_e

51.12.1

In order to indicate the probability of occurrence of an alternative value of a forecast element, the groups PROBC_2C_2 GGG_eG_e shall be placed directly before the alternative value. For C_2C_2 only the values 30 and 40 shall be used to indicate the probabilities 30% and 40% respectively.

NOTE: A probability of less than 30% of actual values deviating from those forecast is not considered to justify the use of the group PROB. When the possibility of an alternative value is 50% or more, this should be indicated by the use of BECMG or FM as appropriate.

51.12.2

A probability statement may also be related to the occurrence of temporary fluctuations. In this case, the group PROBC_2C_2 shall be placed immediately before the change group TEMPO and the group GGG_eG_e shall be placed after TEMPO (for example PROB30 TEMPO 1216).

51.12.3

The group PROBC_2C_2 shall not be used in combination with the change indicator group BECMG or the time indicator group FMGG.

51.13

Amended aerodrome forecast.

An amended aerodrome forecast in code form shall be identified by the use of the prefix TAF AMD in place of TAF and it shall cover the whole remaining validity period of the original TAF.

FM 53-IX Ext. ARFOR - Area forecast for aviation

CODE FORM:

SECTION 1 ARFOR YYGGggZ $G_1G_1G_2G_2$ (KMH or
(KT or
(MPS

$$\text{AAAAA (VVVV)}\ (w_1w_1w_1)\ \left(\begin{array}{l}(N_sN_sN_sh_sh_sh_s \\ \text{(or} \\ (\underline{VV}h_sh_sh_s\ ) \\ \text{(or} \\ (\underline{SKC}\text{ or }\underline{NSC}\end{array}\right.$$

$7h_th_th_th_fh_fh_f$ $6I_ch_ih_ih_it_L$ $5Bh_Bh_Bh_Bt_L$
$(4h_xh_xh_xT_hT_h$ $d_hd_hf_hf_hf_h)$ $(2h'_ph'_pT_pT_p)$

SECTION 2 (11111 $QL_aL_aL_oL_o$ $h'_jh'_jf_jf_jf_j$)

SECTION 3 (22222 $h'_mh'_mf_mf_mf_m$ (d_md_mvv))

SECTION 4 $9i_3nnn$

NOTES:

(1) ARFOR is the name of the code for an aviation forecast in figure code prepared for a specific area.

(2) See Notes (2) and (3) under FM 51-IX Ext. TAF.

(3) The code form is divided into four sections as follows:

Section number	Symbolic figure group	Contents
1	-	Code identification and time groups; area forecast
2	11111	Jet-stream data (optional)
3	22222	Data of maximum wind and vertical wind shear (optional)
4	-	Supplementary phenomena

Sections 2, 3 and 4 are not transmitted separately.

REGULATIONS:

53.1

Section 1

53. 1.1

The code name ARFOR shall appear as a prefix to individual coded area forecasts, followed by the group YYGGgg$\underline{Z}$.

NOTE: See Regulation 51.1.2.

53.1.2

The group $G_1G_1G_2G_2$ shall be immediately followed, with a space, by the unit of wind speed used and indicated by one of the letter code indicators KMH, KT or MPS, as the case may be.

NOTES:

(1) KMH, KT and MPS are the standard ICAO abbreviations for kilometres per hour, knots and metres per second, respectively.

(2) The unit of wind speed used is determined by national decision. However, the primary unit prescribed in ICAO Annex 5 for wind speed is the kilometre per hour (KMH), with the knot (KT) permitted for use as a non-SI alternative unit until a termination date is decided - subject to a decision which is currently under review by ICAO.

53.1.3

Regulations 51.1.3 and 51.1.4 shall apply.

53.1.4

Group AAAAA

If, instead of plain language, a code is used for AAAAA, this code shall be subject to regional agreements.

53.1.5

Group (VVVV)

53.1.5.1

This group shall be omitted when visibility is not forecast.

53.1.5.2

Regulation 51.4.1 shall apply.

53.1.6

Group ($w_1w_1w_1$)

53.1.6.1

This group shall be used when any of the following phenomena are forecast: tropical cyclone, severe line squall, hail, thunderstorm, marked mountain waves, widespread sandstorm or duststorm, or freezing rain.

53.1.6.2

When corresponding equivalents in the form of letter abbreviations (Code table 4691) are added in accordance with regional air navigation agreements, the letter abbreviations shall immediately follow the $w_1w_1w_1$ figures without the insertion of any space.

53.1.7

($N_sN_sN_sh_sh_sh_s$
Group (or
(($\underline{VV}h_sh_sh_s$)
(or
($\underline{SKC}$ or $\underline{NSC}$

Regulations 51.6.1 to 51.6.9 inclusive shall apply.

53.1.8

Group $7h_th_th_th_fh_fh_f$

53.1.8.1

When the heights above mean sea-level of both the base and top of a number of layers are forecast, the cloud and 7-groups shall be used in pairs for each layer.

53.1.8.2

When the 0°C isotherm is forecast but no forecast is made for top of clouds, the 7-group shall have the form $7///h_fh_fh_f$. If two cloud groups are given but only one 0°C isotherm is forecast, the order of the groups shall be cloud group, 7-group, cloud group, 7-group, as indicated in 53.1.7, and the second 7-group shall be given as $7h_th_th_t///$. If one cloud group and two 0°C isotherms are forecast, the groups shall be given as cloud group, 7-group, 7-group, with the second 7-group given as $7///h_fh_fh_f$.

53.1.9

Group $6I_ch_ih_ih_it_L$

Regulations 51.9.1 and 51.9.2 shall apply.

53.1.10

Group $5Bh_Bh_Bh_Bt_L$

Regulation 51.10 shall apply.

53.1.11

Groups $(4h_xh_xh_xT_hT_hd_hd_hf_hf_hf_h)$

These groups shall always be used together and repeated for each level for which temperature and wind are forecast.

53.1.12

Group $(2h'_ph'_pT_pT_p)$

This group shall be omitted when tropopause data are not forecast.

53.2

Section 2

53.2.1

Section 2 shall be omitted when jet-stream data are not forecast.

53.2.2

The groups $QL_aL_aL_oL_o$ $h'_jh'_jf_jf_jf_j$ shall be repeated as often as necessary to indicate the position of the jet core and the wind to be encountered in the core of a jet which extends through a large portion of the area or through several zones.

53.3

Section 3

53.3.1

When the maximum wind is forecast but no forecast is made for the vertical wind shear, the last group of the section shall have the form d_md_m//.

53.3.2

When only information for vertical wind shear is to be provided, the group $h'_mh'_mf_mf_mf_m$ is omitted from the coded forecast and the group $d_md_m$vv shall have the form //vv.

53.4

Group $9i_3$nnn

53.4.1

The groups $91P_2P_2P_2$, $92F_tL_aL_a$, $93F_tL_oL_o$, $94F_t$GG, if required, shall always be placed at the end of the relevant part of the message. The groups $92F_tL_aL_a$, $93F_tL_oL_o$, $94F_t$GG shall only be used to indicate the type of front, together with the position or time of passage. The type of weather during the frontal passage shall be indicated separately, e.g. by separating the forecasts into different periods, or by using the groups $96GGG_p$ and $97GGG_p$ or by a combination of both methods.

53.4.2

A forecast shall cover the period extending from G_1G_1 to G_2G_2. A change group $96GGG_p$ or $97GGG_p$ shall be introduced when a change in some or all of the elements forecast is expected to occur at some intermediate time GG. Such a change group shall not be introduced until all the data groups necessary to describe the elements forecast in the period G_1G_1 to GG have been given. The change group shall be followed by a description of all the elements for which a change is forecast during the period G_p beginning at GG. When an element is not described in the data groups which follow the change group, the description of this element for the period between G_1G_1 and GG shall be considered to remain valid. When a group $96GGG_p$ is used, the conditions described in the data groups which follow shall be considered to remain valid after the expiration of the time G_p. When necessary, a second change group referring to conditions at a later time GG shall be used.

NOTE: Plain-language equivalents which are used for the change group $9i_3$nnn, in accordance with regional air navigation agreements, shall be those specified in Code table 1864.

53.4.3

Group $96GGG_p$

53.4.3.1

The group $96GGG_p$, with G_p set to zero (96GG0), shall be used to indicate the beginning of a self-contained part of the forecast indicated by GG. In this case, all forecast conditions given before the group 96GG0 are superseded by the conditions indicated after the group.

53.4.3.2

The group $96GGG_p$, with G_p coded 1 to 4, shall be used to indicate a change in forecast meteorological conditions expected to occur at either a regular or irregular rate at an unspecified time within the period beginning at GG and indicated by G_p. The duration of the period G_p shall normally not exceed two hours and in any case shall not exceed four hours.

53.4.4

Group $97GGG_p$

The group $97GGG_p$ shall be used to indicate frequent or infrequent temporary fluctuations to forecast meteorological conditions which are expected to last less than one hour in each instance and, in the aggregate cover, less than half of the period indicated by G_p.

NOTES:

(1) If the modified forecast condition is expected to last one hour or more, Regulation 53.4.3.1 or 53.4.3.2 applies: i.e. the change group $96GGG_p$ must be used at the beginning and end of the period during which conditions are expected to depart from those forecast prior to GG.

(2) To keep forecasts clear and unambiguous, the use of change indicators should be carefully considered and kept to a minimum. In particular, the overlapping of change periods should be avoided. At any time during the validity of the ARFOR, only one possible variation to the prevailing forecast conditions should normally be indicated. The subdivision of the forecast period by 96GG0 should be used to avoid too complex forecasts in cases where many significant changes to weather conditions are expected to occur throughout the forecast period.

53.4.5

If there is a requirement for G_p greater than GG plus nine hours, the forecast period shall be divided.

53.4.6

Group $9999C_2$

53.4.6.1

The group $9999C_2$ shall be used to indicate the probability of either the occurrence of an alternative value of a forecast element or the occurrence of temporary fluctuations.

NOTE: A probability of less than 30% of actual values deviating from those forecast is not considered to justify the use of the group $9999C_2$. When the possibility of an alternative value is 50% or more, this should be indicated by the use of a group $96GGG_p$ as appropriate.

53.4.6.2

When used to indicate the probability of occurrence of an alternative value of a forecast element, the group $9999C_2$ shall be followed immediately by an associated time group $99GGG_p$. The groups $9999C_2$ $99GGG_p$, directly placed after the forecast element concerned, shall be followed immediately by the alternative value of that element.

NOTE: See Regulation 53.4.7

53.4.6.3

When used to indicate the probability of occurrence of temporary fluctuations, the group $9999C_2$ *shall be placed immediately before the change group* $97GGG_p$.

53.4.6.4

The group $9999C_2$ shall not be used in combination with the change group $96GGG_p$.

53.4.7

Group $99GGG_p$

The group $99GGG_p$, used in combination with the probability group $9999C_2$, shall indicate the time period G_p beginning at GG that the alternative value of a forecast element may occur.

53.4.8

Plain-language equivalents which are used for change group $9i_3nnn$, in accordance with regional air navigation agreements, shall be those specified in Code table 1864.

53.5

Amended area forecast

An amended area forecast in code form shall be identified by the use of the prefix ARFOR AMD in place of ARFOR, and it shall cover the whole remaining validity period of the original ARFOR.

FM 54-IX Ext. ROFOR - Route forecast for aviation

CODE FORM:

SECTION 1 ROFOR YYGGgg$\underline{Z}$ $G_1G_1G_2G_2$ ($\underline{KMH}$ or / $\underline{KT}$ or / $\underline{MPS}$)

CCCC ($QL_aL_aL_oL_o$) CCCC $0i_2zzz$

(VVVV) ($w_1w_1w_1$) (($N_sN_sN_sh_sh_sh_s$ or ($\underline{VV}h_sh_sh_s$) or ($\underline{SKC}$ or $\underline{NSC}$)

$7h_th_th_th_fh_fh_f$ $6I_ch_ih_ih_it_L$ $5Bh_Bh_Bh_Bt_L$
$(4h_xh_xh_xT_hT_h$ $d_hd_hf_hf_hf_h)$ $(2h'_ph'_pT_pT_p)$

SECTION 2 (11111 $QL_aL_aL_oL_o$ $h'_jh'_jf_jf_jf_j$)

SECTION 3 (22222 $h'_mh'_mf_mf_mf_m$ (d_md_mvv))

SECTION 4 $9i_3nnn$

NOTES:

(1) ROFOR is the name of the code for an aviation forecast in figure code prepared for a route between two specified aerodromes.

(2) See Notes (2) and (3) under FM 51-IX Ext. TAF.

(3) The code form is divided into four sections as follows:

Section number	Symbolic figure group	Contents
1	-	Code identification and time groups; route forecast
2	11111	Jet-stream data (optional)
3	22222	Data of maximum wind and vertical wind shear (optional)
4	-	Supplementary phenomena

Sections 2, 3 and 4 are not transmitted separately.

REGULATIONS:

54.1

Section 1

54.1.1

The code name ROFOR shall appear as a prefix to individual coded route forecasts, followed by the group YYGGgg$\underline{Z}$.

NOTE: See Regulation 51.1.2.

54.1.2

The group shall be considered as valid between the hours G_1G_1 and G_2G_2 at all points or in all sections along the route.

54.1.3

The group $G_1G_1G_2G_2$ shall be immediately followed, with a space, by the unit of wind speed used and indicated by one of the letter code indicators KMH, KT or MPS, as the case may be.

NOTES:

(1) KMH, KT and MPS are the standard ICAO abbreviations for kilometres per hour, knots and metres per second, respectively.

(2) The unit of wind speed used is determined by national decision. However, the primary unit prescribed in ICAO Annex 5 for wind speed is the kilometre per hour (KMH), with the knot (KT) permitted for use as a non-SI alternative unit until a termination date is decided - subject to a decision which is currently under review by ICAO.

54.1.4

Regulations 51.1.3 and 51.1.4 shall apply.

54.1.5

In describing forecast conditions, one of the two following methods shall be used:

(a) By dividing the route into sections (i_2 = 0 to 5 inclusive) and giving the details of conditions expected during the period over the extent of each section. Five-degree zones (i_2 = 5) may be combined if weather elements are sufficiently uniform;

(b) By selecting series of points along the route (i_2 = 6 to 9 inclusive) and forecasting the conditions at these points. Sufficient points must be selected to provide an adequate sampling of the various weather and wind conditions expected along the route.

54.1.6

Route designation

54.1.6.1

The route to which the forecast applies shall be given by the international four-letter location indicators CCCC of the aerodromes at either end of the route. Where it is desirable to specify the route in greater detail, group(s) $QL_aL_aL_oL_o$ shall be included between CCCC groups to identify a sufficient number of additional points.

54.1.6.2

The forecast detail shall be given starting from the aerodrome of departure indicated by the first CCCC group.

54.1.6.3

The group $0i_2zzz$ shall be used at the beginning of the forecast for each section or point.

54.1.6.4

Regulation 51.2.1 shall apply.

54.1.7

Forecast elements

Regulations 53.1.5 to 53.1.12 inclusive shall apply.

54.2

Section 2

Regulations 53.2.1 and 53.2.2 shall apply.

54.3

Section 3

Regulations 53.3.1 and 53.3.2 shall apply.

54.4

Group $9i_3nnn$

54.4.1

Regulation 53.4.1 shall apply.

54.4.2

In addition to Regulation 53.4, the groups 951//, $952L_aL_a$, $953L_aL_a$, $954L_oL_o$, $955L_oL_o$, or the corresponding plain-language alternative terminology (see Code table 1864), shall be used if it is necessary to indicate changes along the route.

54.4.3

Regulations 53.4.2 to 53.4.8 inclusive shall apply.

54.5

Amended route forecast

An amended route forecast in code form shall be identified by the use of the prefix ROFOR AMD in place of ROFOR, and it shall cover the whole remaining validity period of the original ROFOR.

SECTION C - SPECIFICATIONS OF SYMBOLIC LETTERS (or groups of letters)

Include the following new specifications:

D_v	Direction of observation given by one or two letter indicators of the eight points of the compass (N, NE, etc.). (FM 15-IX Ext., FM 16-IX Ext.)
$d_nd_nd_n$	The extreme counterclockwise direction of a variable wind, reported with reference to true north and rounded off to the nearest 10. (FM 15-IX Ext., FM 16-IX Ext.)
$d_xd_xd_x$	The extreme clockwise direction of a variable wind, reported with reference to true north and rounded off to the nearest 10°. (FM-IX Ext., FM 16-IX Ext.)
i	Tendency of runway visual range values, indicated by i = U for increasing and i = D for decreasing runway visual range values, and i = N when no distinct change in runway visual range is observed. (FM 15-IX Ext., FM 16-IX Ext.)
GGgg<u>Z</u>	Time of observation or forecast, in hour and minutes UTC, followed by letter <u>Z</u> as an abbreviated indicator of UTC. (FM 15-IX Ext., FM 16-IX Ext., FM 51-IX Ext., FM 53-IX Ext., FM 54-IX Ext.) (1) FM 15-IX Ext.: official time of observation laid down by the meteorological office concerned, in accordance with regional air navigation agreements. (2) FM 16-IX Ext.: time of occurrence of change(s) which justified the issue of the report. (3) FM 51-IX Ext., FM 53-IX Ext., FM 54-IX Ext.: time of origin of forecast.
$N_sN_sN_s$	Category of cloud amount, scattered, broken or overcast, given by three letter abbreviations "SCT" (1 to 4 oktas), "BKN" (5 to 7 oktas) or "OVC" (8 oktas). (FM 15-IX Ext., FM 16-IX Ext., FM 51-IX Ext., FM 53-IX Ext., FM 54-IX Ext.)
TT	Two letter indicators preceding without a space the time group, where TT = AT (at), FM (from) or TL (until). (FM 15-IX Ext., FM 16-IX Ext., FM 51-IX Ext.)
$V_xV_xV_xV_x$	Maximum horizontal visibility at surface, in metres, in increments of 1000 metres between 5000 metres up to 9999 metres, with 9999 indicating visibility of 10 km and above.

Change following specifications to read:

GGgg — Time of observations, in hours and minutes UTC.
(FM 12-IX Ext., FM 13-IX Ext., FM 14-VIII, FM 15-IX Ext., FM 16-IX Ext., FM 18-IX Ext., FM 35-IX Ext., FM 36-IX Ext., FM 37-VII, FM 38-IX Ext., FM 42-IX Ext., FM 62-VIII Ext., FM 63-IX, FM 64-IX, FM 65-IX, FM 67-VI)

(1) FM 12-IX Ext., FM 13-IX Ext., FM 18-IX Ext.: actual time of observation.

(2) FM 63-IX, FM 64-IX: time of launching of the bathythermograph.

(3) FM 67-VI: time of occurrence of the observed maximum or observed minimum values of stage or discharges.

\- Time, in hours and minutes UTC, of the beginning or the end of a forecast change, or at which specific forecast condition(s) are expected. (FM 15-IX Ext., FM 16-IX Ext.)

GGggHR — To be deleted.

$h_sh_sh_s$ — Height of base of cloud layer or mass or observed or forecast vertical visibility.
(Code table 1690) (FM 15-IX Ext., FM 16-IX Ext., FM 51-IX Ext., FM 53-IX Ext., FM 54-IX Ext.)

(1) If, notwithstanding the existence of fog, sandstorm, duststorm, blowing snow or other obscuring phenomena the sky is discernible, the partially obscuring phenomena shall be disregarded.

(2) FM 15-IX Ext., FM 16-IX Ext., FM 51-IX Ext.: heights are above surface (see Note (1) under h).

(3) See Note (2) under $h_Bh_Bh_B$.

$h_th_th_t$ — Altitude of cloud layer or mass. (Code table 1690)
(FM 53-IX Ext., FM 54-IX Ext.)

N_s — Amount of individual cloud layer or mass whose genus is indicated by C. (Code table 2700) (FM 12-IX, FM 13-IX)

VVVV — Horizontal visibility at surface, in metres, in increments of 50 metres up to 500 metres, in increments of 100 metres between 500 and 1500 metres, in increments of 500 metres between 1500 and 5000 metres and in increments of 1000 metres between 5000 metres up to 9999 metres, with 9999 indicating visibility of 10 km and above.
(FM 15-IX Ext., FM 16-IX Ext., FM 51-IX Ext., FM 53-IX Ext., FM 54-IX Ext.)

(1) If the value is between two increments, it shall be rounded off downward to the lower of the two increments. For example, a visibility of 370 metres shall be reported as 0350, a visibility of 570 metres shall be reported as 0500, a visibility of 3700 metres shall be reported as 3500 and a visibility of 5700 metres shall be reported as 5000.

Change Code table 1864 as follows:

$9i_3nnn$

$952L_aL_a$, $953L_aL_a$, $954L_oL_o$ and $955L_oL_o$: delete the word "Rapid"

$96GGG_p$, to read: "(a) When G_p = O: a self-contained part of the forecast beginning at GG. All prior forecast conditions are superseded.

(b) When G_p = 1 to 4: change at either a regular or irregular rate at an unspecified time within the period beginning at GG and indicated by G_p.

$97GGG_p$, to read: "Frequent or infrequent temporary fluctuations taking place within the period indicated by G_p."

$98GGG_p$: (to be deleted)

$9999C_2$, to read: "(a) When used in combination with $99GGG_p$; probability C_2 of occurrence of an alternative value of a forecast element, indicated in tens or per cent

(b) When used in combination with $97GGG_p$; probability C_2 of occurrence of temporary fluctuation, indicated in tens of per cent."

$99GGG_p$, to read: "Used in combination with $9999C_2$; time period G_p beginning at GG that the alternative value of a forecast element may occur."

Plain language alternative terminology for the group $9i_ennn$

951//: Change the term "GRADU" to "BECMG"

$952L_aL_a$, $953L_aL_a$, $954L_oL_o$ and $955L_oL_o$: change the form "RAPID" to "FM"

$96GGG_p$, to read: "(a) The form FMGG should be used to indicate the beginning of self-contained part of the forecast indicated by GG. All forecast conditions before FMGG are superseded by the conditions indicated thereafter.

(b) The form BECMG GGG_eG_e should be used to indicate a change to forecast meteorological conditions expected to occur at either a regular or irregular rate at an unspecified time within the period beginning at GG and ending at G_eG_e. The duration of the period beginning at GG and ending at G_eG_e shall normally not exceed two hours and in any case shall not exceed four hours."

$97GGG_p$, to read: "The form TEMPO GGG_eG_e should be used to indicate frequent or infrequent temporary fluctuations to forecast meteorological conditions which are expected to last less than one hour in each instance and in the aggregate cover less than half of the period beginning at GG and ending at G_eG_e."

$98GGG_p$: (to be deleted)

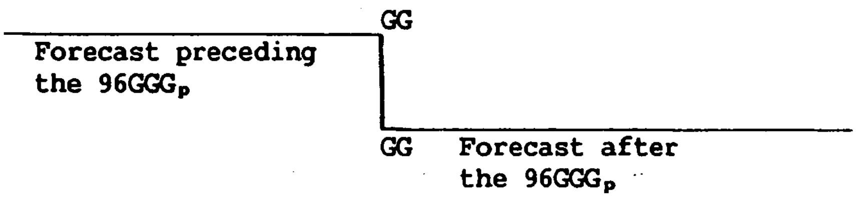
$9999C_2$, to read: "The form PROB (per cent) should be used for this group, either followed by GGG_eG_e to indicate the probability of occurrence of an alternative value of a forecast element (e.g. PROB30 1216) or followed by TEMPO GGG_eG_e to indicate the probability of occurrence of temporary fluctuations (e.g. PROB30 TEMPO 1216)."

<u>Pictorial illustration of changes or fluctuations</u>

Heading: First line to read as above, 2nd line: change "hh" to "$h_sh_sh_s$".

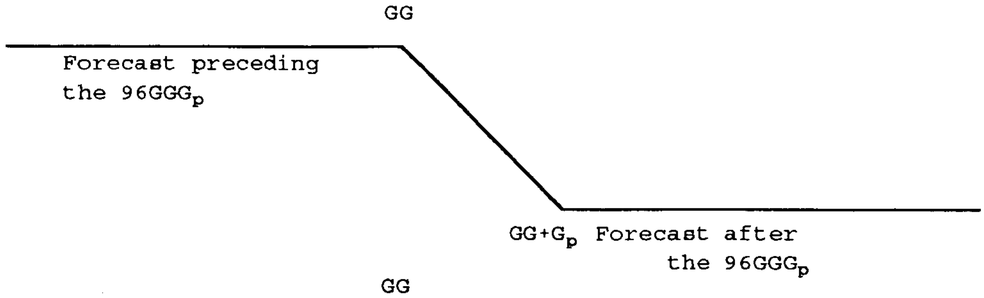
"$96GGG_p$ – Change at specified time (G_p = 0)

Example

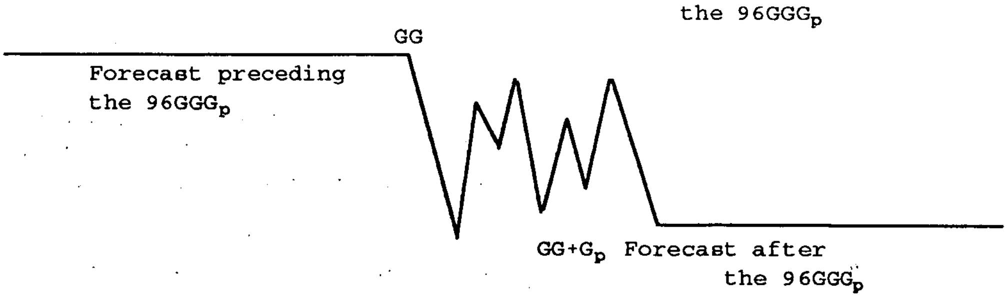


$96GGG_p$ Change at unspecified time within indicated time period (G_p = 1 to 4)

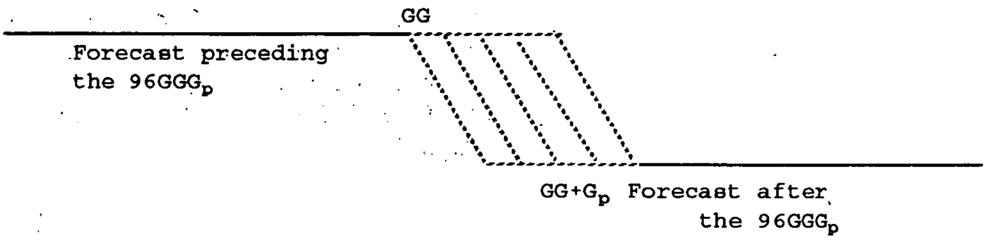
Example (a)
(regular change throughout whole period)



Example (b)
(irregular change throughout part or whole of period)

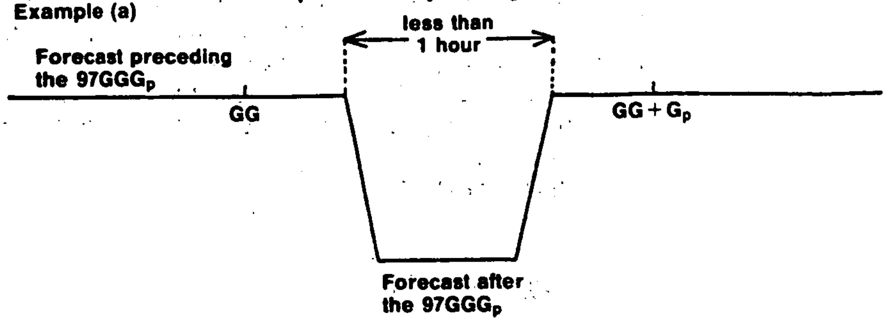


Example (c)
(regular change at unspecified time throughout period)

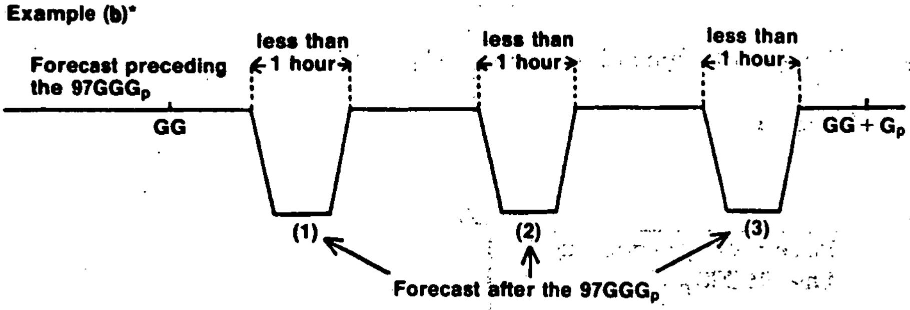


$97GGG_p$ — *Temporary variation(s)*

Example (a)



Example (b)*



* 1 + 2 + 3 = should be less than half the time indicated by G_p

Examples show deteriorating conditions. For improvements, the examples should be taken upside down."

$98GGG_p$: (To be deleted)

CODE TABLE 4678

w'w' Significant Present and Forecast Weather

QUALIFIER		WEATHER PHENOMENA		
INTENSITY OR PROXIMITY (1)	DESCRIPTOR (2)	PRECIPITATION (3)	OBSCURATION (4)	OTHER (5)
- light	MI Shallow	DZ Drizzle	BR Mist	PO Well developed dust/sand whirls
moderate (no qualifier)	BC Patches	RA Rain	FG Fog	
				SQ Squalls
	DR Drifting	SN Snow	FU Smoke	
+ heavy		SG Snow grains	VA Volcanic Ash	FC Funnel cloud(s) (tornado or water-spout)
	BL Blowing			
VC In the vicinity	SH Shower(s)	IC Diamond dust	DU Widespread dust	
		PE Ice pellets		SS Sandstorm
	TS Thunderstorm		SA Sand	
		GR Hail	HZ Haze	
	FZ Supercooled			DS Duststorm
		GS Small hail and/or snow pellets		

The w'w' groups shall be constructed by considering columns 1-5 in the table above in sequence, that is intensity followed by description followed by weather phenomena. An example could be +SHRA (heavy shower(s) of rain).

NOTES:

(1) Entries in this code table are based on the descriptions of hydrometeors and lithometeors found in Publication WMO-No. 407 - International Cloud Atlas Volume 1 (Manual on the Observation of Clouds and other Meteors).

(2) Regulations in 15.7 shall apply.

(3) More than one form of precipitation shall be combined, the dominant type of precipitation being reported first. An example could be +SNRA.

(4) More than one phenomenon other than a precipitation combination noted shall be reported in separate w'w' groups in the order of the columns. An example could be -DZ FG.

(5) Intensity shall be indicated only with precipitation, showers, thunderstorms, blowing dust, sand or snow, duststorm or sandstorm. Well developed tornadoes or waterspouts shall be reported using the indicator +, for example +FG.

(6) Not more than one descriptor shall be included in a w'w' group, for example -FZDZ.

(7) The descriptors MI and BC shall be used only in combination with the letter abbreviation FG, for example MIFG.

(8) The descriptor DR (drifting) shall be used for dust, sand or snow raised by the wind not extending above two metres. BL (blowing) shall be used to indicate dust, sand or snow carried by the wind, extending above 2 metres. The descriptors DR and BL shall be used only in combination with the letter abbreviations DU, SA and SN, for example BLSN.

(9) When blowing snow is observed with snow falling from cloud, both phenomena are reported, e.g. SN BLSN. When due to heavy blowing snow the observer cannot determine whether or not snow is also falling from cloud, then only +BLSN shall be reported.

(10) The descriptor SH shall be used only in combination with one or more of the letter abbreviations RA, SN, GS and GR, to indicate precipitation of the shower type at the time of observation, for example SHSN.

(11) The descriptor TS shall be used only in combination with one or more of the letter abbreviations RA, SN, PE, GS and GR to indicate thunderstorm with precipitation at the aerodrome, for example TSSNGS.

(12) The descriptor FZ shall be used only in combination with the letter abbreviations FG, DZ and RA, for example FZRA.

(13) The proximity qualifier VC shall be used only in combination with the letter abbreviations FG, FC, SH, PO, BLDU, BLSA and BLSN.

Rec. 16 (CBS-Ext.(90)) - PROPOSED FM 22-IX EXT. RADREP - RADIOLOGICAL DATA REPORT - (MONITORED ON A ROUTINE BASIS AND/OR IN CASE OF AN ACCIDENT) AND FM 57-IX EXT. RADOF - RADIOLOGICAL TRAJECTORY DOSE FORECAST - (DEFINED LOCATION AND EXPECTED TIME OF ARRIVAL)

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 5 (CBS-IX) - Working Group on Data Management (DM),

(2) The final report of the first session of the CBS Working Group on Data Management Sub-group on Codes, general summary, paragraphs 4.1,

(3) The final report of the first session of the CBS Working Group on Data Management, general summary, paragraph 4.2.3,

(4) CBS-IX general summary, paragraph 9.6,

CONSIDERING:

(1) That the need for one set of codes for real-time exchange of radiological data in lieu of several existing national coding practices was agreed to by CBS-IX,

(2) The proposed radiological codes are based on requirements stated by CBS-IX and procedures published in IAEA/WMO Manual on the use of the GTS for early notification convention as well as recently adopted BUFR specifications (Class 23 - dispersal and transport and Class 24 - radiological elements),

RECOMMENDS that the proposed FM 22-IX EXT. RADREP - Radiological Data Report - (monitored on a routine basis and/or in case of an accident) and FM 57-IX Ext. RADOF - Radiological Trajectory Dose Forecast - (defined location and expected time of arrival) as given in the annex to this recommendation, be adopted for use as from 1 November 1991;

REQUESTS the Secretary-General to arrange for the inclusion of the new codes in Volume I of the Manual on Codes.

Annex to Recommendation 16 (CBS-Ext.(90))

FM 22-IX Ext. RADREP - RADIOLOGICAL DATA REPORT (MONITORED ON A ROUTINE BASIS AND/OR IN CASE OF ACCIDENT)

CODE FORM

		(IIiii*
		(or
Section 0	RADREP	(D....D** $Y_rY_rG_rG_ra_5$ $L_aL_aL_aL_aA$ $L_oL_oL_oL_oL_oB$ $h_rh_rh_rh_ri_h$
		(or
		($A_1b_wn_bn_bn_b$

Section 1 111AA MMJJJ $Y_aY_aG_aG_ag_ag_a$ $L^1_aL^1_aL^1_aL^1_aA$ $L^1_oL^1_oL^1_oL^1_oL^1_oB$ $4A_aB_TR_cR_cR_cR_c$

$5A_cA_eE_cE_sE_e$ $6R_eP_aD_{Pa}D_{Pa}D_{Pa}D_{Pa}$ $((7h_ah_ah_ah_a)$ (or $((7h_eh_eh_eh_e)$ $(8d_{ta}d_{ta}f_{ta}f_{ta})$

$(9d_{tw}d_{tw}f_{tw}f_{tw})$ (0qqq0aa)

Section 2 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ (5nnnIS) $6XXXs_naa$ $(7XXXs_naa)$

Section 3 333 $GGggi_w$ (ddfff) (5nnnIS) $6XXXs_naa$

Section 4 444 $GGggi_w$ (Nddff) (00fff) $(1s_nTTT)$ $(2s_nT_dT_dT_d)$ $(3P_oP_oP_oP_o)$

$(6RRRt_r)$ (7wwW/) (80000 $0d_ad_ad_cd_c)$

Section 5 555 TTGGgg $4A_aB_TR_cR_cR_cR_c$ $5A_cA_eE_cE_sE_e$ $6R_eP_aD_{Pa}D_{Pa}D_{Pa}D_{Pa}$

$((7h_ah_ah_ah_a)$ (or $((7h_eh_eh_eh_e)$ $(8d_{ta}d_{ta}d_{ta}f_{ta}f_{ta})$ $(9d_{tw}d_{tw}d_{tw}f_{tw}f_{tw})$ (0qqq0aa)

$122R_pI_n$

Section 6 666 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ (5nnnIS) $6XXXs_naa$ $(7XXXs_naa)$

Section 7 777 TTGGgg (Nddff) (00fff) $(1s_nTTT)$ $(6RRRt_R)$ (7ww//)

NOTES:

(1) RADREP is the name of the code for reporting radiological data monitored on a routine basis and/or in case of an accident. A RADREP message may have a trend forecast appended.

(2) A RADREP message or a bulletin of RADREP messages is identified by the word RADREP.

(3) Relevant groups of Section 0, the first three groups and the group $6XXXs_naa$ of Section 2 are always included in a report of radiological data from a surface observing station. Section 1 is only included when data on accident notification is reported.

(4) Relevant groups of Section 0, the first two groups and the group $6XXXs_naa$ of Section 3 are always included in a report of radiological data from an airborne observing station.

(5) The code form is divided into seven Sections as follows:

Section number	Symbolic figure group	Content
0	–	Identification and position data (ship's call sign/buoy identifier, date and reporting time, location and elevation/altitude) and type of report and unit of reported radiological quantity.

1	111AA	Data on accident notification: activity or facility involved, date and time of accident, location of accident, early notification convention article applicable, type and composition of release, cause and evolution of accident, characteristic, state and evolution of emission, possible health effect, protective measures taken with its radius, height or effective height, main transport in atmosphere and/or water and discharge of receiving water body.
2	222	Data on date and time of start and end of monitoring (when relevant, isotope mass and element name), observed radiological quantity, dose on land surface and density of deposits from a surface observing station.
3	333	Data on time of monitoring, unit of wind speed, upper wind (when relevant, isotope mass and element name) and observed radiological quantity from an airborne observing station.
4	444	Data on time of observed meteorological conditions, unit of wind speed, total cloud cover, surface wind, temperature, dew point, station pressure, precipitation and related duration, weather and variation of surface wind direction.
5	555	Data on forecast trend of accident in next 6 hours: time or period of expected change, early notification convention article applicable, type and composition of release, cause and evolution of accident, characteristic, state, and evolution of emission, possible health effect, protective measures to be taken and its radius, height or effective height, main transport in atmosphere and/or water, discharge of receiving water body, and possibility plume encountering precipitation and/or change in wind.
6	666	Data on forecast trend of radiological quantity in next 6 hours: date and time (when relevant, isotope mass and element name), expected radiological quantity, expected dose on land surface and density of deposits.
7	777	Data on forecast trend in surface meteorological conditions in next 6 hours: time or period of expected change, total cloud cover, surface wind, temperature, precipitation and related duration, and weather.

REGULATIONS

22.1

General

22.1.1

The code name RADREP shall be included at the beginning of an individual RADREP message. In the case of a bulletin, which may consist of more than one RADREP message, the code name RADREP shall be included in the first line of the text of the bulletin, and the identification, date, reporting time, type of report and position groups shall be included in every individual message.

NOTE: See Regulation 12.1.7

22.1.2

Groups	(IIiii* (or (D....D** (or ($A_1b_wn_bn_bn_b$	$Y_rY_rG_rG_ra_s$	$L_aL_aL_aL_aA$	$L_oL_oL_oL_oL_oB$	$h_rh_rh_rh_ri_h$

NOTE: See Regulation 14.4.1, notes (1), (2) and (3).

22.1.2.1

The identification and position of a fixed land station shall be indicated by means of the group IIiii. The identification of a sea or mobile land station shall be indicated by the group D...D or $A_1b_wn_bn_bn_b$. The position and elevation/altitude of fixed and mobile land stations, sea stations or airborne observing stations shall be indicated by the groups $L_aL_aL_aL_aA$ $L_oL_oL_oL_oL_oB$ $h_rh_rh_rh_ri_h$.

22.1.3

Use of Sections

22.1.3.1

Accident notification reports shall always contain at least Sections 0 and 1. When the report contains environmental (on site) radiological monitoring results and/or meteorological monitoring results, that report shall also include Sections 2 and/or 4 respectively.

22.1.3.2

Environmental radiological data monitoring results reports from surface observing stations of a routine nature or activated following an accident shall always contain at least Section 0 and 2. When in addition the report contains meteorological monitoring results, that report shall also include Section 4.

22.1.3.3

In radiological data monitoring results reports of gamma dose in air along the main transport path (defined location and time period), Section 2 shall contain the groups 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ $6XXXs_naa$.

22.1.3.4

In radiological data monitoring results reports of air concentration (of named isotope type including gross beta), Section 2 shall contain the groups 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ 5nnnIS 6XXX$s_n$aa.

22.1.3.5

In radiological data monitoring results reports of concentration in precipitation (of named isotope type), Section 2 shall contain the groups 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ 5nnnIS 6XXX$s_n$aa, and Section 4 at least the groups 444 6RRRt_R.

22.1.3.6

When relevant forecast data is available, Sections 5, 6 and/or 7 shall be appended as appropriate to an accident notification report or an environmental radiological data monitoring report, to indicate expected changes in radiological and/or meteorological conditions in the next 6 hours.

22.2

Section 1 - Data on accident notification

22.2.1

Group 111AA

This group shall always be included in accident notification reports. AA shall be encoded in accordance with code table 0177 - Activity or facility involved in accident.

22.2.2

Groups MMJJJ $Y_aY_aG_aG_ag_ag_a$ $L_a^1L_a^1L_a^1L_a^1A$
$L_o^1L_o^1L_o^1L_o^1L_o^1B$

These groups shall always be included in accident notification reports to give the date, time and location of the accident: month, three last digits of year, day of the month, hour and minutes in UTC, latitude and longitude in degrees and minutes.

22.2.3

Group $4A_aB_TR_cR_cR_cR_c$

This group shall always be included in accident notification reports. A_a shall be encoded in accordance with code table 0131 - Accident early notification - article applicable. B_T shall be encoded in accordance with code table 0324 - Type of release. $R_cR_cR_cR_c$ shall be encoded such that each R_c is in accordance with code table 3533 - Composition of release, so that a combination of up to four elements shall be reported in order of significance. If less than four elements are to be reported, the group shall be completed with slashes(/).

22.2.4

Group $5A_cA_eE_cE_sE_e$

This group shall always be included in accident notification reports. A_c shall be encoded in accordance with code table 0133 - Cause of accident; A_e in accordance with code table 0135 - Evolution of accident; E_c in accordance with code table 0933 - Characteristic of emission; E_s in accordance with code table 0943 - State of emission; and E_e in accordance with code table 0936 - Evolution of emission.

22.2.5

Group $6R_eP_aD_{Pa}D_{Pa}D_{Pa}D_{Pa}$

This group shall always be included in accident notification reports. R_e shall be encoded in accordance with code table 3535 - Risk of significant chemical toxic health effect; and P_a in accordance with code table 3131 - Protective measures taken near border.

NOTE: This group may be repeated as necessary, e.g. if more than one protective measure is to be indicated.

22.2.6

Groups $((7h_ah_ah_ah_a)$ (or $((7h_eh_eh_eh_e)$ $(8d_{ta}d_{ta}f_{ta}f_{ta})$

If release is not ground level release and relevant data is available, these groups shall be included in accident notification reports to give either the actual release height or the effective release height in metres and the main transport speed in metres per second.

22.2.7

Groups $(9d_{tw}d_{tw}d_{tw}f_{tw}f_{tw})$ (0qqq0aa)

If release is to water and relevant data is available, these groups shall be included in accident notification reports to give the main transport direction in degrees from north and main transport speed in metres per second, and the discharge of the main receiving water body in cubic metres per second as appropriate.

22.3

Section 2 - Radiological monitoring data from a surface observing station.

22.3.1

Groups 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$

These groups shall always be included in radiological data monitoring results reports or accident report to give the day and time of start and day and time of end, in hours and minutes UTC, of monitoring operations or release.

22.3.2

Group (5nnnIS)

22.3.2.1

The group (5nnnIS) shall be included in either radiological data monitoring results reports of air concentration of named isotope type including gross beta or to give the isotope mass and element name.

NOTES:

(1) This group may be repeated as necessary, e.g. if more than one isotope is to be included.

(2) See Regulation 22.1.3.5.

22.3.2.2

The group (5nnnIS) shall be omitted from the report in radiological data monitoring results of gamma dose in air along the main transport path for defined location and time.

22.3.3

Group $6XXXs_naa$

This group shall always be included in radiological data monitoring results reports or accident reports to give the three most significant digits of the reported monitored radiological quantity or estimated release quantity followed without a space by the sign of the exponent (s_n) and the decimal exponent (aa). The type of report and units of the reported radiological quantity shall be indicated by a_5 in the group $Y_rY_rG_rG_ra_5$ of Section 0.

NOTE: See note (1) to Regulation 22.3.2.1.

22.3.4

Group ($7XXXs_naa$)

If relevant data is available, this group shall be included in reports of radiological data monitoring results to give the dose of gamma radiation or the density of deposits (total beta activity) on land surface.

22.4

Section 3 - Radiological monitoring data from an airborne observing station

22.4.1

Inclusion of groups of Section 3 shall be determined by national decision.

22.4.2

Section 3 shall always be preceded by Section 0.

22.4.3

Group (5nnnIS)

This group shall be included in radiological data monitoring results of air concentration of named isotope type followed by the group $6XXXs_naa$ (radiological quantity of the isotope).

NOTE: See note (1) to Regulation 22.3.2.1.

22.4.4

Group $6XXXs_naa$

Regulation 22.3.3 shall apply.

22.5

Section 4 - Meteorological monitoring data

22.5.1

If meteorological data is available, relevant groups of this Section shall be included in a radiological data report.

NOTE: See Regulation 22.1.3.5.

22.5.2

Group ($6RRRt_R$)

22.5.2.1

When no precipitation occurred during the reference period, RRR shall be encoded 000.

22.5.2.2

When precipitation occurred during the reference period but the amount of precipitation has not been measured, RRR shall be encoded ///.

22.5.3

Groups (80000 $0d_ad_ad_cd_c$)

If relevant data is available, this group shall be included in addition to the group (Nddff) or the groups (Nddff) (00fff) as the case may be, to give the variation in wind direction.

NOTE: Variation and mean wind direction are measured over the ten-minute period immediately preceding the observation.

22.6

Section 5 - Accident behaviour over time

22.6.1

Group TTGGgg

The time group GGgg, preceded without a space by one of the letter indicators TT = FM (from) or AT (at), shall be used as appropriate, to indicate the beginning (FM) of a forecast change, or the time (AT) at which specific forecast conditions are expected.

22.6.2

Group $122R_pI_n$

This group shall be included to indicate the possibility that a plume will encounter precipitation in the State in which the accident occurred and whether the plume will encounter a change in wind direction and/or speed. R_p shall be encoded in accordance with code table 3548; and I_n in accordance with code table 1743.

SPECIFICATION OF SYMBOLIC LETTERS

A_a	Accident early notification article applicable (code table 0131)
A_c	Cause of incident (code table 0133)
A_e	Incident situation (code table 0135)
AA	Activity or facility involved in incident (code table 0177)
a_S	Type of report and unit of reported radiological quantity (code table 0266)
aa	Decimal exponent of radiological quantity or discharge of the main receiving water body
B_T	Type of release (code table 0324)
$D_{Pa}D_{Pa}D_{Pa}D_{Pa}$	Radius of protective action (to be) taken, in kilometres
d_ad_a	Extreme anticlockwise direction from the mean direction of the wind reported by dd
d_cd_c	Extreme clockwise direction from the mean direction of the wind reported by dd
$d_{ta}d_{ta}d_{ta}$	Main transport direction in atmosphere in degrees from north
$d_{tw}d_{tw}d_{tw}$	Main transport direction in water in degrees from north
E_c	Characteristics of release (code table 0933)
E_e	Release behaviour over time (code table 0935)
E_s	State of current or expected release (code table 0943)

$f_{ta}f_{ta}$	Main transport speed in atmosphere in metres per second
$f_{tw}f_{tw}$	Main transport speed in water in metres per second
$G_aG_ag_ag_a$	Time of accident in hours and minutes UTC
$G_eG_eg_eg_e$	Time of end of monitoring operation or release in hours and minutes UTC
G_rG_r	Time of issue of report, on monitoring operation or release in whole hours UTC
$G_sG_sg_sg_s$	Time of start of monitoring operation or release in hours and minutes UTC
$h_ah_ah_ah_a$	Actual release height in metres. Code figure 9999 indicating a height of 10 000 metres or above.
$h_eh_eh_eh_e$	Effective release height in metres. Code figure 9999 indicating a height of 10 000 metres or above.
$h_rh_rh_rh_r$	Elevation of a surface observing station or pressure altitude of an airborne observing station, in metres or tens of feet indicated by i_h. Code figure 9999 indicating an altitude of 10 000 metres or above, or 100 000 feet or above as the case may be.
IS	International two letter characters of the isotope element name
I_n	Possibility plume encountering change in wind direction and/or speed (code table 1743)
i_h	Indicator of sign and unit of elevation/altitude (code table 1840)
$L^1_aL^1_aL^1_aL^1_aA$	Latitude of site of accident in degrees and minutes
$L^1_oL^1_oL^1_oL^1_oL^1_oB$	Longitude of site of accident in degrees and minutes
nnn	Isotope mass
P_a	Countermeasures taken near border (code table 3131)
qqq	Three most significant digits of the discharge of the main receiving water body in cubic metres per second.
R_c	Composition of release (code table 3533)
$R_cR_cR_cR_c$	Combination of up to four elements constituting the composition of release
R_e	Possibility of significant chemical toxic health effect (code table 3535)

R_p	Possibility that plume will encounter precipitation in State in which incident occurred (code table 3548)
XXX	Three most significant digits of radiological quantity or release quantity
s_n	Sign of exponent (code table 3841)
Y_aY_a	Date of accident, calendar day
Y_rY_r	Date of issue of report, calendar day
Y_eY_e	Date of end of monitoring operation or release, calendar day
Y_sY_s	Date of start of monitoring operation or release, calendar day

Amend second specification of D...D to read:

> "Call sign consisting of three or more alphanumeric characters, for mobile land station making upper air observations or issuing a radiological report on a routine basis and/or in case of an accident.
> (FM 22-IX Ext., FM 34-IX, FM 38-IX)"

CODE TABLES

0131

A_a - Accident early notification

Code figure	
1	Articles 1 and 2
2	Article 3
3	Article 5.2
4-6	Reserved
7	Missing value
8-9	Not used

0133

A_c - Cause of incident

Code figure	
0	Incident State does not understand what happened
1	Incident State knows the cause of the incident
2	Reserved
3	Missing value
4-9	Not used

0135

A_e – Incident situation

Code figure	
0	No improvement
1	Unstable
2	No deterioration
3	Improving
4	Stable
5	Deteriorating
6	Reserved
7	Missing value
8–9	Not used

0177

AA – Activity or facility involved in incident

Code figure	
1	Nuclear reactor on ground
2	Nuclear reactor at sea
3	Nuclear reactor in space
4	Nuclear fuel facility
5	Radioactive waste management facility
6	Transport of nuclear fuel or radioactive waste
7	Storage of nuclear fuel or radioactive waste
8	Manufacture of radio-isotopes
9	Use of radio-isotopes
10	Storage of radio-isotopes
11	Disposal of radio-isotopes
12	Transport of radio-isotopes
13	Use of radio-isotopes for power generation
14–19	Reserved
20	Fire in toxic chemical plant
21	Transport of toxic chemicals
22	Toxic chemical leakage into a river
23–29	Reserved
30	Other
31	Missing value
32–99	Not used

0266

a_5 – Type of report and unit of reported radiological quantity

Code figure	
1	Report of accidental radioactivity release to atmosphere, in Becquerels (Bq)

2	Report of accidental radioactivity release to water, in Becquerels (Bq)
3	Report of accidental radioactivity release to both atmosphere and water, in Becquerels (Bq)
4	Report of accidental radioactivity release to ground water, in Becquerels (Bq)
5	Report of named isotope concentration in precipitation, in Becquerels per litre (Bq/l)
6	Report of named isotope type including gross beta concentration in air, in Becquerels/m^3 (Bq m^{-3}) and, if data available, the density of deposits, in Becquerels/m^2 (Bq m^{-2})
7	Report of gamma dose in air along main transport path and, if data available, on land surface, in milli-Sievert (mSv)
8	Report of an airborne observing station of named isotope type including concentration in air, in Becquerels/m^3 (Bq m^{-3}) and/or report of gamma dose in air, in milli-Sievert (mSv)
9	Reserved

0324

B_T – Type of release

Code figure	
0	No release
1	Release to atmosphere
2	Release to water
3	Release to both atmosphere and water
4	Expected release to atmosphere
5	Expected release to water
6	Expected release to both atmosphere and water
7	Missing value
8–9	Not used

0933

E_c – Characteristics of release

Code figure	
0	No release
1	Release has stopped
2	Release
3	Release is continuing
4–6	Reserved
7	Missing value
8–9	Not used

0935

E_e - Release behaviour over time

Code figure	
0	Release no longer occurring
1	Release still occurring
2	Release expected to increase in next 6 hours
3	Release expected to remain constant in next 6 hours
4	Release expected to decrease in next 6 hours
5-6	Reserved
7	Missing value
8-9	Not used

0943

E_s - State of current or expected release

Code figure	
0	Gaseous
1	Particulate
2	Mixture of gaseous and particulate
3	Missing value
4-9	Not used

1743

I_n - Possibility plume will encounter change in wind direction and/or speed

Code figure	
0	No significant change expected within the next 6 hours
1	Anticipated significant change expected within the next 6 hours
2	Reserved
3	Missing value
4-9	Not used

1840

i_h - Indicator of sign and unit of elevation/altitude

Code figure	
1	Elevation at/or above sea level in metres
2	Elevation at/or above sea level in feet
3	Elevation below sea level in metres
4	Elevation below sea level in feet
5	Altitude of aircraft in tens of metres
6	Altitude of aircraft in tens of feet

7	Negative altitude of aircraft in tens of metres
8	Negative altitude of aircraft in tens of feet

NOTE: In code figures 5 through 8 aircraft altitude is reported with reference to the standard datum plane 1013.25 hPa (29.92 inches of mercury).

3131

P_a – Countermeasures taken near border

Code figure	
0	No countermeasures
1	Evacuation
2	Sheltering
3	Prophylaxis
4	Water
5	Milk
6	Vegetables
7	Other food types
8–9	Reserved
/	Missing value

3533

R_c – Composition of release

Code figure	
0	Noble gases
1	Iodines
2	Caesiums
3	Transuranics
4–9	Reserved
/	Missing value

3535

R_e – Possibility of significant chemical toxic health effect

Code figure	
0	No significant chemical toxic health effect
1	Significant chemical toxic health effect possible
2	Reserved
3	Missing value
4–9	Not used

3548

R_p – Possibility that plume will encounter precipitation in State in which incident occurred

Code figure	
0	Plume will not encounter rain in incident State
1	Plume will encounter rain in incident State
2	Reserved
3	Missing value
4–9	Not used

Add note to code table 3590 (RRR - Amount of precipitation which has fallen during the period preceding the time of observation, as indicated by t_R):

"NOTE: See Regulation 22.5.2.1 and 22.5.2.2"

FM 57 - IX Ext. RADOF - Radiological trajectory forecast (defined time of arrival and location)

CODE FORM

Section 0 RADOF $F_1F_2Y_rY_rG_rG_r$ $Y_oY_oG_oG_o$ $Y_1Y_1G_1G_1G_pG_p$ (IIiii* (or (D. . .D** AAMMJJJ

$Y_aY_aG_aG_ag_ag_a$ $L_aL_aL_aL_aA$ $L_oL_oL_oL_oL_oB$ $h_rh_rh_rh_ri_h$

Section 1 11101 $Y^1Y^1G^1G^1g^1g^1$ $L_a^1L_a^1L_a^1L_a^1A$ $L_o^1L_o^1L_o^1L_o^1L_o^1B$ $h^1h^1h^1h^1$ (5nnnIS)

6XXX$s_n$aa (7XXX$s_n$aa)

11102 $Y^2Y^2G^2G^2g^2g^2$ $L_a^2L_a^2L_a^2L_a^2A$ $L_o^2L_o^2L_o^2L_o^2L_o^2B$ $h^2h^2h^2h^2$ (5nnnIS)

6XXX$s_n$aa (7XXX$s_n$aa)

....

111jj $Y^jY^jG^jG^jg^jg^j$ $L_a^jL_a^jL_a^jL_a^jA$ $L_o^jL_o^jL_o^jL_o^jL_o^jB$ $h^jh^jh^jh^j$ (5nnnIS)

6XXX$s_n$aa (7XXX$s_n$aa)

Section 2 22201 $Y^1Y^1G^1G^1g^1g^1$ $L_a^1L_a^1L_a^1L_a^1A$ $L_o^1L_o^1L_o^1L_o^1L_o^1B$ ($h_mh_mh_mh_m$ $i_zs_ns_1s_1s_p$)

22202 $Y^2Y^2G^2G^2g^2g^2$ $L_a^2L_a^2L_a^2L_a^2A$ $L_o^2L_o^2L_o^2L_o^2L_o^2B$ ($h_mh_mh_mh_m$ $i_zs_ns_1s_1s_p$)

....

222jj $Y^jY^jG^jG^jg^jg^j$ $L_a^jL_a^jL_a^jL_a^jA$ $L_o^jL_o^jL_o^jL_o^jL_o^jB$ ($h_mh_mh_mh_m$ $i_zs_ns_1s_1s_p$)

NOTES:

(1) RADOF is the name of the code used to provide forecast radiological trajectory dose for defined expected time of arrival and locations

(2) A RADOF message is identified by the word RADOF

(3) The code form is divided into three Sections as follows:

Section number	Symbolic figure group	Content
0	–	Indications of the data-processing centre originating the forecast and time of issue, initial time of analyses/forecasts used to produce the trajectory, period of validity of radiological trajectory forecast data, and identification of incident (activity or facility involved, time and location) to which trajectory is associated.
1	111jj	Definition of arrival times of radiological contamination and trajectory locations (when relevant, isotope mass and element name), associated forecast radiological quantity, and data on radioactive substance concentration (total beta activity) in surface layer for each location.
2	222jj	Definition of times and trajectory locations, associated mixing height, stability index and category for each location.

REGULATIONS

57.1

General

57.1.1

The code name RADOF shall always be included at the beginning of a RADOF message.

57.1.2

When in printed form, the format of the RADOF message shall present the characteristic of a direct reading data table.

57.1.3

Use of Sections

57.1.3.1

Radiological trajectory forecasts shall always contain at least Section 0 and the first five groups of Section 1.

57.1.3.2

In radiological trajectory forecasts of gamma dose in air, Section 1 shall in addition to the first five groups include the group 6XXXs$_n$aa to give the expected radiological quantity at the forecast time and point position, in milli-Sievert (mSv).

57.1.3.3

In radiological trajectory forecasts of air concentration of named isotope type including gross beta, Section 1 shall in addition to the first five groups include the groups 5nnnIS $6XXXs_naa$ to give the isotope mass and element name and the expected radiological quantity at the forecast time and point position, in Becquerels/m^3 (Bq m^{-3}).

57.1.3.4

When relevant data is available, the group ($7XXXs_naa$) shall also be included to give the radioactive substance concentration (total beta activity) in the surface layer, in Becquerels/m^3 (Bq m^{-3}).

57.1.3.5

When relevant forecast data is available, Section 2 shall be included in radiological trajectory forecasts to give the mixing height and/or stability index and category as appropriate for defined times and trajectory locations.

NOTE: Since the density of information required to be given on mixing height and stability index and category is generally more widespread, the sequence of times and forecast point positions to be included in Section 2 is not necessarily the same as in Section 1.

57.2

Section 0

57.2.1

The groups of this Section shall constitute the first line of the text of the message.

57.2.2

Groups $F_1F_2Y_rY_rG_rG_r$ $Y_oY_oG_oG_o$

The data-processing centre originating the forecast shall be indicated by F_1F_2 and is followed by the date and time of issue of the forecast ($Y_rY_rG_rG_r$) and the initial date and time of analyses/forecasts used to produce the trajectory ($Y_oY_oG_oG_o$) respectively.

57.2.3

Group $Y_1Y_1G_1G_1G_pG_p$

The trajectory forecast shall cover the period G_pG_p beginning at $Y_1Y_1G_1G_1$.

57.2.4

(IIiii*
Groups (or AAMMJJJ $Y_aY_aG_aG_ag_ag_a$ $L_aL_aL_aL_aA$ $L_oL_oL_oL_oL_oB$ $h_rh_rh_rh_ri_h$
(D...D**

These groups shall be included to identify the incident (activity or facility involved, time and location) to which the trajectory forecast is associated.

57.3

Section 1

57.3.1

The indicator group 111jj, the expected time of arrival of contamination $Y^jY^jG^jG^jg^jg^j$ and the forecast point position groups in the form $L_a^jL_a^jL_a^jL_a^jA$ $L_o^jL_o^jL_o^jL_o^jL_o^jB$ $h^jh^jh^jh^j$ giving the latitude and longitude in degrees and minutes and the height above mean sea level in metres, shall be included as the first five groups in the following lines of the text of the message.

NOTE: Sequence number jj = 01-99 indicates the data line(s) of subsequent forecast point positions given.

57.3.2

The forecast radiological quantity $6XXXs_naa$, when relevant preceded by the isotope mass and element name (5nnnIS) and followed by data on radioactive substance concentration (total beta activity) in the surface layer ($7XXXs_naa$), shall be included in the same data line following the point position groups.

57.3.3

If several isotopes are forecast for the same time and point position, groups 5nnnIS $6XXXs_naa$ shall be repeated as required.

NOTE: In order to keep the characteristic of a direct reading data table, in that case the time and position groups should not be repeated and be replaced by blank spaces.

57.3.4

A data line consisting of relevant groups of this Section shall be repeated for different forecast trajectory point positions as required.

57.4

Section 2

57.4.1

When relevant data is available, the indicator group 222jj, the expected time of arrival of contamination and the forecast point position groups shall be included as the first four groups in the subsequent lines of the text of the message.

NOTE: See note to Regulation 57.3.1.

57.4.2

Data on mixing height ($h_m h_m h_m h_m$) and/or stability index and category ($i_z s_n s_i s_i s_p$) shall be included in the same data line following the point position groups. i_z shall be encoded in accordance with code table 1859 - Stability index, which forecast value is given by $s_i s_i$ modified by s_n for the sign of the value; s_p shall be encoded in accordance with code table 3847 - Pasquill-Gifford stability category.

57.4.3

Regulation 57.3.4 shall apply.

SPECIFICATION OF SYMBOLIC LETTERS

$h^1h^1h^1h^1$) . . . . .) $h^jh^jh^jh^j$)	Height above mean sea level in metres, Code figure 9999 indicating 10 000 metres or above.
$h_m h_m h_m h_m$	Mixing height at the forecast point, in metres. Code figure 9999 indicating 10 000 metres or above.
$G_o G_o$	Initial time, in whole hours UTC, of analyses/forecasts used to produce the trajectory.
$G_1 G_1$	Time, to the nearest whole hour UTC, specifying the beginning of the period covered by the forecast
$G_r G_r$	Time of issue of the forecast, to the nearest whole hour UTC.
$G_p G_p$	Period covered by the forecast, in whole hours.
$G^1G^1g^1g^1$) . . . . .) $G^jG^jg^jg^j$)	Time, in hours and minutes UTC, of expected arrival of radiological contamination at specified point location.
i_z	Stability index (code table 1859).
$L_a^1L_a^1L_a^1L_a^1$) . . . . .) $L_a^jL_a^jL_a^jL_a^j$)	Latitude co-ordinates of forecast position of radiological contamination.
$L_o^1L_o^1L_o^1L_o^1L_o^1$) . . . . . .) $L_o^jL_o^jL_o^jL_o^jL_o^j$)	Longitude co-ordinates of forecast position of radiological contamination.
$s_i s_i$	Forecast value of stability index at point position.
s_p	Pasquill-Gifford stability category (code table 3847)
$Y_o Y_o$	Date of analyses/forecasts used to produce the trajectory, calendar day.
$Y_1 Y_1$	Date of the beginning of the period covered by the forecast, calendar day.

Y_rY_r	Date of issue of forecast, calendar day.
Y^1Y^1) . .) Y^jY^j)	Date of expected arrival of radiological contamination at specified point location, calendar day.

CODE TABLES

1859

i_z - Stability index

Code figure	
0	No index available
1	Total totals
2	Showalter
3	KO-index
4	Faust index
5-9	Reserved

3847

s_p - Pasquill-Gifford stability category

Code figure	
0	Not available
1	A
2	A-B
3	B
4	B-C
5	C
6	D
7	E
8	F
9	G

Rec. 17 (CBS-Ext.(90)) - ORGANIZATION OF THE CO-ORDINATION GROUP ON THE COMPOSITE OBSERVING SYSTEM FOR THE NORTH ATLANTIC (COSNA)

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 3 (EC-XXXVI) establishing the concept of Operational WWW Systems Evaluations, and the efforts of participants to organize and conduct the OWSE-North Atlantic,

(2) The final report of the Committee on the OWSE-NA (CONA) which recommends the establishment of a Co-ordination Group on the COSNA,

(3) Resolution 5 (EC-XLII) endorsing the formation of the Co-ordination Group on the COSNA,

(4) The actions initiated by various Members and organizations to establish such a group,

CONSIDERING:

(1) The importance of timely, accurate and representative environmental data from the area of the North Atlantic for regional, hemispheric and global forecasts,

(2) The success achieved in conducting the OWSE-NA and the high levels of co-operation attained by the participants,

(3) The need for an active and continuing joint management of the observing system over the North Atlantic to ensure:

(a) Adequate data coverage;

(b) The maintenance of acceptable levels of data quality;

(c) The careful and timely incorporation of new technologies;

(d) The efficient use of resources for the maintenance and evolution of the COSNA,

ENDORSES the organization of the Co-ordination Group on the Composite Observing System for the North Atlantic (CGC) with its main tasks as noted in Resolution 5 (EC-XLII), and having for its primary goal the efficient management of the environmental data from the North Atlantic to ensure that they meet the established standards for timeliness, quality, coverage and utility;

RECOMMENDS that appropriate Members and organizations participate fully in the work of the CGC;

REQUESTS the president of CBS or his representative to maintain an active liaison with the CGC and to report back to CBS any matters needing its attention;

FURTHER REQUESTS the chairmen of the CBS Working Groups on the GOS and Data Management to participate as appropriate in the work of the CGC particularly with regard to data quality and data management issues.

<u>Rec. 18 (CBS-Ext.(90)) - OWSE-AFRICA</u>

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 3 (EC-XXXVI) - Operational World Weather Watch Systems Evaluations (OWSEs),

(2) General summary, EC XLII, paragraphs 3.1.11 to 3.1.14 concerning the OWSE-AF, especially the recommendation that Members consider the requirements of the OWSE-AF as a matter of urgency,

(3) The continuing difficulties with the operation of the GTS in RA I,

(4) The summary report, Organization and Status of the OWSE-AF, July 1990, submitted by the chairman of the OWSE-AF Steering Group to CBS-Ext.(90), and the significant improvements reported in the exchange of observational data at selected stations,

(5) The significant difficulties in finding sufficient resources for the OWSE-AF evaluations despite the important support provided to date,

EXPRESSES its deep appreciation to the Members and organizations participating in the OWSE-AF for their substantial support through national, bilateral, VCP, and direct contributions,

CONSIDERING:

(1) The substantial information still to be gained on the use of DCP/DRS and MDD capabilities in RA I, and the benefits still to be achieved from the completion of both Phases I and II of the OWSE-AF,

(2) The potential for substantially improved information bases to be achieved by the effective use of the DCS/DRS and MDD as a general augmentation of the GTS in RA I,

(3) The importance of the results from the OWSE-AF in providing guidance on the efficient implementation and use of these satellite capabilities in RA I and elsewhere,

RECOMMENDS:

(1) That VCP donors and potential contributors to bilateral programmes examine the requests for support developed by the OWSE-AF Steering Group with a view to providing additional assistance especially for the Phase II evaluations;

(2) That the WMO give high priority to the support of the OWSE-AF from any surplus which might become available;

(3) That participants in the OWSE-AF continue, and where possible increase, their support to the evaluation programme;

INVITES the Secretary-General to inform donors and organizations such as the UNDP of the importance of the OWSE-AF to the future development of the WWW in RA I, and to seek their further assistance.

Rec. 19 (CBS-Ext.(90)) - GUIDELINES FOR OPERATIONAL WWW SYSTEMS EVALUATIONS

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 3 (EC-XXXVI) defining the concept of Operational WWW Systems Evaluations, and the annex on the Technical Plan for GOS-OWSEs,

(2) The final report on the OWSE-North Atlantic,

(3) The status of implementation of OWSE-Africa,

CONSIDERING:

(1) The potential need to organize and conduct evaluations on the components of the WWW, including the GOS, GDPS, GTS and the Data Management activities,

(2) The need to provide technical guidance on the organization of OWSEs which conserves the basic concepts agreed by the Executive Council, but is applicable to a range of current implementation issues,

(3) The importance of examining the impact of changes to the WWW system on national programmes with a view to reducing the risks and increasing the cost-effectiveness involved with such changes,

(4) The important role that scientific assessments had in the OWSE-NA,

RECOMMENDS the adoption of guidelines for Operational WWW Systems Evaluations as contained in the annex to this Recommendation.

Annex to Recommendation 19 (CBS-Ext.(90))

GUIDELINES FOR OPERATIONAL WWW SYSTEMS EVALUATIONS

1. General framework

There is general recognition that technological innovation can lead to substantial improvement to the WWW. A major objective for the Integrated Systems Study (ISS) had been to provide guidance for these improvements.

A transition phase, however, sometimes seems to be required between the current levels of operational knowledge and that which is required to conduct the global implementation envisaged as a result of the ISS.

The steps already being taken by some Members to bridge this transition phase might be made more productive by co-ordinating Members' efforts, setting down common goals and objectives in advance, and providing a focus for the effective application of available resources.

Experience has shown that the operational employment of new or improved components, singly and in various mixes, results in overall systems questions which cannot be dealt with by abstract studies alone. Operational demonstrations - evaluations, or risk reduction activities are needed to answer practical questions relating to subjects such as:

- Efficiency of field operations;

- Management and supporting services required;
- Procedures and equipment maintenance;
- Data quality control;
- Loads on the various components of the GTS;
- Format and types of products to be generated and exchanged;
- Archiving of data and products;
- Co-ordination procedures.

Each of these has an important impact on the cost of implementation and operation of the WWW. Direct involvement by Members is essential to determine the nature and extent of the impact. OWSEs are the appropriate mechanism for risk reduction when individual Members' efforts or bilateral arrangements are insufficient.

Just as there is a need to obtain practical information on the expected performance of proposed WWW configurations, there is also a need to provide for more effective implementation of the components comprising the overall design at minimum cost.

Ninth Congress (1983), when considering implementation, expressed substantial concern about the manner and speed with which improvements should be made in the WWW. It agreed that new technology offered great promise but should be implemented carefully to ensure that a proper mix of current and new systems was maintained without causing problems from a too-rapid transition. Congress emphasized that systems should be proven in operational use before being implemented on a global basis. While identifying the need for careful planning to ensure a smooth transition, Ninth Congress also recognized that serious deficiencies existed in the current WWW and that specific facilities or components were at hand which could be of substantial benefit.

2. Concept of operational evaluations

A series of carefully constructed, well-focused operational evaluations appears to be needed to answer questions concerning the deployment of new technologies in the WWW. These evaluations should be comprehensive enough to examine a significant range of WWW implementation questions with global application. At the same time, they should be defined and be specific enough to be accomplished in a realistic time period and at realistic cost. They would be conducted for a definite period of time to answer the questions:

(a) Will a specified GOS, GTS, GDPS or data management configuration meet its objectives in a cost-effective manner? and

(b) Will that design be viable in the WWW?

Careful consideration should be given in the planning for operational evaluations as to the particular type of evaluation best suited to the questions to be answered. Operational WWW Systems Evaluations are only one type of activity which might be considered. Further, it may be feasible and even necessary to consider conducting several types of evaluations, singly or in combination, including OWSE's, national or multi-lateral demonstration and/or assessment activities. Each of these activities could provide important information on the implementation of new capabilities. In the context of the implementation of the WWW, however, the OWSE has been demonstrated to be an effective mechanism for addressing complex systems questions.

3. Purposes

One aspect of an operational evaluation is to better understand the full range of operational questions which arise when making changes to the WWW as a system. A second is to provide a framework for limited implementation. Of necessity, maximum effort will be made to interact with and incorporate the appropriate implementation efforts which are under way already in the WWW. A third is to identify the possible impact that the new technology would have on the operational procedures of the Members and/or supporting organizations. All purposes would be focused on the need to prove systems in operational environments.

4. Goal

To create and make available a base of operational experience and information on suitable technologies applicable to the WWW, and their associated support services, which would lead to the most efficient implementation of these technologies into the WWW. One aspect of an OWSE is to reduce the inherent risk involved with the implementation of new technologies.

5. Scope

An OWSE should encompass the design, implementation, operation and evaluation of specific technologies for defined objectives. Included would be an evaluation of the impact on the interfaces with other components of the WWW as well as recommendations to Members on the possible impact on national procedures.

In view of the growing integration of the WWW components, especially through the wide application of computers, the evaluations also should be concerned with the issues of integrated technologies and applicable software. The OWSE should include evaluations based on both field experience and scientific assessments, especially concerning the impact of the new technology on operational products and services.

In general, the scope, geographical area and the period of the evaluation need to be carefully defined and tailored to both the available time and resources.

6. Objectives

An OWSE should contribute towards identifying problems and proposing solutions in the larger WWW design. It should indicate the optimal deployment of different mixes of new WWW technologies, taking into account systems already established for national and/or multinational purposes, available resources and predefined schedules. In doing so, users' needs for observational data and GDPS products on different time- and space-scales would be considered.

An OWSE should answer key questions:

(a) Operational support required;

(b) Operational inter-relationships between systems;

(c) Effect on operational products and procedures of the transition from one system to another;

(d) Priorities for implementation based on cost and demonstrated operational impact and benefits;

(e) Requirements for associated technologies, supporting services, and/or organizational changes needed for the effective use of the new technology in the WWW.

7. General strategy

Each OWSE should consist of four principal phases: design, implementation, operation and preparation of the final report. There is a need for evaluation activities associated with each phase and throughout the OWSE. The operational phase could consist of several major elements such as field programmes and scientific analyses. The evaluation of a proposed design should yield results which would apply not only to the specific OWSE, but also to the overall design of the WWW. Similarly, the incremental implementation and operation of particular configurations should yield both meteorologically useful operational data as well as information on system performance and the impact on interfaces with other parts of WWW. The intention is not only to conduct an evaluation, but to provide a framework for systematic implementation while maintaining the integrity of the components of the WWW.

The increasing integration of the various components of the WWW and the resulting complexity of their interactions means that it may be necessary in one OWSE to evaluate directly several WWW components. The wide use of computers and automated data processing, for example, has resulted in new technologies which combine several WWW functions, such as data acquisition and generation of products. In addition, some components of the WWW, such as the satellites, are difficult to evaluate, or are amenable only to partial evaluation, through limited field implementation in advance of their full operational use in the WWW.

At times scientific analyses, studies, or assessments may be necessary either to properly evaluate the complex interactions of the new technologies with the existing components of the WWW or to assess in advance their expected impact.

8. Criteria

In setting the criteria for the technical framework of an OWSE and for identifying the issues to be examined, several aspects need to be considered:

(a) The focus should be on those issues which deal with key questions of WWW implementation and also have a reasonable expectation of being answered, considering the available resources. There should, thus, be both an urgent need to resolve a particular set of issues and a real possibility of implementing well-founded recommendations arising from the evaluations;

(b) Special emphasis should be given to those issues which concern a broad group of WMO Members and which are not easily addressed by them individually;

(c) Efforts should be made to define the objectives of the OWSE so that the results can be applied to other geographical areas and/or activities of the WWW;

(d) As a matter of efficiency and completeness, every opportunity should be taken to incorporate in the OWSE appropriate activities already in progress or planned by Members and organizations. Existing organizations should be encouraged to participate, either directly or through experts, in the work of the evaluations;

(e) To the extent possible, a real and continuing improvement to the WWW should be one of the objectives in the design of the OWSE.

9. Organization for planning and conducting of OWSEs

The organization for planning and conducting OWSEs can be structured around a system comprised of the following major elements, each of which may have internal *ad hoc* arrangements having a limited life:

- Overall co-ordination of OWSEs;
- Organization of specific OWSEs;
- Evaluation of OWSEs.

The overall co-ordination should include:

- An outline design for all of the OWSEs;
- Specific objectives common to all the OWSEs;
- Cost and resource constraints;
- Overall schedules;
- Mechanisms for assessing the results of OWSEs and generating recommendations based on these results.

In carrying out the above functions, the participant in individual OWSEs would:

- Seek and receive evaluations from specialized group(s) and assess impacts and consequences;
- Give guidance to relevant groups, especially on network implementation;
- Monitor implementation and propose revised priorities where necessary;
- Promote the application of appropriate technologies;
- Solicit commitments to the OWSEs and, where necessary, their components;
- Seek the initiation of necessary supporting action in, for example, WMO constituent bodies;

- Seek commitments as necessary to supporting actions or organizations where joint multilateral activity is essential.

While it is envisaged that there will be general OWSE activities which will be co-ordinated on a broad scale, there will also be a need for the design of regional evaluations or experiments and, subsequently, for their management. This activity would be undertaken by appropriate ad hoc organizing committees. The composition of committees will vary as their tasks change and they would not continue in existence beyond the end of their specific responsibility.

The evaluation of OWSEs would be concerned with the development and application of a set of agreed evaluation techniques and related matters, including both quality of data and the impact of data from the observing system on operational forecasting.

10. Reports

The preparation of a report is the important conclusion to the OWSE. The report should include both a summary of the work performed under the OWSE as well as a set of conclusions and recommendations concerning the main issues addressed.

As a minimum the report should contain the following sections:

(a) An Executive Summary containing a brief summary of the main points and conclusions;

(b) A statement of the objectives and the degree to which the objectives had been met;

(c) A description of the organization, implementation and conduct of the evaluations;

(d) A discussion of the main lessons and/or themes arising from the evaluations and cost/benefit estimates;

(e) A statement of the conclusions and recommendations;

(f) A summary of the actions proposed for the CBS and the WMO in general;

(g) A summary of the possibilities for extending the results to other geographical areas and/or issues of the WWW, including any constraints on making such an extension.

In addition to the final report, every effort should be made to provide interim reports on the progress being made or on special issues needing immediate attention.

Rec. 20 (CBS-Ext.(90)) - CBS PARTICIPATION IN THE IDNDR

THE COMMISSION FOR BASIC SYSTEMS,

NOTING:

(1) Resolution 13 (EC-XLI) - Fostering the aims of the International Decade for Natural Disaster Reduction (IDNDR),

(2) The WMO Plan of Action for the International Decade for Natural Disaster Reduction (IDNDR) as endorsed by EC-XLII,

CONSIDERING:

(1) That CBS has a major role to play in the achievement of the aims of the IDNDR,

(2) That the implementation of the WWW Plan is a first essential in the establishment or improvement of severe weather warning systems,

RECOMMENDS that in the implementation of the WMO Plan of Action for the IDNDR, the highest possible priority should be given to:

(a) The establishment and operation of networks of observing platforms and communication links for the detection and monitoring of severe weather phenomena;

(b) The application of numerical models and other analytical tools for the preparation of forecasts;

(c) The preparation of training materials on the physical nature and forecasting of hazardous meteorological phenomena;

RECOMMENDS FURTHER that urgent attention should be given to the promotion, introduction and applications of improved current systems and new technology in the various components of the WWW in order to accelerate their implementation;

URGES MEMBERS:

(1) To make greater efforts to implement WWW facilities as identified in the WMO Action Plan for the IDNDR;

(2) To fully co-operate with CBS in the design and introduction of new observing, telecommunication and data-processing techniques and systems;

URGES potential donors to take this recommendation into account in planning their technical co-operation activities in developing countries;

REQUESTS the president of CBS and its Advisory Working Group to keep the implementation of this recommendation under regular review and to report thereon to future sessions of the Commission;

REQUESTS the Secretary-General to provide all possible support to Members and to the Commission in the implementation of this recommendation.

Rec. 21 (CBS-Ext.(90)) - REVIEW OF RESOLUTIONS OF THE EXECUTIVE COUNCIL BASED ON PREVIOUS RECOMMENDATIONS OF THE COMMISSION FOR BASIC SYSTEMS OR RELATED TO THE WWW

THE COMMISSION FOR BASIC SYSTEMS,

NOTING with satisfaction the action taken by the Executive Council on the previous recommendations of the Commission for Basic Systems or related to the WWW in general,

CONSIDERING that some of the previous Executive Council resolutions are still to be implemented,

RECOMMENDS:

(1) That the following Executive Council resolutions should be kept in force:

Resolutions 1, 2 and 3 (EC-XXXVI) and Resolutions 1 and 3 (EC-XL);

(2) That Resolutions 4 (EC-XXXVI) and 2 (EC-XXXVII) be replaced by a single new resolution;

(3) That Resolution 3 (EC-XXXVIII) not be kept in force.

ANNEX I

LIST OF PARTICIPANTS

1. Officers of the session

A.A. Vasiliev	president
T. Mohr	vice-president

2. Representatives of Members of WMO

M. Yermeche	principal delegate	Algeria
A. Bourbala	delegate	
M.R. Noune	delegate	
D.J. Gauntlet	principal delegate	Australia
R.R. Brook	alternate	
H. Gmoser	principal delegate	Austria
E. De Dycker	principal delegate	Belgium
N. De Keyser (Ms)	alternate	
J.K. Leepile	principal delegate	Botswana
P. Phage	delegate	
T.F. Nikiema	principal delegate	Burkina Faso
G. Shimizu	principal delegate	Canada
A. Kellie	delegate	
D. Phillips	adviser	
T.A. Godoy (Ms)	principal delegate	Chile
H.F. Martinez	alternate	
X. Wu	principal delegate	China
D. Cai	delegate	
R. Wu	delegate	
E. Sanchez	principal delegate	Colombia
A. Lebvoua	principal delegate	Congo
V. Seifert	principal delegate	Czechoslovakia
A.M. Jorgensen (Ms)	principal delegate	Denmark
A.M. El Masry	principal delegate	Egypt
Prasad Rajendra	principal delegate	Fiji
M. Alestalo	principal delegate	Finland
K. Soini (Ms)	delegate	
F. Duvernet	principal delegate	France
M. Fischer	delegate	

2. Representatives of Members of WMO (contd.)

H. Veit	delegate	German Democratic Republic (until: 2.10.1990)
T. Mohr	principal delegate	Germany, Federal Republic of
D. Fickel	delegate	
M. Kurz	alternate	
C. Lemensieck	adviser	
F. Quiring	delegate	
J.B. Dankwa	principal delegate	Ghana
G.A. Wilson	delegate	
N.T. Diallo	principal delegate	Guinea
P. Li Chung-sum	principal delegate	Hong Kong
A. Kapovits	principal delegate	Hungary
M.A. Einarsson	principal delegate	Iceland
N. Sen Roy	principal delegate	India
Ali M. Nourian	principal delegate	Iran
Bahram Dianati	delegate	
A. Sedaghat-Kerdar	delegate	
B.E. McWilliams	principal delegate	Ireland
Z. Alperson	principal delegate	Israel
G. De Florio	principal delegate	Italy
T. Nitta	principal delegate	Japan
E.A. Mukolwe	principal delegate	Kenya
K.I. Essendi	delegate	
H. Riza	principal delegate	Maldives
J.T.M. Lee Man Yan	principal delegate	Mauritius
C.F. Reudink	principal delegate	Netherlands Antilles
H. Daan	principal delegate	Netherlands
C. Kooman	delegate	
A.P.M. Baede	delegate	
M.W. Pointer	principal delegate	New Zealand
K. Bjoerheim	principal delegate	Norway
Z. Litynska (Mrs)	principal delegate	Poland
L.A. Baranski	observer	

32

2. <u>Representatives of Members of WMO</u> (contd.)

H.-J. Seang	principal delegate	Republic of Korea
M. Ioana	principal delegate	Romania
S.O. Baazim	principal delegate	Saudi Arabia
M. Yattara	principal delegate	Senegal
C. Callejas	principal delegate	Spain
I. Collado	delegate	
G. Ryne	principal delegate	Sweden
K. Gerdin	delegate	
M. Haug	principal delegate	Switzerland
A. Ben Jemaa	principal delegate	Tunisia
Bwango-Apuuli	principal delegate	Uganda
P. Ryder	principal delegate	United Kingdom of Great Britain and Northern Ireland
F. Singleton	alternate	
R. Adams	delegate	
M.J. Atkins (Ms)	delegate	
B.A. Callander	adviser	
P.E. Francis	delegate	
D.J. Griggs	delegate	
C.D. Hall	delegate	
C. Little	adviser	
S. Long (Ms)	delegate	
W.A. McIlveen	delegate	
D.J. Painting	delegate	
R.J. Sowden	delegate	
P.A. Mwingira	principal delegate	United Republic of Tanzania
R. Landis	principal delegate	United States of America
J.R. Neilon	alternate	
W.J. Hussey	delegate	
F.S. Zbar	delegate	
J.S. Sedunov	principal delegate	Union of Soviet Socialist Republics
A.A. Vasiliev	alternate	
M.M. Ardiya	delegate	
N.P. Fakrutdinova	delegate	
I. Gamaiounov	delegate	
N. Veltishchev	delegate	
V. Jurcec	principal delegate	Yugoslavia

3. <u>Invited expert</u>

P. Menzel	CBS Rapporteur on Satellite Data

37

4. Observers from other international organizations

P. Ranaivason	Agency for Air Safety in Africa and Madagascar (ASECNA)
J.K. Gibson G.J. Hoffmann M. Jarraud B. Strauss H. Bottger	European Centre for Medium Range Weather Forecasts (ECMWF)
A. Massart	European Space Agency (ESA)
G. Bridge	European Organization for the Exploitation of Meteorological Satellites (EUMETSAT)
R. Renton	International Federation of Air Line Pilots Associations (IFALPA)
G. Fraser	Commission of the European Communities (CEC)
B.H. Weiss	International Atomic Energy Agency (IAEA)
J.L. Fear	International Maritime Satellite System (INMARSAT)
T. Fox	International Civil Aviation Organization (ICAO)

5. WMO Secretariat

D.N. Axford (part-time)	Representative of the Secretary-General
J.L. Rasmussen (part-time)	Representative of the Secretary-General
S. Mildner	
E. Sarukhanian	
H.M. McCombie	
J. Giraytys (part-time)	
D. Hinsman (part-time)	
M. Mlaki (part-time)	
D. Schiessl (part-time)	
Y. Watanabe (part-time)	

23

A N N E X   II

AGENDA

Agenda item		Relevant documents	Resolution adopted	Recommendations adopted
1.	OPENING OF THE SESSION	PINK 1		
2.	ORGANIZATION OF THE SESSION	PINK 2		
2.1	Consideration of the report on credentials			
2.2	Adoption of the agenda	1; 2;		
2.3	Establishment of committees			
2.4	Other organizational questions			
3.	REPORT BY THE PRESIDENT OF THE COMMISSION	14; PINK 3		
4.	STATUS OF WWW IMPLEMENTATION AND OPERATION, INCLUDING MONITORING	12; PINK 3		
5.	DEMONSTRATION OF CAPABILITIES OF RSMCs MIAMI, NEW DELHI AND TOKYO	37; 38; PINK 22		
6.	SPECIFIC WWW MATTERS, INCLUDING REPORT BY THE CHAIRMEN OF WORKING GROUPS AND RAPPORTEURS			
6.1	Global Data-processing System (GDPS)	3; 3, ADD. 1; 3, ADD. 2; 3, ADD. 3; 10; 19; 27; 28; 29; 34; 37; PINK 4; PINK 14		1, 2
6.2	Global Observing System (GOS)	8; 9; 11; 18; 21; 24; 25; 27; 32; PINK 5; PINK 6; PINK 9; PINK 10; PINK 19		3, 4, 5
6.3	Global Telecommunication System (GTS)	17; 17, ADD. 1; 18; PINK 21		6, 7, 8

Agenda item		Relevant documents	Resolution adopted	Recommendations adopted
6.4	WWW Data Management (DM), including codes	4; 4, ADD. 1; 4, APP. A CORR. 1 (English only); 5; 13; 22; 27; 30; 35; PINK 8; PINK 15, REV. 1; PINK 15, REV. 2; PINK 18		9, 10, 11, 12, 13, 14, 15, 16
6.5	Report of Rapporteurs on Satellite Data	7; 23; PINK 13		
6.6	WWW Implementation Support Activities (ISA), including the Operational Information System (OIS) and Implementation Co-ordination activities (WIC)	26; PINK 7		
6.7	Operational WWW System Evaluations (OWSE-NA and OWSE-AF)	15; 20; 31; PINK 23		17, 18, 19
7.	CONSIDERATION OF THE THIRD WMO LONG-TERM PLAN (TLTP)	33; PINK 12		
8.	EDUCATION AND TRAINING RELATED TO CBS ACTIVITIES	36; PINK 17		
9.	RELATIONSHIP OF THE WWW WITH OTHER WMO AND INTERNATIONAL PROGRAMMES, INCLUDING REGIONAL PROGRAMMES	16; PINK 16		20
10.	REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION AND OF RELEVANT EXECUTIVE COUNCIL RESOLUTIONS	6; PINK 20	1	21
11.	DATE AND PLACE OF THE TENTH SESSION OF THE COMMISSION	PINK 24		
12.	CLOSURE OF THE SESSION	PINK 24		

A N N E X   III

Annex to paragraph 6.1.21 of the general summary

TABLE OF CONTENTS OF THE REVISED GUIDE ON
THE GLOBAL DATA-PROCESSING SYSTEM

C O N T E N T S

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[1] In the proposed contents for Chapters 1-3, the titles which are suggested to be changed are marked by superscript.

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[1] In the proposed contents for Chapters 1-3, the titles which are suggested to be changed are marked by superscript.

A N N E X IV

Annex to paragraph 6.1.22 of the general summary

LAYOUT OF THE PROPOSED WWW TECHNICAL PROGRESS REPORT ON THE GLOBAL DATA-PROCESSING SYSTEM

Table of Contents

ANNEX V

Annex to paragraph 6.3.7 of the general summary

EVOLUTION OF THE OPERATIONAL STRUCTURE OF THE GTS

Improved operational structure for the GTS and in particular the MTN

A. The requirements placed on the GTS have been increasing for many years as regards the volume of data transmitted, the number of different data types (alphanumeric, binary, graphical, pictorial) and shorter transmission delay. The GTS and, in particular, the MTN has been significantly upgraded through the progressive introduction of modern communication protocols (X.25) and medium to high transmission rates (9.6-64 Kbit/s). Nevertheless, the GTS still has shortcomings at some centres, mainly the following:

(i) Very limited capability for rerouteing traffic in case of overload or outages of circuits or centres;

(ii) Non-optimized traffic routeing, leading to duplication of messages;

(iii) Overwhelming volume of routeing directories at RTHs, (particularly on the MTN), which can be difficult to maintain and update;

(iv) Lack of flexibility in meeting temporary exchange requirements;

(v) Insufficient operational control and lack of end-to-end exchange control to ensure an efficient and reliable data transfer between centres.

B. The further development of the World Weather Watch necessitates that the GTS handles three types of traffic:

(i) Alphanumeric and binary messages for routine data collection, exchange and distribution;

(ii) Request-reply messages, for non-routine exchange of meteorological and related information;

(iii) Data files (or long "messages") for transfer of data fields (such as preprocessed observational data, analysis, forecasts) between some WWW centres.

C. In order to facilitate its implementation, the improved GTS structure shall make it possible to:

(i) Reconcile different levels of technology and telecommunication means available in the various parts of the GTS;

(ii) Allow for a progressive implementation of upgraded facilities at various GTS centres.

The topography of the improved GTS, fully in line with the second and draft Third Long-term Plan, is conceptually pictured in Figure 1.

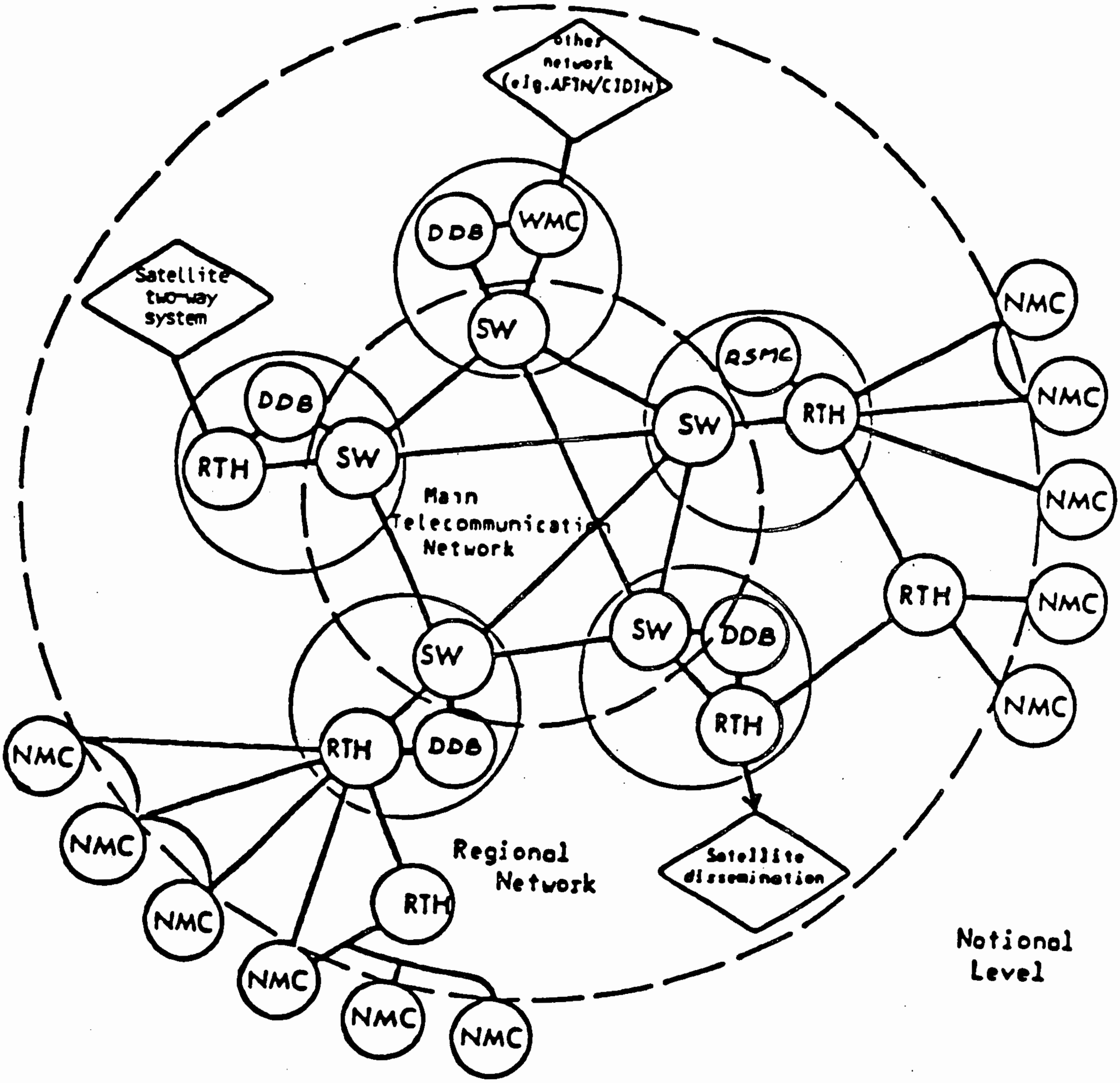
Core GTS network (i.e. Main Telecommunication Network)

D. It will be necessary to evolve towards a new concept of a global meteorological network serving both the functions of the current GTS and incorporating new OSI application layer services meeting the needs of emerging WWW Data Management functions, such as Distributed Data Bases. Existing RTHs, on the MTN are encouraged to investigate new technologies such as packet switching and OSI services such as X.400 and FTAM.

Regional Telecommunication Networks (RMTNs)

E. Designated centres on the MTN would interface regional networks with the MTN and provide a gateway to the communication procedures in use on regional networks. Various types of configuration and techniques will be used in RMTNs, including leased circuits and satellite-based communication systems for data collection and/or data distribution. Procedures similar to those used on the MTN could be progressively introduced in RMTNs, as appropriate.

STRUCTURE OF GTS



SW: Switching Node (included in functions of RTHs on the MTN)

Figure 1

A N N E X VI

Annex to paragraph 6.3.16 of the general summary

EXCERPTS OF THE ITU ADMINISTRATIVE COUNCIL RESOLUTION ON THE WARC-92

The ITU Administrative Council,

Considering ....

Resolves

1. That the World Administrative Radio Conference for Dealing with Frequency Allocations in Certain Parts of the Spectrum (WARC-92) be convened in Spain from 3 February 1992 for a period of four weeks and two days;

2. The agenda for WARC-92 shall be as follows:

On the basis of proposals by administrations and taking account of reports from the IFRB and the CCIR:

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2.2.5

2.2.6 The examination of the frequency bands 2 025 - 2 110 MHz and 2 200 - 2 290 MHz for the space operations and space research services, as indicated in Recommendation 716(Orb-88);

2.2.7

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2.6

2.7 To develop new recommendations and resolutions in relation to the agenda of the conference including Meteorological aids service in frequency bands below 1000 MHz and present allocations to space services above 20 GHz which were not placed on this agenda;

2.8 To consider problems associated with the use of the frequency bands in the range 401-403 MHz by the meteorological satellite and earth exploration satellite services with the view to recommend their consideration by the next competent administrative radio conference;

2.9

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2.10

Invites

1. The CCIR to prepare the technical and operational bases for the conference and to submit to administrations a report setting out the results of its work at least eight months prior to the opening of the conference;

2. The IFRB to provide technical assistance for the preparation and organization of the conference and to submit to all administrations a report on results with respect to the appropriate above agenda items at least ten months prior to the opening of the conference.

Instructs the Secretary-General

1. To make all the arrangements necessary for holding the conference;

2. To communicate this resolution to ICAO, IMO, WMO and to other concerned international organizations.

A N N E X VII

Annex to paragraph 6.4.5 of the general summary

DESCRIPTION OF THE CONCEPTUAL SYSTEM OF THE DISTRIBUTED DATA BASES

Conceptual system

WWW data are considered to be comprised of a number of data sets of observational data and products of the WWW system primarily for use in real time or near real time. In entirety each data set provides all currently available data of a particular type or of a defined scope, e.g. all TEMP data, all satellite soundings at a defined resolution. In order to provide timely and efficient routine collection and distribution of data and rapid access for special purposes, sets or subsets of the total set of data are to be held at centres distributed in relation to geographic or other requirements recognizing the constraints imposed by telecommunication facilities.

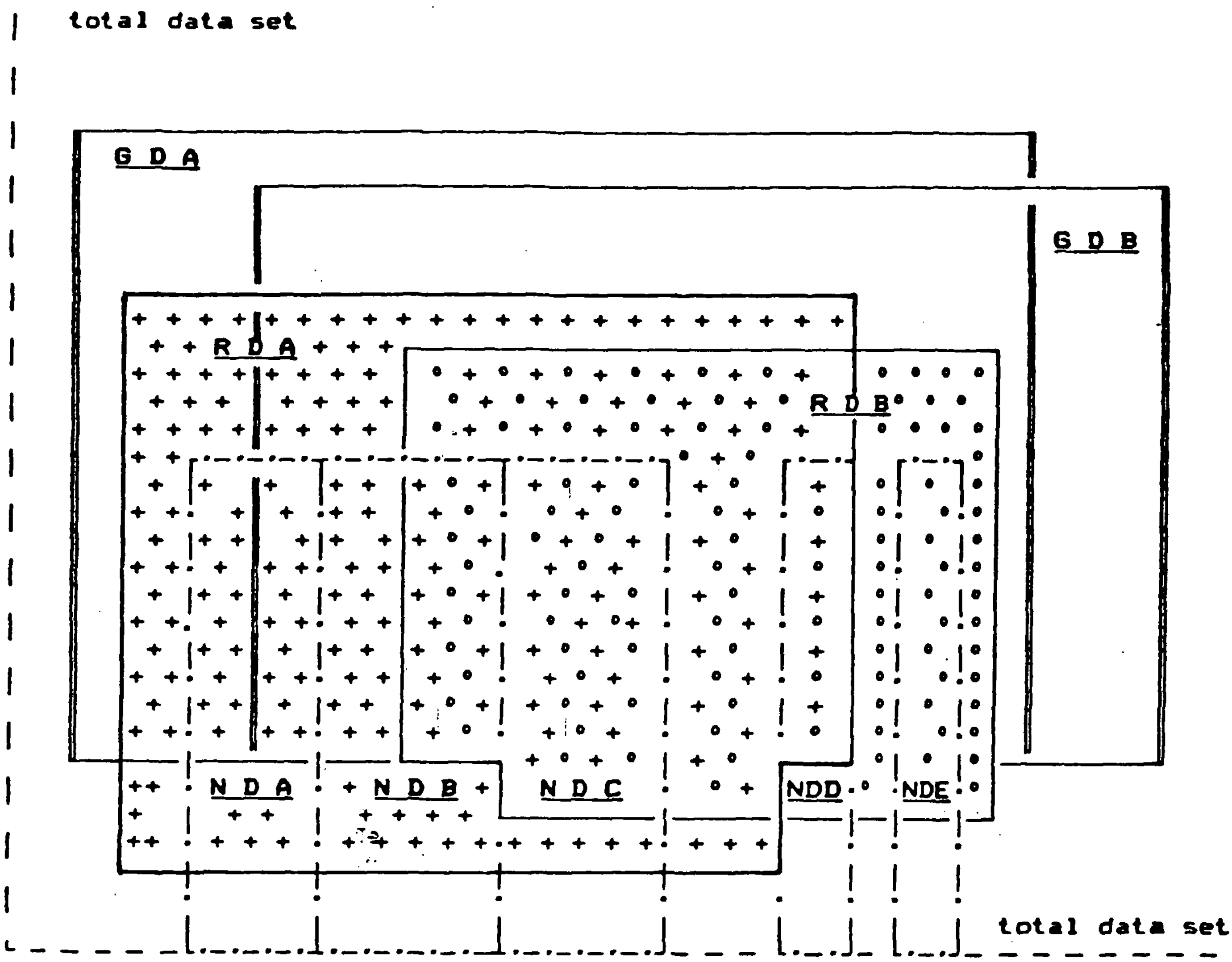
The assignment of specific responsibilities above national level to individual data centres will be by international agreement through CBS and its working groups. Planning of the data centre network should ensure that each set or subset of data provided at a data centre to meet the needs of a particular service domain should be available at another centre and that in event of failure arrangements are made for supply of required data to/from that domain from/to the alternate centre and for the rapid re-establishment of data base contents on recovery of the centre which has suffered failure.

The logical organization for the DDBs is illustrated in Figure 1. Designation of centres with primary and alternate responsibilities must be governed by availability of appropriate telecommunication services. Principally, these will be provided by the improved GTS as illustrated by the proposed schema in Figure 2. The use of other facilities, e.g. public data networks, for back-up and special purpose access must also be expected. Adequate measures to protect from unauthorized access must be provided.

As well as subsets of data of different types, e.g. provided by different types of observing system, the DDBs should include added information to original observation data, e.g. quality control information provided by GOS and/or GDPS services. Such information should be made available as required. Data should also be provided selectively to meet routine needs or specific requirements, the smallest addressable data entity within the DDB being governed by the ability to represent such data within a single element of a WMO code form, e.g. one BUFR item, one GRIB representation.

The DDBs will provide status information on availability of data, including products, and in response to requests may provide data either from within their own data base or by initiating requests to other network nodes.

Figure 1 Domains for one data set



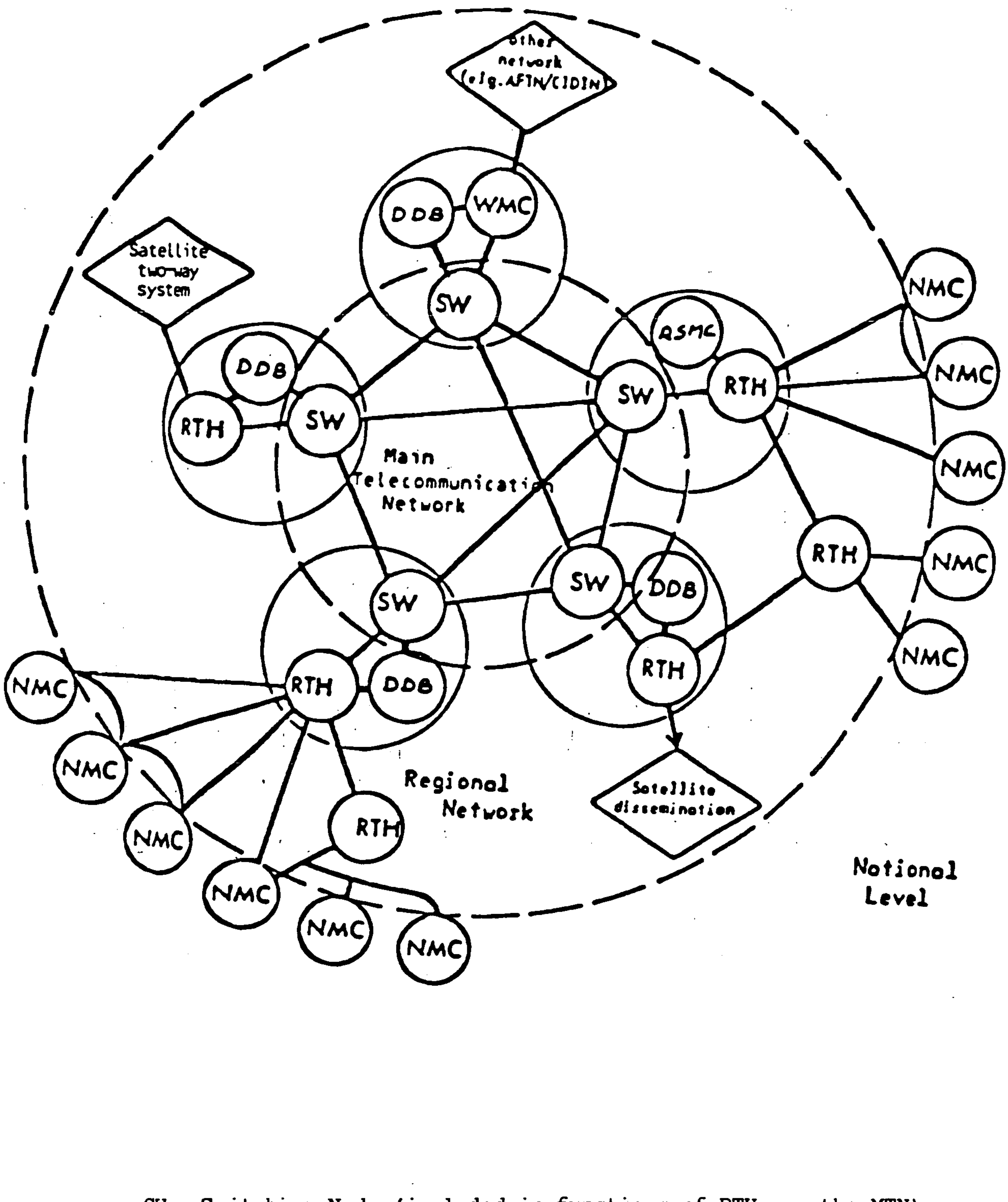
N = National domain - includes all national data and the subsets received from other national, regional and global data centres

R = Regional domain - includes data collected from national domains and required sets or subsets from other regional centres and from global centres

G = Global domain - includes all required data from global and regional exchange

Note: Required data are those data needed by centres routinely served plus data needed to provide alternate (backup) service in emergency.

STRUCTURE OF GTS



SW: Switching Node (included in functions of RTHs on the MTN)

Figure 2

ANNEX VIII

Annex to paragraph 6.4.7 of the general summary

REQUIREMENTS PLACED UPON GTS AND GDPS BY THE DISTRIBUTED DATA BASES

I. Introduction

The Distributed Data Bases (DDB) are defined as an organized set of data bases which together provide the total set of observational data and products available under WWW. The DDB concept, agreed by CBS-IX to be introduced in the WWW system, provides the means to improve the co-ordinated handling and dissemination of observational data and processed information available within the WWW system.

II. The role of DM

The WWW system provides the basic services for the meteorological community. In view of the rapidly growing volume of data generated by the space-based subsystem of the GOS and continuing development of higher resolution forecast models at GDPS centres and also segments of other WMO programmes, such as climatological, hydrological, oceanographic and environmental ones, specific needs for enhanced telecommunication services continue to develop. It is the responsibility of the WWWDM to define and specify the principle requirements with a view to providing a co-ordinated basis upon which the GTS and GDPS can design and engineer new services. Some requirements appear to overlap GTS and GDPS and, at this stage, it is not always obvious which of the two WWW components would cater for the corresponding services. Further work is necessary to analyse these cases.

III. Description of and rationale for the new services

The current GTS provides services based on a store-and-forward methodology. This is a suitable principle for the distribution of data and products in the traditional way controlled by routine arrangements using procedures for regular forwarding of data following pre-defined programmes. However, it cannot adequately respond to the emerging need for the exchange of:

- Much larger volumes of data;
- New types of data;
- Metadata on data availability and quality monitoring;
- Data under special arrangements (e.g. bilateral agreements, time constraints, emergency situations, irregular transmission of and ad hoc requests for specific data, recovery of data losses, non-real-time requirements).

Constraints, particularly of telecommunication facilities, may necessitate provision of information in a format different to that in which it was received. For example, data received in binary coded form (e.g. BUFR) may need to be forwarded in an alphanumeric form (e.g. BTAB). To meet these requirements, new services will have to be introduced. It is envisaged that the DDB concept and facilities compliant with the higher levels of the ISO OSI model will be employed for this purpose and implemented in the GTS and, to some extent, in the GDPS as appropriate.

IV. Requirements placed on the GTS

The GTS nodes should continue to operate as peers with no master nodes as specified in the organizational principles of the GTS, contained in the Manual on the GTS, Vol. I, part 1, para. 1.2.

The GTS should continue to deliver observational data and processed information as quickly and reliably as possible; the increased data volume should not be allowed to adversely impact the timely distribution of data; global DDB should be connected through high speed communications links to ensure a rapid and flexible data exchange on a global basis.

The retention period at main nodes for observational data to be exchanged in real-time should be at least 24 hours, preferably three days, in order to provide rapid access for recovery following data losses or special requirements of connected centres.

The GTS operational procedures for data exchange should distinguish routine arrangements and special arrangements, whereby procedures for special arrangements should comprise bilateral agreements, time constraints, emergency situations, irregular exchange of specific data, recovery of data losses, non-real-time requirements, etc.

The GTS should develop a more comprehensive request/reply mechanism for real-time and non-real-time requests; a unified request/reply interface should be established to provide the request/reply services (i.e. standardized formats for requests (queries) and replies (transmissions) compatible with the standard interfaces for enquiries, response and transmissions from data bases being developed by WGDM for more general use.

Appropriate catalogues should be provided as part of the data bases at each centre describing the intended and actual contents of the data bases; these catalogues should be based on a standardized format and be accessible via real-time request procedures; the exchange of catalogues should be in machinable form.

Access to the data bases should be available by dedicated circuits or by non-permanent connections conforming to agreed standards.

The GTS should develop and implement reasonable measures to prevent unauthorized access for data acquisition and to protect against attempts of disruption.

Exchange of information on the operational status of GTS and data-processing centres, e.g. telecommunication lines and network nodes, content of data bases, delays in observational data and product dissemination, etc., should be possible.

Exchange of information on the operational status (telecommunications, content of data bases, quality of model output, delays in time, etc.) of a centre should be possible.

Transmission of larger volumes of data and products should be supported; for example, the rapid recovery of the data base at a centre would be greatly aided by the bulk transfer of organized sets of data not necessarily in GTS message formats from another data base; telecommunication procedures such as a file transfer mechanism are needed to facilitate this type of transmission.

The GTS should consider alternative types and levels of services that would be required for several ranges of traffic in the future including through switching of traffic, e.g. using packet switching techniques by agreement.

An agreed set of services for conversions between different data representation forms should be available; such conversions must not cause delay in relay of data to other recipients; development of the GTS should be such as to minimize requirements for conversions.

V. Requirements placed on the GDPS

Data bases covering the global, regional and national domains should be available; global data bases should hold an agreed minimum of data; regional data bases should hold relevant data within a specific geographic area; there should be additional global data bases at some centres responsible for specific types of data.

Principal centres and other centres responsible for maintaining DDB should establish and maintain directories (catalogues) on the sets of data which should be and which are available, depicting information on individual sets of data, (e.g. counts of observations and products available and affiliated quality information) and exchange this information with other centres routinely and on a request/reply basis.

The DDB should be routinely monitored to ascertain the current status of data exchange and to provide reports on that status.

The centres responsible for maintaining DDB should establish and maintain the capability to recognize requests and issue replies for information that does not exist at the GTS nodes.

The centres responsible for maintaining DDB should be able to provide larger portions of their data bases in the form of large files for efficient exchange over the GTS.

The centres responsible for maintaining DDB should use a common interface for all data bases providing an independence from the actual data base support software; DDB centres would be required to provide DDB management software to form appropriate bridges between this interface and their own internal system; this approach would provide independence from the actual data base mechanisms and simplify the development of software needed by users to obtain access.

The organization of the DDB should ensure that data are available at all times through means of appropriate back up features.

The design of the DDB should be such as to allow expansion and to accommodate requirements of other WMO programmes as appropriate.

The availability of data bases facilities at meteorological centres is associated with the operations at these centres; it is likely that implementation of the DDB concept may be aided by use of these facilities, which may be unrelated to present GDPS responsibilities, provided that appropriate and effective telecommunications arrangements exist.

ANNEX IX

Annex to paragraph 6.4.18 of the general summary

RECOMMENDATIONS ON QUALITY CONTROL PROCEDURES
AND MONITORING DATA QUALITY

1. Recommended improvements for the real-time quality control at observing sites and collecting centres:

(a) When it becomes feasible, data representation (BUFR) in binary form should be utilized to exchange, together with the observations:

(i) Information of instruments and observational procedures used;

(ii) Information on data corrections applied;

(iii) Information on quality control;

(b) Minimum quality control procedures at observation sites for key elements (such as surface pressure, temperature and wind) should be defined. The WMO Secretariat should initiate action to provide appropriate guidance to perform such control, e.g. at manned sites, the use of time series diagram paper to enable a "minimum" core checking procedure;

(c) Any computer-based quality control at the observation site or collecting centres should be supported by standard software modules. The WMO Secretariat is invited to study possibilities of making appropriate software modules available within the framework of the WWW Implementation Support Activities in co-operation with potential donors;

(d) In order to provide users with up-to-date information on the level of quality control which is applied before data are injected into the GTS, the Secretariat was invited to undertake a survey on the basis of a questionnaire amongst NMCs to that effect;

(e) The value of providing quality control feed-back between GDPS centres and data producers in real-time has been established in a preliminary study for radiosonde data. Such feedback should be introduced more widely by lead centres and data providers;

(f) The WMO Manual and Guide on the GOS should be reviewed by the WGGOS/study group in light of the new possibilities in information exchange provided under general code concepts.

2. Recommendations concerning the role of the appointed lead centres:

(a) When compiling the consolidated lists of suspect stations and data platforms, they should be rigorous so as to identify only those stations where they are confident that the observations are of consistently low quality. Where possible, clear evidence should be passed to WMO defining the problems;

(b) Information on problems with observing sub-systems should also be passed to WMO;

(c) Recognizing the fact that deteriorations in observation quality can be detected on time-scales much shorter than six months (the interval recommended by CBS for producing consolidated monitoring information), they should determine the appropriate response time for communicating suspect stations (or observing systems) to WMO and other GDPS centres;

(d) They should define common methods and criteria to be used for compiling monthly statistics, after liaison with the other participating centres.

3. Recommendations concerning the procedures and formats for the monthly exchange of monitoring results:

(a) Monthly lists of suspect stations and data platforms should contain an indication of the number of "gross" errors detected;

(b) Monitoring information for wind data from aircraft and geostationary satellites should be exchanged in the form of mean wind vectors of observed minus first-guess values averaged over latitude/longitude boxes for designated levels;

(c) Monitoring information for satellite sounding data should be exchanged in two forms:

(i) Mean observed minus first-guess values of thickness averaged over latitude/longitude boxes for designated standard layers;

(ii) Co-location statistics with radiosondes displayed as vertical profiles;

(d) Recognizing the fact that the monthly lists of suspect stations could be misinterpreted if the methods of compilation are not completely understood, they should be circulated only to those centres which indicate that they should contain a clear explanation of the criteria used and the limitations of the system;

(e) Upper-air and marine observations:

(i) The reports attached to the consolidated lists sent to WMO should be short. They may have a technical attachment, and it should also be made clear that detailed information can be provided by the lead centre on request;

(ii) In the monthly lists, gross errors (see 6 (d) and 7 (a) above) should be handled by all the centres in the same way. Their number should be indicated and they should not be taken into account in the percentage of rejected data (in neither the numerator nor denominator);

(iii) The RMS-based criteria used for the monthly lists of suspect upper-air stations are not efficient for all types of problems; for example they do not pick up those stations with a large bias but small standard deviation. To improve this, it is recommended that:

- For height, to add tests based on the standard deviation and mean departures from first-guess, and to make all tests dependent on the pressure level;

- For wind, in addition to the current test on the vector RMS departure, to explore the introduction of a test based on the speed and direction departures;

ECMWF as the lead centre should make a proposal in that respect to the other centres participating in the exchange;

(iv) Concerning the consolidated list of stations reporting suspect height values, it is recommended to add a list of stations with consistently large bias but small standard deviation, this would enable further study to determine whether the verifying model, or the observations were showing a systematic bias, thus possibly enabling corrective measures to be taken;

(v) In the list of suspect drifting buoys, the mean position of the buoy during the month should be indicated;

(vi) The WMO TP.4 Volume A list of stations be brought up to date as many entries are incorrect;

(f) Aircraft and satellite observations:

(i) The methods of monitoring these data are very different and not as well defined as in the case of marine and upper-air data;

(ii) Concerning the quality of satellite sounding and cloud-track wind data, it would be useful for every centre to be informed of the pre-determined data exclusion practices in use elsewhere. This information should be sent to NMC Washington for further distribution;

(iii) When monitoring aircraft data, it is important to be able to distinguish true AIREP reports from PIREP coded in AIREP format. The practice of using XX as the identifier of these pseudo-AIREP should be generalized. It will also be important to have the capability of monitoring the performance of automatically transmitted reports (e.g. ASDARs) as opposed to the normal AIREPs.

4. Recommendations concerning the exchange of CBS standard verification scores:

(a) As agreed by the GDPS meeting in April 1989, an update of the list of radiosonde stations to be used for the computation of the standard scores against observations has been proposed for implementation on 1 January 1990;

(b) The need for exchanging standard scores by electronic means in addition to the current exchange of printouts was recognized at the same meeting. It appears that electronic mail cannot easily be handled by all the participating centres. The use of the GTS should be explored further;

(c) The standard format of the tables to be exchanged every month (CBS/Ext.(85)) does not include the mention of the forecast centre, and some centres indicate it only in the covering letters. It should be indicated in heading of the tables or at least on each page.

A N N E X X

Annex to paragraph 6.5.13 of the general summary

DIRECT BROADCAST SERVICE CHANGES

1. NOAA D, I, J - No changes from present services.
NOAA D scheduled for launch in May 1991.

2. NOAA K, L, M, N (NOAA K LAUNCH - 1994)

HRPT - Remains the same as NOAA J. Downlinks at 1707.0 MHz and 1698.0 MHz depending on satellite. Both links 667 kbps. Format contains all spacecraft data including the AVHRR, HIRS, AMSU A and B, ARGOS and SEM.

APT - Remains the same as NOAA J. Downlinks at 137.50 MHz and 137.62 MHz. AM/FM signal.

BEACON - Present 136.77 MHz; after NOAA J, is being moved to 137.35 MHz. The other beacon frequency at 137.77 MHz remains the same. Both links 8 kbps. Downlink does not include the AMSU A and B data. Format includes only HIRS, ARGOS, SEM, SBUV and spacecraft telemetry. AMSU could not be included because of data rate and bandwidth limitations.

3. NOAA O SERIES (NOAA O LAUNCH - 2001)

HRPT - Higher data rate instruments require that the HRPT downlink be upgraded. Studies are underway to investigate a HRPT link at 3.5 megabits per second. NOAA will issue a technical report in late 1991 detailing the changes required to existing ground systems.

4. Next GOES series (GOES I-M) - No changes are planned from present services. GOES I launch is scheduled for 1992.

A N N E X XI

Annex to paragraph 6.6.9 of the general summary

PLANNING CHART OF ALL PUBLICATIONS AND SUPPLEMENTS
TO BE ISSUED WITHIN THE OIS IN 1991/1992

	1991												1992											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
<u>Volume A - Observing Stations</u>																								
- New Edition					X						X						X						X	
- List of changes in respect to previous edition					X						X						X						X	
<u>Volume B- Data Processing</u>																								
- New Edition or Supplements				X						X						X						X		
<u>Volume C - Transmissions</u>																								
- Chapter I - Catalogue of Meteorological Bulletins																								
- New Edition					X						X						X						X	
- Chapter II - Transmission Schedules - New Editions (by Region) or Supplements	X		X				X		X				X		X				X		X			
<u>Volume D - Information for Shipping</u>																								
- New Editions (by Region) or Supplements		X		X		X		X		X		X		X		X		X		X		X		X
<u>International List of Observing Ships</u>																								
- New Editions							X												X					
<u>List of Stations for Global and Regional Exchange</u>																								
- New Editions or Supplements			X							X					X							X		

A N N E X XII

LIST OF DOCUMENTS

Doc. No.	Title	Agenda item	Submitted by
	A. "DOC" series		
1	Provisional agenda	2.2	
2	Explanatory memorandum relating to the provisional agenda	2.2	
3	Specific WWW matters, including reports by the chairmen of working groups and rapporteurs	6.1	Secretary-General
	Global Data-processing System (GDPS)		
	ADD.1		
	ADD.2		
	ADD.3		
4	Representation of observational data and products	6.4	Secretary-General
	ADD. 1		
5	WWW Data Management, including codes and data representation	6.4	Secretary-General
	Software registry		
6	Review of previous resolutions and recommendations of the Commission and relevant Executive Council resolutions	10	Secretary-General
7	Report of Rapporteurs on Satellite Data	6.5	P. Menzel and J. Le Marshall
8	Global Observing System (GOS)	6.2	Chairman of the working group
	Report of the chairman of the Working Group on the Global Observing System		
9	Global Observing System	6.2	Secretary-General
	Aircraft-to-Satellite Data Relay (ASDAR)		

Doc. No.	Title	Agenda item	Submitted by
10	Global Data-processing System (GDPS)	6.1	Chairman of the working group
	Report by the chairman of the CBS Working Group on the GDPS		
11	Global Observing System	6.2	Secretary-General
	Future of the Automated Shipboard Aerological Programme (ASAP)		
12	Status of WWW implenetation and operation, including monitoring	4	Secretary-General
13	WWW data management, including codes and data representation	6.4	Chairman of the CBS Working Group on Data Management
	Quality control procedures and monitoring data quality		
14	Report of the president of the Commission	3	President of CBS
15	Operational WWW systems evaluations (OWSE-NA and OWSE-AF)	6.7	Chairman of CONA
	Final report on the OWSE-North Atlantic		
16	Relationship of the WWW with other WMO and international programmes, including regional programmes	9	Secretary-General
17	Global Telecommunication System (GTS)	6.3	Chairman of the Working Group on the GTS
	ADD.1		
18	Global Observing System (GOS)	6.2 and 6.3	Secretary-General
	Global Telecommunication System (GTS)		
	Frequency allocation for meteorological satellites in the 2 GHz band		
19	Global Data-processing System (GDPS)	6.1	Secretariat
	Product quality monitoring/verification		
20	Operational WWW Systems Evaluations (OWSEs)	6.7	Secretary-General

Doc. No.	Title	Agenda item	Submitted by
21	Global Observing System Consolidated satellite data requirements	6.2	Secretary-General
22	WWW Data Management, including codes and data representation Report of the chairman of the CBS Working Group on Data Management	6.4	Chairman of the working group
23	Report of Rapporteurs on Satellite Data Studies concerning future satellite programmes	6.5	Secretary-General
24	Global Observing System Report of the pilot study to establish the value of information exchange between ECMWF and National Focal Points for Radiosonde Systems	6.2	Secretary-General
25	Global Observing System Definition of the space-based portion of the Global Observing System	6.2	Secretary-General
26	WWW Implementation Support Activities (ISA) including the Operational Information Service (OIS) and Implementation Co-ordination Activities (WIC) WWW System Support Activities (WWW/SSA)	6.6	Secretary-General
27	Global Data-processing System (GDPS) Global Observing System (GOS) WWW Data Management (WWWDM), including codes and data representation Report on results of data quality monitoring	6.1, 6.2, 6.4	Secretary-General
28	Global Data-processing System (GDPS) Demonstration of capabilities of RSMCs Miami, New Delhi and Tokyo	6.1	India

Doc. No.	Title	Agenda item	Submitted by
29	Global Data-processing System (GDPS)	6.1	France
30	WWW Data Management, including codes and data representation Amendments to the Manual on Codes	6.4	Secretary-General
31	Operational WWW systems evaluations (OWSE-NA and OWSE-AF)	6.7	Chairman of the OWSE-AF Steering Group
32	Global Observing System (GOS) Report on the Baseline Upper-Air Network Evaluation	6.2	United States of America
33	Consideration of the Third WMO Long-term Plan (a) World Weather Watch Programme (b) Public Weather Services Programme	7	Secretary-General
34	Global Data-processing System (GDPS) Processed product quality monitoring and forecast verification	6.1	France
35	WWW Data Management (WWWDM), including codes and data representation X-RA VI proposed amendments to FM 12-IX SYNOP related code tables and other code matters referred to CBS by RA VI	6.4	Secretary-General
36	Education and training related to CBS activities	8	Secretary-General
37	Demonstration of capabilities of RSMCs Miami, New Delhi and Tokyo	5	United States of America
38	Demonstration of capabilities of RSMCs Miami, New Delhi and Tokyo	5	Japan
	B. "PINK" series		
1	Opening of the session	1	President of CBS
2	Organization of the session	2	President of CBS

Doc. No.	Title	Agenda item	Submitted by
3	Report of the president of the Commission	3, 4	President of CBS
4	Global Data-processing System (GDPS)	6.1	Co-chairman, Committee A
5	Global Observing System (GOS)	6.2	Co-chairman, Committee A
6	Global Observing System (GOS)	6.2	Co-chairman, Committee A
7	WWW Implementation Support Activities (ISA), including the Operational Information System (OIS) and Implementation Co-ordination activities (WIC)	6.6	Co-chairman, Committee B
8	WWW Data Management, including codes and data representation	6.4	Co-chairman, Committee A
9	Global Observing System (GOS)	6.2	Co-chairman, Committee A
10	Global Observing System (GOS)	6.2	Co-chairman, Committee A
11	Operational WWW Systems Evaluations OWSE-NA and OWSE-AF)	6.7	Co-chairman, Committee B
12	Consideration of the Long-term Plan	7	President of CBS
13	Report of Rapporteurs on Satellite Data	6.5	Co-chairman, Committee A
14	Global Data-processing System (GDPS)	6.1	Co-chairman, Committee A
15	WWW Data Management, including codes and data representation	6.4	Co-chairman, Committee A
	REV. 1		
	REV. 2		
16	Relationship of the WWW with other WMO and international programmes including regional programmes	9	Co-chairman, Committee B
17	Education and training related to CBS activities	8	Co-chairman, Committee B

Doc. No.	Title	Agenda item	Submitted by
18	WWW Data Management, including codes and data representation	6.4	Co-chairman, Committee A
19	Global Observing System (GOS)	6.2	Co-chairman, Committee A
20	Review of previous resolutions and recommendations of the Commission and relevant Executive Council resolutions	10	President of CBS
21	Global Telecommunication System (GTS)	6.3	Co-chairman, Committee A
22	Demonstration of capabilities of RSMCs Miami, New Delhi and Tokyo	5	President of CBS
23	Operational WWW System Evaluations (OWSE-NA and OWSE-AF)	6.7	Co-chairman, Committee B
24	Date and place of the tenth session of the Commission	11, 12	President of CBS