WORLD METEOROLOGICAL ORGANIZATION

COMMISSION FOR MARITIME METEOROLOGY

ABRIDGED FINAL REPORT

OF THE

THIRD SESSION

Utrecht, 16-31 August 1960

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1961

C O N T E N T S

Recommendations (continued)

Recommendations (continued)

Annexes

LIST OF PERSONS ATTENDING THE SESSION

1. Officers of the session

H. Thomsen	President
K.T. McLeod	Vice-President

2. Representatives of Members of WMO

L.M. de la Canal	Principal delegate	Argentina
A. Descamp	Principal delegate	Belgium
J.M. Dury	Delegate	
H.W. Sansom	Principal delegate	British East Africa Territories including the Seychelles
Khiou Bonthonn	Principal delegate	Cambodia
Kak-Yom	Delegate	
K.T. McLeod	Principal delegate	Canada
C.H. Hsueh	Principal delegate	China
J.S. Fabricius	Principal delegate	Denmark
S.N. Venho	Principal delegate	Finland
Ph. Jonglez	Principal delegate	France
L. Bonnard	Delegate	
J. Romer	Delegate	
H.U. Roll	Principal delegate	Germany, Federal Republic
M. Rodewald	Delegate	
R.R. Nikolaidis	Principal delegate	Greece
S.L. Tierney	Principal delegate	Ireland
S. Hegedus	Principal delegate	Israel
M. Piloni	Principal delegate	Italy
B. Muzii	Delegate	
K. Terada	Principal delegate	Japan
S. Chung	Principal delegate	Korea, Republic of
J.A. van Duijnen	Principal delegate	Netherlands
Montijn		
G. Koudijs	Delegate	

Representatives of Members of WMO (continued)

G. Verploegh	Delegate	Netherlands (continued)
B. Heyna	Expert	
A.A. Fresco	Adviser	
J.J. Steensma	Adviser	
F. Spinnangr	Principal delegate	Norway
K.U. Siddiqi	Principal delegate	Pakistan
W. Parczewski	Principal delegate	Poland
S. Kluźniak, Mrs.	Delegate	
J.B. Blanc de Portugal	Principal delegate	Portugal
J.B. Blanc de Portugal	Delegate	Portuguese East Africa
J.B. Blanc de Portugal	Delegate	Portuguese West Africa
J.B. López Cayetano	Principal delegate	Spain
O.B. Rhode	Principal delegate	Sweden
C.V. Bunnag	Principal delegate	Thailand
A.B. Crawford	Principal delegate	Union of South Africa
J.J. Taljaard	Delegate	
L.A. Zaharov	Principal delegate	Union of Soviet Socialist Republics
G.M. Tauber	Delegate	
V.E. Zelenko	Interpreter	
C.E.N. Frankcom	Principal delegate	United Kingdom of Great Britain and Northern Ireland
J.A. Burnett	Delegate	
F.E. Lumb	Delegate	
P.H. Kutschenreuter	Principal delegate	United States of America
R.E. Mottern	Adviser	
J.F. Tatom	Delegate	
J.J. Schule	Delegate	
A.E. Sik	Delegate	
W.W. Shinners	Adviser	

3. Representative of a country non-Member of WMO

W.B. Phillips	Observer	Liberia

4. Representatives of international organizations

T. Laevastu	Observer	Food and Agriculture Organization of the United Nations

Representatives of international organizations (continued)

F. di Benedetto	Observer	International Civil Aviation Organization
L. Howell Rivero	Observer	United Nations Educational, Scientific and Cultural Organization
J.A. van Duijnen Montijn	Observer	International Committee for the Exploration of the Sea
C.B. Broersma	Observer	International Radio Maritime Committee
A. Wepster	Observer	
J. Veldkamp	Observer	International Scientific Radio Union
B. Heyna	Observer	International Union of Geodesy and Geophysics
J.J. Elzerman	Observer	Permanent International Association of Navigation Congresses
K. Wyrtki	Observer	Special Committee on Oceanic Research

5. Invited experts

I. Darbyshire
F. Nusser
H. Walden

6. Guest

M.A. Kohler	President CHM

7. Representatives of WMO Secretariat

K. Langlo	Chief, Technical Division
R. Crémet	Technical assistant
R. Mathieu	Technical assistant

8. Secretariat of the session

C.G.C. Schütte
P. Verschoor
J. Muysert
W.H. Ywema
A.M.J. Schenk

A G E N D A

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GENERAL SUMMARY OF THE WORK OF THE SESSION

The Commission for Maritime Meteorology of the World Meteorological Organization held its third session in the main building of the University of Utrecht from 16 to 31 August 1960, under the chairmanship of Mr. Helge Thomsen, President of the commission. Facilities for the session including interpretation were provided by the Netherlands Government.

1. OPENING OF THE SESSION (Agenda item 1)

The formal opening of the session took place on Tuesday, 16 August 1960, at 10 a.m. in the Auditorium of the University of Utrecht, Mr. Helge Thomsen, of Denmark, President of the commission, being in the chair.

Mr. C.J. Warners, Director in chief of the Royal Netherlands Meteorological Institute, welcomed the participants on behalf of the Government of the Netherlands and the Minister of Transport and Public Works. Referring to the creation of the International Meteorological Organization at Utrecht in 1878 he emphasized the rôle of maritime meteorology in the foundation of many meteorological services.

Mr. H. Ploegh Jr., Deputy Mayor of Utrecht, expressed satisfaction on behalf of the Municipality of Utrecht at having the third session of the commission in this city.

Mr. Langlo, Chief of the Technical Division of the WMO Secretariat, conveyed a goodwill message from the Secretary-General of the Organization and briefly retraced the ten years of activity of the World Meteorological Organization.

Finally Mr. Thomsen, President of the CMM, presented a short survey of the evolution of shipping and the growing influence of meteorology in this field and expressed the thanks of the commission to the Netherlands authorities for their invitation.

The local secretariat of the session was under the direction of Mr. C.G.C. Schütte of the Royal Netherlands Meteorological Institute.

2. CONSIDERATION OF THE REPORT ON CREDENTIALS (Agenda item 2)

A list of the persons present and the capacity in which they were attending the session was presented at the first plenary meeting on the basis of the credentials received.

The commission did not consider it necessary to establish a credentials committee.

Thirty Members, one non-Member country and nine international organizations were represented at the meeting. A full list of those present is given at the beginning of this report.

3. ADOPTION OF THE AGENDA (Agenda item 3)

The meeting agreed to include a new item 9.6 and the approved final agenda is reproduced at the beginning of this report.

4. ESTABLISHMENT OF COMMITTEES (Agenda item 4)

The commission established a Nomination Committee, two technical committees and a Co-ordination Committee.

The Nomination Committee was composed of the following six members, each pertaining to a region of WMO :

A.B. Crawford (Union of South Africa - Region I)
L.A. Zaharov (USSR - Region II)
L.M. de la Canal (Argentina - Region III)
P.H. Kutschenreuter (USA - Region IV)
C.V. Bunnag (Thailand - for Region V in the absence of delegates from this region)
H.U. Roll (Federal Republic of Germany - Region VI).

Committee A dealt with operational and organizational matters and was entrusted with items 6.3, 6.5, 6.6, 7.8, 7.11, 7.12, 7.13, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 10.1, 10.2, 14, 15, 16, 22. Cmdr. Frankcom was nominated chairman of that committee.

Committee B dealt with technical problems and was entrusted with items 6.1, 6.2, 6.4, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.9, 7.10, 9.3, 11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 12.2, 13.1, 13.2, 13.3, 13.4, 16. Mr. Roll was nominated chairman of that committee.

Items 1, 2, 3, 4, 12.1, 17, 18, 20 and 21 were dealt with directly in plenary meetings. Items 9.3 and 16 were successively considered by CommitteesB and A. The chairmen of each of the technical committees were assisted by a member of the WMO Secretariat acting as technical secretary.

The Co-ordination Committee was composed of the president and the vice-president of the commission, the chairmen of Committees A and B and the representative of the Secretary-General of the Organization.

No drafting committee was established; the reports were prepared by

the technical secretaries with the assistance of certain members of the committee.

5. REPORT BY THE PRESIDENT OF THE COMMISSION (Agenda item 5)

The commission took note with satisfaction of the report of the president which covers inter alia the questions raised since the second session. The various questions referred to in this report were examined under the relevant items of the agenda.

6. REPORTS OF THE CHAIRMEN OF WORKING GROUPS ESTABLISHED BY THE COMMISSION (Agenda item 6)

6.1 Working Group on marine climatology (Agenda item 6.1)

The commission noted with satisfaction the report presented by the chairman of the working group. Appropriate action was taken on this report under item 11.

6.2 Working Group on sea ice (Agenda item 6.2)

The commission noted with satisfaction the report presented by the chairman of the working group. Appropriate action on this report was taken under item 13.

6.3 Working Group on organizational and operational matters (Agenda item 6.3)

The commission noted with appreciation the report presented by the working group. It was agreed that appropriate action on the report had been taken under agenda items 8.1, 8.2, 8.5, 8.6 and 10.1 except for the question dealt with below. The commission examined the major portion of the first draft of a handbook on "The preparation and use of weather maps by mariners" which was available in time for the session and noted with satisfaction the thoroughness of the work done by Mr. Rodewald. Although it was the intention that the first draft would receive approval by the session, it was agreed that the scope of the task was more than could be accomplished during the time of the session. The conclusions of the commission are contained in Resolution 3 (CMM-III) and Recommendation 21 (CMM-III).

The commission agreed that one of the maps prepared by the Secretariat showing the distribution of ships' reports on a day picked at random (1st November 1957), completed as necessary, should be included as an annex* to the report of the session and that the total number of observations shown on these maps should be indicated on the map. The commission further agreed that paragraph 9 of the report of the working group should be included as an additional

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* See Annex I.

annex* together with the statistics suitably amended concerning "number of ships' observations received for 19 May 1958 (00, 06, 12 GMT) in the WMO IGY Data Centre" and "number of messages received from ships' for the different collecting areas in 1958" appended to this report.

6.4 Working Group on technical problems (Agenda item 6.4)

The commission noted with satisfaction the report presented by the chairman of the working group. Appropriate action on this report was taken under agenda items 7.1 to 7.7 and 12.2.

6.5 Report of the Working Group on the Marine Cloud Album for use by observers at sea (Agenda item 6.5)

The report of the working group on this question was examined by a sub-committee. The findings of this sub-committee as subsequently approved by the commission are reported under agenda item 7.8.

6.6 Working Group on the relations with the international fisheries organizations (Agenda item 6.6)

The commission examined the report submitted by the Working Group on the relations with the international fisheries organizations including the draft recommendations and resolutions attached to that report.

Various members informed the commission of their experiences with regard to the relation with fishermen and fisheries organizations. It was noted that good results had been obtained in some countries, but not in others. In particular, the commission noted the important rôle which port meteorological liaison officers could play in this connexion. The main decisions of the commission, arising out of the report of the working group, are incorporated in Recommendation 15 (CMM-III).

The commission further agreed that the Secretary-General should be requested to arrange that the question of meteorological traffic capacity of coastal radio stations should be discussed by the IMCO, ITU, ICAO and WMO permanent joint study group on questions concerning safety at sea under the heading telecommunication.

During the discussion of this item reference was made of the desirability of issuing sea temperature forecasts. As some doubt was expressed as to the ability of meteorological services to prepare such forecasts at present it was agreed that Members should be encouraged to study this question as the need for such forecasts will increase in coming years.

The commission also considered that further studies should be carried out on weather advices and fishing operations and that, therefore, a working

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* See Annex II.

group on this matter should be established. This working group, amongst others, should have the task to prepare the material and instructions relating to meteorological aids for fishermen, as required, for the guidance of Members. The terms of reference of the working group are given in Resolution 5 (CMM-III).

7. METEOROLOGICAL OBSERVATIONS MADE ABOARD SHIP (Agenda item 7)

7.1 Precipitation measurements at sea (Agenda item 7.1)

The commission discussed the review of the present state of precipitation measurements at sea presented by the Working Group on technical problems and the suggestions made by Members on the subject. The commission felt that much has already been achieved towards obtaining a clear insight into the possible solution of the various problems involved.

Since, however, no entirely satisfactory solution has as yet been found, continued exchange of ideas and experimental results should be promoted. To this aim it was decided to include the problem of precipitation measurements at sea in the terms of reference of the Working Group on technical problems. Furthermore it was recommended that the review mentioned above be published as a WMO Technical Note. It was further recommended that the maritime countries be invited to make increased efforts to improve precipitation measurements at sea. These conclusions are incorporated in Recommendation 7 (CMM-III).

7.2 Measurement of sea surface temperature (Agenda item 7.2)

A report on this question was presented to the commission by the CMM Working Group on technical problems in accordance with Resolution 2 (CMM-II). The commission was informed of the investigations now being carried out by the Federal Republic of Germany, the Netherlands, the United Kingdom and the United States of America. It was agreed that there was a need for further study in order to arrive at a cheap, practical and reliable method of measuring sea surface temperature. The decision of the commission on this matter is included in Recommendation 8 (CMM-III).

7.3 Revision of WMO Publication No. 8.TP.3, Chapter 10 (Agenda item 7.3)

The commission studied this question on the basis of the revised text prepared by the Working Group on technical problems. Further amendments were brought to this text to conform more closely with Technical Regulations and to take into account the decisions of the session. The commission decided to ask the Secretary-General to take appropriate action in consultation with the president of the Commission for Instruments and Methods of Observation to have this revised text included in the Guide. Incidental amendments to Publication No. 9.TP.4, Volume D, Chapter D, will also be required. It was also decided to draw the attention of the CIMO to the next to last paragraph under 10.1.1 of this chapter.

During the discussions one member suggested that the paragraphs related to wind observations should indicate whether relative wind as well as true wind was meant. It was decided to refer this question to the Working Group on technical problems. The commission noted that instructions for ice observations, to be included in Chapter 10, paragraph 9, could not be prepared until agreement on the codes was reached. With this accomplished, the commission decided that a working group should now proceed with the preparation of these instructions (see Resolution 2 (CMM-III)).

7.4 Reporting visibility (Agenda item 7.4)

The commission examined the relevant part of the report of the Working Group on technical problems concerning the problem of reporting visibility at sea and also a proposal to introduce a new procedure for reporting this element.

Pending the outcome of the study at present being carried out by CSM the commission agreed to take no further action at present. It was agreed that the Working Group on technical problems should re-examine the question as soon as the result of the study by CSM becomes available. Under this agenda item the commission also considered the code table used for reporting visibility at sea (Code 4377). The commission agreed that it was inconsistant to require that ocean weather stations should report visibility in the full Code 4377, while selected ships were only required to use code figures 90-99. Evidence was provided that it was not practicable to report visibility in the full VV code by ocean weather stations. The commission consequently decided to request the Commission for Synoptic Meteorology to consider amending the appropriate provisions in Publication No. 9.TP.4, Volume B, to permit also ocean weather stations to report visibility by code figures 90-99.

7.5 Gust (application of definition) (Agenda item 7.5)

The commission examined the report submitted by the Working Group on technical problems and agreed to the conclusion of the working group that there is a need for further research on gustiness at sea. In particular the commission agreed that it is of importance for several practical applications (as, e.g., wind effects on ships, sailing vessels, lighthouses and other maritime constructions) to know more about wind structure at sea and its dependence on wind speed and thermal stability, especially with regard to amplitude, time parameters and frequency of gusts.

The main conclusions of the commission are embodied in Recommendation 9 (CMM-III).

7.6 Atmospherics (Agenda item 7.6)

The commission studied the report on the question of atmospherics observations at sea submitted by the Working Group on technical problems. It was

noted that there is at present no known intention on the part of Members concerned to install atmospherics equipment or lightning-flash counters on ocean station vessels or on merchant vessels.

The commission agreed with the conclusion of the working group that at the present time priority should be given to improving the observation equipment of the more commonly observed meteorological parameters on reporting ships rather than to expand into the field of atmospherics. The commission would, however, welcome any investigation on the use of lightning-flash counters on board ocean station vessels if any Member concerned finds it practicable to undertake such studies.

7.7 Measurement of true wind at sea (Agenda item 7.7)

The commission considered the relevant part of the report of the Working Group on technical problems relating to measurement of true wind at sea. The commission noted that at present there existed no economical equipment for measuring true wind at sea, but expressed the hope that such equipment might become available in the future. It was agreed that the Working Group on technical problems should keep itself informed on further development of this question and also keep under current review the even more important requirement for development of instruments for measuring relative wind at sea.

7.8 Marine Cloud Album (Agenda item 7.8)

The commission recommended a selection of 40 photographs of the Abridged Cloud Atlas for the Marine Cloud Album in accordance with Recommendation 25 (CMM-II) and Resolution 33 (EC-IX). The commission redrafted the text of the legends to the photographs in order to get a shorter and simpler text than that proposed by the working group.

The commission further recommended that a chapter on cloud observation referring to the special conditions met at sea should be included in the Cloud Album. Both the text of the legends and that of the chapter on cloud observation are included respectively as Parts A and B of the annex to Recommendation 11 (CMM-III).

The commission authorized the president of CMM to make necessary editorial changes to Parts A and B of the annex to Recommendation 11 (CMM-III) in consultation with the WMO Secretariat.

The commission considered that in addition to the Marine Cloud Album there was need for a sheet showing only the pictures of typical cloud features and the associated code figures. Since several Members would not be able to prepare such a sheet themselves, it was recommended that it should be prepared by the WMO Secretariat and should be made available for purchase by Members. Further details on this subject are found in Recommendation 10 (CMM-III).

7.9 Required accuracy of measurement (Agenda item 7.9)

The commission studied a report on this question prepared by the president of CMM, and discussed in some detail the various problems involved in laying down requirements for accuracy of measurements at sea. The main conclusions of the commission are given in summarized form in annex* to the present report.

With reference to the request contained in paragraph 5.8.1.7 of the General Summary of the work of Third Congress, the commission agreed that it would be desirable to include in the Technical Regulations the prescribed precision of reading instruments for measuring atmospheric pressure and sea surface temperature in addition to the existing regulations concerning accuracy of reading thermometers (for psychrometric purposes) and precipitation amount. Recommendation 4 (CMM-III) was consequently adopted.

7.10 Report of the Executive Committee Working Group on the Beaufort Scale (Agenda item 7.10)

7.10.1 The commission had a long and detailed discussion on this point, particularly as regards the second recommendation of the Executive Committee working group. Some members were of the opinion that the new wind-speed equivalents of the Beaufort numbers are the most suitable values known at present only for the figures up to and including 7. Finally, a majority of the members of the commission expressed its agreement with the conclusions of the Executive Committee working group. The possible introduction of the new wind-speed equivalents was also discussed in detail. It was finally decided to postpone a decision on this subject until the fourth session of the commission. Members which have doubt concerning these new equivalents are urged to continue studies and verify their opinion. Recommendation 12 (CMM-III) refers to this subject.

7.10.2 The commission also studied the present use of the Beaufort numbers for sea observations of the wind speed, especially with regard to the use of Beaufort numbers 13 through 17. The commission discussed the point that since the estimation of the wind speed is made by using definite specifications referring to visual observations and since no specifications are given in WMO Code 1100 for the Beaufort numbers 13 through 17, no practical use can be made of these numbers. The hope was expressed that Members concerned would develop specifications for estimating wind speeds in the present range of Beaufort numbers 13 through 17. Considering that specifications corresponding to Beaufort numbers higher than 12 are extremely difficult to develop for shipboard observers, the commission agreed to recommend that Beaufort numbers 13 through 17, and reference to them, be deleted from Code 1100 and from other codes where appearing. The relevant conclusions are incorporated in Resolution 8 (CMM-III).

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* See Annex III.

7.11 Units used in international exchange of meteorological reports (Agenda item 7.11)

The commission considered the request of Third Congress that the technical commissions should consider and recommend the necessary changes in the Technical Regulations, guides and codes, in accordance with Resolution 30 (Cg-III).

The commission agreed to invite the attention of the Executive Committee to the fact that the marine meteorological observations are largely carried out on voluntary basis and that the meteorological services therefore have not the same control over the progress in changing over to the metric system and Celsius degree with regard to meteorological reports from ships as for reports from land stations. The commission noted with satisfaction that some Members are taking steps to change over from Fahrenheit to Celsius either by changing the thermometers on their selected ships or to arrange for the messages to be converted before they are included in collective messages for international exchange. The attention of the Executive Committee is drawn specifically to the fact that certain ships for national reasons continue to use Fahrenheit and that their reports will be in Fahrenheit. It is suggested that a note to this effect be included in an appropriate part of Volume B.

With regard to the changes to be made in WMO publications, the commission considered that the use of knots and nautical miles should be continued because mariners are familiar with them, having used them for many years. The conclusions of the commission are incorporated in Recommendation 5 (CMM-III) including as an annex the recommended changes to be made in WMO Publication No. 9.TP.4, Volumes B and D.

7.12 Code 4900 : Y-day of the week (Agenda item 7.12)

The commission noted the discrepancy existing between the systems for numbering the days of the week used in code table 4900 : Y and in Publication No. 9.TP.4, Vol. A, and that no apparent confusion had resulted.

The commission considered that Code 4900 has been employed by ships' officers for many years and that any change in it would introduce errors in a considerable number of ships' weather messages and ships' weather logs. It consequently decided to request the president of CMM to inform the president of CSM that no changes should be made in Code 4900.

7.13 Reporting of sea surface temperature (Agenda item 7.13)

The commission noted that sea temperature data derived from SHIP reports were frequently unreliable as a result of errors occurring in the coding of $T_S T_S$. It considered that the inclusion in SHIP reports of the sea surface temperature itself in whole degrees instead of the difference between sea and air temperature in half degrees would reduce considerably such errors.

The commission agreed to request the president of CMM to submit this proposal to the president of CSM with the proviso that if CSM cannot approve the reporting of sea surface temperature in whole degrees Celsius, it should devise some method of reporting this element directly as read from the thermometer to tenth of a degree Celsius, bearing in mind the undesirability of making radical changes in the general lay-out of the code with which ships officers have now become so familiar.

8. ORGANIZATION OF METEOROLOGICAL NETWORKS OF OBSERVATIONS FROM SHIPS AT SEA (Agenda item 8)

8.1 Voluntary observing ship scheme (Agenda item 8.1)

8.2 Establishing aerological observations from merchant ships (Agenda item 8.2)

The commission considered in some detail the various documents presented under the two agenda items mentioned above.

8.2.1 Voluntary observing ship scheme and related problems

Referring first to the voluntary observing ship scheme and related problems, the commission agreed that the most efficient way to improve the oceanic network is by energetic action on the part of port meteorological liaison officers and that countries bordering the deficient areas should make special efforts in this direction.

On the subject of simplified procedure of addressing ships' weather reports to shore stations the commission considered the action taken by CSM on Recommendation 23 (CMM-II) and noted that it was the best possible solution under the existing international regulations.

In this connexion the commission recommended that each "auxiliary" ship should have available more complete information on the addresses to which meteorological messages could be sent.

The commission further agreed that greater use should be made of the WMO "sparse area" chart originally prepared for use on board auxiliary ships during the IGY. It was also agreed that the title of the chart should be suitably amended to indicate the need for sending weather reports when the ship was plying in the shaded areas shown.

With reference to the simplified code-card supply to auxiliary ships, the commission considered that such code-cards could best be issued by the national services, but agreed that a specimen of a simplified code-card should be included in the abridged report of the session for the guidance of Members (see also agenda item 8.6).

The substance of the above decision are included in Recommendation 13 (CMM-III).

The commission further considered whether the WMO Secretariat should take active part in assisting in organizing the voluntary ship scheme. The commission did not agree to the proposed establishment of the post of a port meteorological liaison officer attached to the Secretariat but recommended that senior members of the Secretariat when visiting countries for other purposes should do their utmost to promote the establishment or development of the system of port meteorological liaison officers and also stress the importance of prompt reception of ships' reports by coastal stations and efficient retransmissions of all ships' reports received by collecting centres (see Resolution 7 (CMM-III)).

The commission noted that studies made by some Members have provided evidence that not all ships' reports received by coastal radio stations are retransmitted to the benefit of other Members.

In order to improve the situation, it was considered necessary to amend the Technical Regulations referring to the dissemination of ships' reports and Recommendation 6 (CMM-III) was consequently adopted.

8.2.2 World-wide network of surface and upper-air sea stations

The commission considered the decision of the Executive Committee at its twelfth session on the question of a world-wide network of meteorological stations. The commission agreed that the establishment of ocean weather stations, as suggested by the Executive Committee, would be the most desirable solution, but in view of the high cost involved other alternatives to fill the gaps should also be explored. One of these alternatives was to charter one or more tankers from the surplus tonnage to be stationed for a considerable time at one or more of the positions proposed in the Executive Committee's plan. Such a ship could have the minimum number of crew, two radio officers, and a minimum of meteorological staff, depending on the programme of observations. The primary function of this ship would be meteorological, but other organizations may wish to contribute to the project by using the ship for other purposes also.

Another alternative would be to introduce an international scheme for the making of radiosonde observations on board mobile ship stations. The commission was informed that the United States programme for aerological observations from merchant ships is now operational and that the special equipment used can now be purchased from the manufacturer. The commission realized that insufficient information was available on the potentialities of these two proposals and it was, therefore, decided that they should both be examined by a small working group of the commission. The terms of reference of this working group are given in Resolution 6 (CMM-III).

8.3 Definition of light-ship station (Agenda item 8.3)

At the request of Third Congress the commission recommended a definition of the term "Light-ship station" and that provision should be made in the Technical Regulations to add to paragraph 2.1.2.1 a note that code forms for land stations or those for ship stations can be employed for reports from light-ship stations. These conclusions are contained in Recommendation 1 (CMM-III).

8.4 Consideration of paragraphs 2.2.1.7 and 2.2.1.8 of the Technical Regulations (Agenda item 8.4)

As requested by Third Congress the commission re-examined paragraphs 2.2.1.7 and 2.2.1.8 of the Technical Regulations. It considered that the substance of these paragraphs was of the nature of an explanatory note complementing the instructions to Members given in paragraph 2.2.1.6 and that this paragraph should be amended slightly to indicate more clearly what was requested from Members. The commission also recommended that the title of the map published in Volume D indicating the density of ships' reports over the oceans be amended to make clear that it refers only to surface observations. These conclusions are recorded in Recommendation 2 (CMM-III).

8.5 Aeronautical requirements to improve substantially the availability of ships' weather reports from the Red Sea, the Arabian Sea, the Bay of Bengal, the Indian Ocean and the China Sea (Agenda item 8.5)

The commission noted Recommendation 7.1/9 of the joint MID-SEA RAN Meeting of ICAO requesting that the availability of these ships' reports from the Red Sea, the Arabian Sea, the Bay of Bengal, the Indian Ocean and the China Sea be improved substantially. From an examination of a chart showing the positions of reports on a given day, presented to the session, it was noted that the number of voluntary ships in these areas appears to be adequate and that the problem seems to be largely that many of these reports were not included in territorial and sub-continental broadcasts for dissemination to Members needing these reports. In view of the general action taken under agenda item 8.1 to improve the distribution of ships' reports, no further measures were considered necessary in this particular case.

8.6 Short meteorological code for whale-catchers, trawlers, etc. (Agenda item 8.6)

8.6.1 The commission noted the request of the Working Group on the relations with international fisheries organizations regarding the establishment of a short meteorological code form for fishing vessels and examined the proposal for such a code contained in CMM-III/Doc. 26. There was general reluctance to the introduction of a new code form, but it was decided to request the president

of CMM to ask the president of CSM to arrange as a matter of urgency for a study by his commission of the most appropriate code form and coding procedure for reports from fishing vessels in sparse areas, keeping in mind the necessity of clear and understandable instructions for use by fishermen and the requirements resulting from the use of these reports for immediate synoptic and ultimate climatological purposes, bearing in mind that some such ships find it difficult to use the full ww code. The CSM is in particular invited to consider making arrangements for fishing vessels and auxiliary ships to report present weather by using a selection of 10 or more code figures of the ww code table (in particular the figures 45, 50, 60, 70, 80 and 95) and of developing a suitable means of indicating in the report in the SHRED-FM 23.B form the use of this restricted ww code. The selected code figures might be printed in bold type in the code table with a foot-note explaining the special use of these figures. Nevertheless, it was agreed that fishing vessels and auxiliary ships should be encouraged to use the full ww code. It was understood that in cases of trawlers operating in large groups only one of the trawlers would be requested to send weather reports. Consideration should also be given to making arrangements for fishing vessels and auxiliary ships to report sea temperature when required.

An example of the lay-out of a simplified code-card which would meet the requirements for reports from fishing vessels is appended to the present report.*

8.6.2 In addition the commission noted that a slide-rule weather coder had been designed for use on fishing boats to encode automatically weather reports in a suitable code form. It recognized that this device could contribute to increasing the number of fishing vessels participating in the weather reporting scheme. The commission decided to recommend that the attention of Members be invited to the availability of this new coding device. Noting a statement concerning a possible modification of the coder for use on aircraft, the ICAO observer requested that this fact should be brought to the attention of ICAO (see Recommendation 14 (CMM-III)).

8.7 Locust reports from ships (Agenda item 8.7)

The commission considered the request of the Anti-Locust Research Centre for assistance by WMO in arranging for ships of all nationalities operating in the seas around Africa, Arabia, Pakistan and India to report any locusts seen, by radio to "Anti-Locust", London.

The commission noted that the cost of such messages will be defrayed by the Desert Locust Information Service in London.

One member raised the question whether the International Telegraph Regulations contain any information on the preamble to be used in such messages,

* See Annex IV.

and it was agreed that this needed to be clarified. The commission agreed to the importance of complying with the request of the Anti-Locust Centre and further noted that the Executive Committee in Resolution 12 (EC-XI) had given favourable consideration to the problem of meteorological assistance in locust control.

The commission consequently concluded that Members concerned should be invited to assist in collecting reports on locusts seen from ships as indicated in Recommendation 16 (CMM-III).

9. WEATHER BULLETINS AND WARNINGS FOR SHIPPING (Agenda item 9)

"Increase of wind" warnings as an alternative to "gale" warnings

The commission noted a suggestion that on the basis of forecast bulletins issued at 6-hourly intervals a system of "increase of wind" warnings might replace "gale" warnings, on lines similar to the amendment procedure used for forecasts of upper winds for aviation. It considered that at present no action was necessary on the part of the commission.

9.1 MAFOR Code (Agenda item 9.1)

The commission examined the question whether the MAFOR code is satisfactory to meet maritime requirements. The commission was informed that indicators for maritime areas used in the MAFOR Code were listed in Publication No. 9.TP.4, Volume D. It was suggested that the specification of code figure 5 in code table 4562 - forecast weather - be amended to read "drizzle" instead of "shower" and that figure 8 be changed to read "squally weather with or without showers".

As regards the question raised in CMM-III/Doc. 14, regarding the coding of wave heights higher than 4 1/2 m (14 feet), it was suggested that this could be achieved by adding 50 to the indicator figure 33 at the beginning of the group. Thus for wave heights above 4 1/2 m the group $33D_KP_WH_W$ would take the form $83D_KP_WH_W$. However, it was considered that no definite proposal should be made on this point and that the problems should be dealt with by the Commission for Synoptic Meteorology.

9.2 Consideration of paragraphs 5.1.1.2 and 5.1.1.1 of the Technical Regulations (Agenda item 9.2)

The commission recommended a new wording of paragraph 5.1.1.2 which is applicable only to reports transmitted by sea stations for incorporation in Chapter 5 of the Technical Regulations. The commission also recommended that a new paragraph covering abbreviated codes used for SHIP and SYNOP reports in bulletins transmitted to shipping be included in Chapter 10 of the Technical Regulations. The amended paragraphs for insertion in the Technical Regulations are included in Recommendation 3 (CMM-III).

9.3 Facsimile broadcasts of weather charts for shipping (Agenda item 9.3)

The commission considered the advantages of facsimile broadcasts for shipping and noted the experiences gained by several countries in the use of facsimile broadcasts of weather, wave and ice data. The commission recommended that information on national broadcasts be included in WMO Publication No. 9. TP.4, Volume D, and that arrangements be made for such information to be provided to ships equipped with facsimile receivers. Recommendation 17 (CMM-III) incorporating these views was adopted.

9.4 Icing of ships (Agenda item 9.4)

The commission examined the important question of ice accretion on ships and considered that it was essential that occurrences of icing be reported by ships to comply with the 1960 International Convention for Safety of Life at Sea. It decided to recommend that the SHIP code forms be expanded to permit the reporting of icing conditions in plain language. The commission also considered that it was necessary to conduct studies on the meteorological conditions associated with ice accretions.

The conclusions of the commission are incorporated in Recommendation 18 (CMM-III). This question was also referred to under agenda item 22.

9.5 Visual storm warnings signals (Agenda item 9.5)

The commission examined Recommendation 2/8 of CAeM-II/MET V relating to the development of a definition for the terms "tropical cyclone" (hurricane, typhoon) and "tropical depression" and noted that a classification of tropical cyclones has already been published in Publication No. 9.TP.4, Volume D and that consequently no further action seems to be necessary.

The commission examined the revised international system of visual storm warning signals prepared by the Secretariat and agreed to recommend the adoption of a revised version of these signals as given in the annex to Recommendation 19 (CMM-III).

9.6 Consideration of amending the contents of Code FM 46.A (IAC FLEET) Analysis in abbreviated form (Agenda item 9.6)

The commission considered a proposal regarding the inclusion in analyses in IAC FLEET analysis code form of prognostic groups giving information on forecast pressure systems and fronts.

It was explained that it was not necessary to develop a particular procedure to this effect since such a procedure was already in use for preparation of analyses in full form FM 45.B and could be applied as well to FM 46.A. The president of CSM explained that the CSM at its last session had not extended the use of this procedure to code form FM 46.A because no request for this had been made at that time. He indicated that the question could be solved by correspondence within the Commission for Synoptic Meteorology.

The commission decided to request the president of CMM to ask the president of CSM to arrange for the amendment of code form FM 46.A (IAC FLEET) to permit Members preparing surface analysis messages for broadcast to shipping to include prognostic groups for pressure systems and fronts in the same message, following the procedure specified in WMO Publication No. 9.TP.4, Volume B, Code FM 45.B, Note 7.

10. SPECIFICATIONS OF AREAS OF RESPONSIBILITIES (Agenda item 10)

10.1 Requests for changes in forecasting and reporting areas (Agenda item 10.1)

The commission noted the decision of the Executive Committee (paragraph 2.4.6.3 of the General Summary of the ninth session of the Executive Committee) that amendments to Maps A and B of Publication No. 9.TP.4, Volume D, should be co-ordinated by CMM and approved by the Executive Committee. It also noted that in some cases proposed amendments are first presented to the regional association concerned and thereafter considered by the CMM, while in other cases the proposed amendments are presented directly to the commission.

The commission considered it desirable to have available the comments of the Members directly concerned with the proposed amendment and also the comments of the president of the regional association concerned before drawing up any recommendation on the proposed amendment to the Executive Committee. In order to avoid undue delay in the handling of requested amendments the commission decided to authorize its president to act on behalf of the commission as soon as the comments mentioned above have been obtained.

With regard to the individual requests for amendments to Maps A and B presented to the session the commission decided as follows :

(a) Request from India

The commission considered a request from India for some adjustments to the forecasting areas and the reporting areas allocated to India.
Since the comments of the president of Regional Association II and of Members directly concerned were not available to the commission, it decided to request the president of CMM to follow up the request from India in accordance with the procedure indicated above.

(b) Request from Cambodia

The commission examined the request presented by Cambodia regarding the allocation of a reporting and forecasting area.
It noted that the great number of overlapping areas in the Indian Ocean and adjacent waters resulted in some difficulties for the dissemination of ships' reports but considered that the measure taken under agenda item 8.1 should reduce the difficulties.

The commission further noted with appreciation that Cambodia had established a coastal radio station at Sihanoukville.
It was decided to request the president of CMM to ask the president of RA II to give early and favorable consideration to the request from Cambodia and to take further action on this request in accordance with the procedure outlined above.

(c) Request from Korea

The commission noted that this request had been examined by Regional Association II at its second session and that the association decided that the matter should first be discussed between Korea, Japan and Hong Kong and results notified to the president of RA II for subsequent consideration by CMM.
The commission was informed that Korea had initiated the action requested by RA II but since the results of the consultations were not yet known the commission decided to request the president of CMM to ask the president of RA II to give early and favorable consideration to the request from Korea and to take further action on this request as soon as the required comments become available.

The commission noted that the present situation as regards radio shore stations accepting ships' reports and the forecasts available for shipping along the west coast of South America was unsatisfactory and had adverse effects on the shipping and fishing activities in this area. The commission was informed that the Secretary-General was investigating this matter in consultation with the president of RA III and expressed its hope for an early improvement.

The commission decided to establish a working group to study the general question of the areas of responsibility for collecting ships' reports and the provision of shipping forecast (see Resolution 7 (CMM-III)).

10.2 Transmission of ships' reports to shore stations (Agenda item 10.2)

The commission considered the problems connected with the transmission of ships' reports to shore stations on the basis of an analysis of replies from members of CMM to an inquiry of the president of the commission regarding this question.

The equatorial region between the South American and African coasts and the South Pacific region bordering South America, were particularly noted as areas in which ships encountered difficulties in transmitting their reports to coastal stations.

The commission decided to request the president of CMM to ask the president of CSM to consider the possibility of replacing the term "continental broadcast" by "regional broadcast" in order to make clear that such a broadcast

includes also data from oceanic areas. The commission finally decided that the working group, established under item 10.1, should study the question of the areas of responsibility for (a) collecting ships' reports and (b) shipping forecasts (see Resolution 7 (CMM-III)).

11. CLIMATOLOGICAL INFORMATION FOR SHIPPING AND FISHING (Agenda item 11)

11.1 Division of responsibility for ocean areas among Members with respect to the marine section of the World Climatic Atlas and the climatological summaries (Agenda item 11.1)

The commission accepted the principle of division of responsibility in respect of the collection of surface marine data and the preparation of climatological summaries. The following Members have expressed their willingness to undertake responsibility for the various zones proposed :

Federal Republic of Germany
Japan
Netherlands
Union of South Africa
United Kingdom
United States of America
Union of Soviet Socialist Republics

The commission having considered that it was proposed to base the marine section of the World Climatic Atlas on data for the period 1950-1979, agreed that it would be inappropriate to make definite proposals now for the allocation of responsibility for the separate volumes of the marine section. It was decided that the map of proposed areas of responsibilities, established by the Working Group on marine climatology, should be retained as it shows the areas recommended as the most suitable for the preparation of the separate volumes of the marine section.

11.2 Punch-card and punching procedures (Agenda item 11.2)

The commission considered the new model of an international maritime punch-card and the supplementary punching procedures. Minor amendments were adopted for these documents so as to provide for the punching, if required, of data concerning ship's course and speed, pressure tendency and precipitation. Provision was also made for the punching of two-figure data for wave height and period. The decisions of the commission on this matter are included in Recommendations 23 and 24 (CMM-III). Recommendation 25 (CMM-III) concerning future code changes affecting the international maritime meteorological punch-card was also adopted.

11.3 Climatological summaries (Agenda item 11.3)

The commission approved the contents of climatological summaries. In

order to ensure uniformity of presentation of these contents and in order to emphasize their international character, it was decided to recommend that the climatological summaries be published by the WMO Secretariat.

With reference to the comments presented by the president of CCl concerning the prompt provision of uniformly arranged processed data publications, the commission agreed that this is precisely the intention behind the decisions concerning the climatological summaries. Decisions on this matter are included in Resolution 1 (CMM-III) and Recommendation 22 (CMM-III).

11.4 Marine section of the World Climatic Atlas (Agenda item 11.4)

The commission considered the lay-out of the marine section of the World Climatic Atlas, prepared by the relevant working group. The commission recognized that this lay-out should be regarded as provisional only, and will need further study. Taking into account the request addressed by Third Congress to CCl (General Summary, paragraph 5.8.1.4), the commission recommended that the preparation of this marine section should be based on the period 1950-1979. It was also agreed that it may be possible to publish a certain number of charts containing rain days in this marine section. Recommendations 26 and 27 (CMM-III) were adopted on this subject.

The commission also decided to have the problem of the best method of representing the variability of meteorological elements from marine surface data studied by the Working Group on marine climatology.

11.5 Specifications for national marine climatic atlases (Agenda item 11.5)

The commission discussed paragraphs 48 and 49 of the General Summary - (Agenda item 7) - of the first session of the Working Group on marine climatology, and agreed to recommend that any Members undertaking the preparation of a new national marine atlas might usefully take into account the recommendations concerning the specifications for the marine section of the World Climatic Atlas (see Recommendations 26 and 27 (CMM-III)), but should bear in mind that these specifications are only provisional, and are subject to amendment in the light of further study.

11.6 Chapter on marine climatology to be included in the Guide to Climatological Practices (Agenda item 11.6)

The commission examined a draft chapter on marine climatology, prepared by the CCl Working Group on the Guide to Climatological Practices which was received a few days before the end of the session.

Due to the very short time available, the commission has not found it possible to adopt this text and, therefore, decided to refer this draft chapter back to the Working Group on marine climatology, together with the request to provide a text for inclusion in Chapter M, describing the main applications of

marine climatological data, for urgent action with a view to its being available for discussion at CCl third session. Resolution 1 (CMM-III) concerns this question.

12. OCEAN WAVES (Agenda item 12)

12.1 Methods of forecasting the state of the sea on the basis of meteorological data (Agenda item 12.1)

The commission noted with satisfaction and appreciation the valuable information provided in the lectures presented at the scientific conference held during the session. The commission welcomed the valuable and practical contribution to the discussion by the marine superintendant of a Netherlands shipping company who expressed his satisfaction in the experimental trials in ship routing carried out by two ships of his company. It considered, on the basis of this information, that forecasting the state of the sea on an operational basis is in the development stage at the present time, and that such forecasts can provide particularly useful advice to shipping that will assist in the safe and efficient operation and routing of ships.

The commission noted that consideration has been given under other items of the agenda to the specific requirements for codes and other means of distribution of information covering the state of the sea, and agreed that the Working Group on technical problems should consider and co-ordinate the progress being made in developing this type of forecast, should give advice which will guide this development, and provide to the president a report which will indicate for the next session of CSM the general requirements of shipping for forecasts of the state of the sea.

It was further agreed that the texts, or substance of the lectures presented at the scientific conference should, if not already published, be distributed in a suitable form such as a Technical Note.

12.2 Observation and reporting of waves (Agenda item 12.2)

The commission considered this question on the basis of the relevant part of the report of the Working Group on technical problems and of the proposal presented by the United States delegation for amending the wave group code. There were divergent views in the commission on this proposal and two other coding procedures were presented which, however, failed to obtain sufficient support. Some members were of the opinion that there is a strong demand for an early code change. The commission, however considered that, before recommending a code change, further study was necessary and decided to refer this question to the Working Group on technical problems (see Resolution 4 (CMM-III)).

13. SEA ICE (Agenda item 13)

13.1 Codes for reporting sea ice (Agenda item 13.1)

The commission considered the recommendations of the Working Group on sea ice concerning the adoption of two ice codes, a unified code for reporting individual ice observations from aircraft, ships, and shore stations (CMM-III/Doc. 20, Annex I), and a special code for converting aerial ice reconnaissance messages to numerical form (CMM-III/Doc. 20, Annex II). The commission noted that the main purpose of these codes was international exchange of scientific ice data, obtained by trained observers and that it would be difficult for the average merchant vessel to report ice in the detailed manner required by the code. The commission agreed that simplified national procedures now used aboard merchant vessels could be used until adequate training of observers is accomplished. The commission also agreed that the acceptance of a special aerial ice reconnaissance code would not preclude international exchange of aerial ice reconnaissance data by word message, should this be more convenient and desirable.

With minor changes to the unified ice code suggested by members, the commission decided to recommend that these codes be adopted for international exchange of ice data (see Recommendation 28 (CMM-III)).

13.2 Abridged International Ice Nomenclature (Agenda item 13.2)

The commission noted that none of the proposed amendments to the Abridged International Ice Nomenclature were of a substantive nature and that decision by a working group on the adoption of these proposals could be reached while the Illustrated Ice Nomenclature is being prepared for publication (see Resolution 2 (CMM-III)).

13.3 Illustrated International Ice Nomenclature (Agenda item 13.3)

The commission noted that suitable photographs for several of the ice types included in the Abridged International Ice Nomenclature are not available. However, in view of the difficulty in obtaining photographs of good quality from both the photographic and technical standpoint, the commission decided to recommend that the Illustrated Ice Nomenclature be issued as a separate publication of the WMO in loose-leaf form to permit convenient addition or replacement of photographs. In addition, the commission recommended that the Secretary-General request Members to assist in completing this publication by submitting photographs of the ice types for which no photographs are available (see Recommendation 29 (CMM-III)). The commission also decided that a working group should be charged with finalizing the Illustrated Ice Nomenclature for publication (see Resolution 2 (CMM-III)).

13.4 International system for ice symbols for use in the preparation of ice charts (Agenda item 13.4)

Noting the increasing international exchange of ice data by means of charts and facsimile, the commission agreed that to complete the international ice-reporting system, the preparation of a set of ice symbols for presenting ice conditions on charts was the most urgent requirement in the field of sea ice. The commission decided to charge a working group with the responsibility for preparing a set of symbols compatible with both the nomenclature and the code and capable of being used to depict ice conditions in varying detail (see Resolution 2 (CMM-III)).

14. INDIAN OCEAN OCEANOGRAPHICAL EXPEDITION (Agenda item 14)

During the consideration of this item the commission had the benefit of the presence of a representative of the Special Committee on Oceanic Research (SCOR), Mr. Wyrtki, who explained in some detail the main object of the Indian Ocean oceanographical expedition.

He explained that this project sponsored by SCOR included a systematic study of the following elements of the whole Indian Ocean : physical oceanography, chemical oceanography, meteorology, marine biology, marine geology and marine geophysics.

The project will cover the period from 1960 to 1964, with some pre-expeditions from 1960 to 1962, and the peak activities from 1962 through 1964. A total of 20 to 25 research vessels from various countries will participate in the project and some of the countries will use large ships suited for carrying out a substantial meteorological project.

The representative of SCOR pointed out that, in order to have the greatest possible benefit from the collected material, certain services would be required from the WMO. These services would include :

(a) Daily weather forecasts;

(b) Monthly summaries of climatological data;

(c) Climatological charts (atlases covering the area in question);

(d) Advices of WMO with regard to organizing the necessary meteorological observations for study of energy exchanges between the ocean and the atmosphere and for making investigations of the boundary layers.

On the other hand the number of shipping operations in this sparse area would give a unique opportunity to make meteorological observations which would benefit the countries providing the above-mentioned services and contribute to meteorological research in general.

The commission considered these requirements in some detail and agreed to recommend the action proposed in Recommendation 30 (CMM-III).

Since the planning of the various expeditions is well under way, the commission considered that this recommendation should be implemented as a matter of urgency and that, therefore, the recommendation should be submitted for approval to the President of the Organization in accordance with General Regulation 9(5).

In view of the service listed under (b) above, it was considered useful that steps be taken to arrange for the preparation of monthly summaries of climatological data for the area, first of all for the period 1962 - 1964, but, if required, also for 1960 - 1962.

15. MAINTAINING A SEPARATE COMMISSION FOR INSTRUMENTS AND METHODS OF OBSERVATION (Agenda item 15)

The commission examined the desirability from its point of view, of maintaining a separate Commission for Instruments and Methods of Observation and concluded that the interests of maritime meteorology in this field would best be served if a new commission constituted along the lines of the present CIMO be established for the determination of general instrumental policy and to which specific problems of instrumentation could be referred. In this connexion the commission recommended that the CMM special terms of reference be amended to include a clear responsibility for initiating recommendations concerning methods of observation and accuracy requirements at sea. Recommendation 31 (CMM-III) incorporating these views was adopted.

16. ROUTING OF SHIPS BY MEANS OF EXTENDED WEATHER FORECASTING (Agenda item 16)

The commission studied the ship routing programmes now being conducted by certain Members and noted that considerable progress had been made since the second session (see first paragraph under agenda item 12.1).

Based on a discussion of the ways in which the present ship routing techniques could be improved, the commission agreed to recommend intensification of research to develop improved wave and extended weather forecasting methods, and the introduction of suitable wave-recording instruments aboard ocean station vessels and other special purpose vessels (see Recommendation 20 (CMM-III).

The commission also noted that analysed synoptic and prognostic sea condition charts employed in ship routing operations were being broadcast to shipping via radio-facsimile. Since it will be a considerable time before all ships have on board radio-facsimile receivers, it was decided to request the president of CMM to ask the president of CSM to devise a code for transmission of analysed sea condition charts by radio-telegraph message; the code to be devised along the lines of the IAC FLEET analysis code (FM 46.A). The elements to be encoded in the analysis messages are given in Annex V to this report.

17. SCIENTIFIC LECTURES AND DISCUSSION OF METHODS OF FORECASTING THE STATE OF SEA ON THE BASIS OF METEOROLOGICAL DATA (Agenda item 17)

The commission devoted one afternoon to the scientific lectures listed below and to the relevant discussions :

The structure and spectrum of ocean waves, by J.J. Schule

The present state of measurement and analysis of waves in Japan, by K. Terada

Forecasting of waves, by H. Walden

Prediction of sea and swell conditions in the North Atlantic Ocean (1) for one point (2) for a grid of 100 points, 200 meters apart, by I. Darbyshire

Application of wave forecasting to ship operations, by G. Verploegh

The information so provided on various aspects of the methods of forecasting the state of sea on the basis of meteorological data proved to be particularly useful for the discussions of agenda items 12.1 and also 16 (see paragraphs 12.1 and 16 above).

18. ESTABLISHMENT OF WORKING GROUPS (agenda item 18)

The commission established or re-established seven working groups on the following items to carry out the programme of the commission between the third and fourth session :

Marine climatology,

Sea ice,

Handbook on the preparation and use of weather maps by mariners,

Technical problems,

Weather advice for fishing operations,

Study of a world-wide network of surface and upper-air sea stations,

Collection of ships' weather reports and the provision of shipping forecasts.

So far as possible, the chairmen and members of the working groups were designated by the commission. The terms of reference and the composition of the working groups are given in Resolutions 1 to 7 (CMM-III).

19. REVISION OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION (Agenda item 19)

The commission established a sub-committee consisting of a representative

of each of the two working committees and of the WMO Secretariat to examine the action to be taken on the previous resolutions and recommendations of the commission. The decisions of the commission in this matter are incorporated in Resolution 9 (CMM-III).

As a consequence of these decisions, the commission considered that some of the Executive Committee resolutions relating to maritime meteorology had become redundant (see Recommendation 32 (CMM-III)).

When deciding not to keep in force Recommendation 8 (CMM-II) concerning meteorological instruments on board ships, the commission realized that it would be useful to keep in force paragraph (1) of the operative part of this recommendation and consequently decided to request the Secretary-General to have the substance of this paragraph included in Publication No. 9.TP.4, Volume D, Part D, Chapter I.

20. ELECTION OF OFFICERS (Agenda item 20)

Mr. J.A. van Duijnen Montijn (Netherlands) and Vice-Admiral Charoon V. Bunnag (Thailand) were elected president and vice-president respectively. Mr. H. Thomsen and Mr. K.T. McLeod previous president and vice-president did not stand for re-election.

21. DATE AND PLACE OF FOURTH SESSION (Agenda item 21)

No suggestion for date and place of the fourth session were received. The commission decided to leave it to the president to arrange for the next session in consultation with the Secretary-General of the Organization.

22. RESULTS OF THE INTERNATIONAL CONFERENCE ON SAFETY OF LIFE AT SEA (LONDON, MAY-JUNE 1960) (Agenda item 22)

The commission studied an extract of the report prepared by the WMO observer at the International Conference on Safety of Life at Sea, 1960. It noted with satisfaction that a joint permanent study group of ICAO, IMCO, ITU and WMO has been established to study the matters of concern to these organizations regarding safety of life at sea. In particular, it seemed that the study group could do useful work towards improving the arrangements for reception and dissemination of weather messages from ships in certain areas. It decided that Publication No. 9.TP.4, Volume D, Part D, Chapter II, should be amended by the Secretariat when the new Convention for Safety of Life at Sea will become effective.

The broadcast of special icing forecasts was not considered practical on a routine basis at present, but it was decided to encourage Members to issue icing warnings wherever possible.

The decisions of the commission on this latter question are found under agenda item 9.4 (see Recommendation 18 (CMM-III)).

CLOSURE OF THE SESSION

The president thanked the Netherlands authorities for all arrangements made for the session and for their hospitality which has made the stay so pleasant to the participants. He also thanked all those who have contributed to the success of the session.

Dr. Warners expressed appreciation for the results obtained by the commission and the hope that all presents have enjoyed this opportunity to visit the Netherlands.

On behalf of all delegates Mr. C.E.N. Frankcom expressed his gratitude to Mr. Thomsen for his activity in the conduct of the work of the commission since its second session.

RESOLUTIONS ADOPTED BY THE SESSION

Res. 1 (CMM-III) - WORKING GROUP ON MARINE CLIMATOLOGY

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Resolution 4 (CMM-II);

(2) Resolution 33 (EC-IX);

CONSIDERING that a number of marine climatological problems has to be studied between the sessions of the commission;

DECIDES,

(1) To re-establish a Working Group on marine climatology with the following terms of reference :

(a) Completion of the marine contributions to the Guide to Climatological Practices;

(b) Preparative studies for the marine section of the World Climatic Atlas, such as :

(i) selection of elements and class intervals for which representations of simultaneous occurrences should be included,

(ii) selection of elements and representative areas for the study of climatic trends,

(iii) representation of the variability of meteorological elements;

(c) Technical advice with regard to the preparation and publication of climatological summaries;

(d) Preparation of a guide on the value and use of the international maritime punch-card (for the benefit of countries which are not yet familiar with punch-card procedures);

(2) To invite, subject to the concurrence of the permanent representatives concerned, the following experts to serve on the working group:

F.E. Lumb (United Kingdom) (chairman)
K. Buajitti (Thailand)
B. Heyna (Netherlands)

H.U. Roll (Federal Republic of Germany)
K.U. Siddiqi (Pakistan)
K. Terada (Japan)
one expert to be designated by each of the following Members:

Argentina
Union of South Africa
United States of America
Union of Soviet Socialist Republics

Res. 2 (CMM-III) - WORKING GROUP ON SEA ICE

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING Recommendations 28 and 29 (CMM-III);

CONSIDERING,

(1) The urgent requirement for a set of ice symbols to be used in the international exchange of ice data by chart and facsimile;

(2) The necessity for preparing the text of WMO Publication No.8. TP.3, Chapter 10, paragraph 9, containing instructions for the observing and reporting of sea ice, to facilitate use of the new WMO ice codes when finally approved;

(3) The desirability of early publication of the Illustrated International Ice Nomenclature;

(4) The need to keep the WMO Abridged Sea Ice Nomenclature up to date, in the light of expanding sea ice technology;

DECIDES,

(1) To establish a Working Group on sea ice with the following terms of reference :

(a) Designing a set of ice symbols to be used in the international exchange of ice data by chart and facsimile. These symbols should be compatible with the nomenclature and the codes, and should be flexible enough to permit the reporting of ice conditions in varying degrees of detail, depending on requirements;

(b) Preparing the text of WMO Publication No. 8.TP.3, Chapter 10, paragraph 9;

(c) Preparing the Illustrated International Ice Nomenclature for final publication;

(d) Studying the proposals made by Members regarding amendments to the Abridged Ice Nomenclature, and preparing recommendations on these prior to final publication;

(2) To invite, subject to the concurrence of the permanent representatives concerned, the following experts to serve on this working group :

J.S. Fabricius (Denmark) (chairman)
Heap (United Kingdom)
J.V. Istošin (U.S.S.R.)
F. Nusser (Federal Republic of Germany)

one expert to be designated by each of the following Members:

Argentina
United States of America

Res. 3 (CMM-III) - HANDBOOK ON "THE PREPARATION AND USE OF WEATHER MAPS BY MARINERS"

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) The proposal of CMM at its second session, that "some guidance on preparing weather maps on shipboard" should be included in WMO Publication No. 9.TP.4, Volume D, Annex 8 to the Abridged Final Report of CMM;

(2) The report of the chairman of the Working Group on organizational and operational matters, in which it is recommended that a booklet on "Guidance on preparing weather maps on shipboard" be prepared and issued as a separate publication;

(3) The major portion of the first draft of a handbook on "The preparation and use of weather maps at sea" prepared by Mr. Rodewald (Federal Republic of Germany) submitted to this session;

CONSIDERING the amount of work necessary to finalize the draft before it will be ready for publication is such that no action could be taken during the present session;

DECIDES,

(1) To establish a Working Group on the preparation and use of weather maps by mariners, with the following terms of reference :

(a) Upon completion of the first draft of the handbook by Mr. Rodewald, review and finalize the first draft as soon as possible, for submission to the president of the commission;

(b) In the light of comments which may be received from members of the commission, revise the draft and put it in a form suitable for publication;

(c) Submit the final document to the president of the commission;

(2) To invite, subject to the concurrence of the permanent representatives concerned, the following experts to serve on the working group :

M. Rodewald (Federal Republic of Germany) (chairman)
A.A. Fresco (Netherlands)
an expert to be designated by the United States of America

(3) To request the president of CMM to distribute the draft handbook to members of the commission for review and comment by correspondence, and to submit the final document to the Secretary-General for publication as a WMO Technical Note.

Res. 4 (CMM-III) - WORKING GROUP ON TECHNICAL PROBLEMS

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Resolution 2 (CMM-II);

(2) Resolution 33 (EC-IX);

CONSIDERING that a number of technical problems will need to be kept under continuous review between the sessions of the commission;

DECIDES,

(1) To re-establish a Working Group on technical problems, with the following terms of reference :

Promotion of research in maritime meteorology, investigations designed to bring about improvement in methods of observation and measurement at sea, co-ordination of results and exchange of reports, especially with regard to the following problems :

(a) Measurement of sea surface temperature;

(b) Precipitation measurements at sea;

(c) Wind structure at sea;

(d) Measurement of relative and true wind on board ship;

(e) Equivalent wind speeds for Beaufort numbers;

(f) Estimating wind at sea, especially during the night;

(g) Reporting visibility;

(h) Observing and reporting of waves;

(2) To invite, subject to the concurrence of the permanent representatives concerned, the following experts to serve on the working group:

G. Verploegh (Netherlands) (chairman)
J.A. Burnett (United Kingdom)
J.M. Dury (Belgium)
J. Romer (France)
G.M. Tauber (U.S.S.R.)
F. Spinnangr (Norway)

one expert to be designated by each of the following Members:

Canada
Poland
Portugal
Portuguese East Africa
Portuguese West Africa
United States of America

Res. 5 (CMM-III) - WORKING GROUP ON WEATHER ADVICE FOR FISHING OPERATIONS

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING Recommendation 15 (CMM-III);

CONSIDERING the importance of receiving weather messages from fishing vessels and of providing daily weather advice and warnings for fishing operations;

DECIDES,

(1) To establish a Working Group on weather advice for fishing operations with the following terms of reference :

(a) To study the difficulties encountered by fishing vessels in making and reporting weather observations, and means for resolving these problems;

(b) To study the practicability of providing coding devices for enciphering position data in weather reports supplied by fishing vessels and advice if special meteorological instruments are required for use aboard fishing vessels;

(c) To prepare for the WMO Secretariat an outline of a booklet on instructions and advice to fishermen about the making and transmitting of meteorological observations and the proper use of weather information made available to them, with a view to national meteorological services preparing detailed instructions;

(d) To study the need for the provision of special services to fishermen, e.g., by port liaison officers;

(2) That the working group should be composed as follows :

(a) The following experts invited by the commission, subject to the concurrence of the permanent representatives concerned :

K. Terada (Japan) (chairman)
F. Spinnangr (Norway)
H. Walden (Federal Republic of Germany)
A.B. Crawford (Union of South Africa)

(b) Representatives of interested international organizations invited by the Secretary-General in accordance with Recommendation 15 (CMM-III).

Res. 6 (CMM-III) - WORKING GROUP FOR THE STUDY OF A WORLD-WIDE NETWORK OF SURFACE AND UPPER-AIR SEA STATIONS

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Recommendation 13 (CMM-II);

(2) Recommendation 13/1 (CAeM-II/MET V);

(3) Resolutions 33 (EC-IX), 20 and 23 (EC-XII);

(4) The relevant parts of the report submitted by the Working Group on organizational and operational matters to the third session of the commission;

CONSIDERING the need for a detailed study of the potentialities of the various proposals for filling the major gaps in the network of sea stations, presented to the session with a view to assisting the president of CMM in formulating a reply to the request made by the Executive Committee in its Resolution 20 (EC-XII);

DECIDES,

(1) To set up a Working Group on the study of a world-wide network of surface and upper-air sea stations with the following terms of reference :

(a) To study the possibility of organizing a system of regular upper-air observations from mobile ship stations, such as merchant ships, research vessels and supply vessels, on the basis of the successful upper-air observations carried out by the United States aboard merchant ships, using portable equipment, in order to assist in filling the major gaps in the world-wide network of upper-air stations as indicated in Resolution 20 (EC-XII);

(b) To include in this study an examination of the practicability of obtaining a reasonable coverage of upper-air observations by means of mobile ship stations, the approximate cost of operating such a network and any technical and organizational problems involved, taking into account the various comments on this question presented to the present session;

(c) To study the merits and practicability of filling one or more of the fixed positions suggested in Part II of the Executive Committee plan (Res. 20 (EC-XII)) by chartering one or more tankers from the surplus tonnage, bearing in mind the very long time that such ships may be able to remain "on station";

(d) To include in this study an examination of the availability of suitable ships, the approximate minimum cost of operating the ship or ships at one or more fixed positions, relief crews and stores being transported by tender, and equipped either for making surface and pilot-balloon observations alone, or also for making upper-air observations with portable equipment, such as that referred to in paragraph (a), which requires a minimum of meteorological staff;

(e) To report to the president of CMM on the merits of the above projects as soon as possible and preferably not later than 1 March 1961;

(2) To invite, subject to the concurrence of the permanent representatives concerned, the following experts to serve on the working group:

C.E.N. Frankcom (United Kingdom)
G. Koudijs (Netherlands)

M. Rodewald (Federal Republic of Germany)
J.J. Taljaard (Union of South Africa)

one expert to be designated by the following Members :

United States of America
Union of Soviet Socialist Republics

AUTHORIZES the president of CMM to present the findings of the working group with appropriate comments, as required, to the Executive Committee.

Res. 7 (CMM-III) - WORKING GROUP ON THE COLLECTION OF SHIPS' WEATHER REPORTS AND THE PROVISION OF SHIPPING FORECASTS

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Paragraph 5.14.2 of General Summary of the work of Third Congress;

(2) That there exist some areas in which ships encounter difficulties in transmitting their weather reports to shore stations;

(3) That some ocean areas are not effectively covered by shipping forecasts;

CONSIDERING,

(1) The importance of reliable and prompt reception of reports submitted by ships to coastal stations;

(2) The necessity to provide shipping with adequate forecasts in all areas;

(3) That the present system of areas of responsibility for collecting ships' reports and issuing weather forecasts may be responsible for some of the present difficulties;

DECIDES,

(1) To establish a Working Group on the collection of ships' weather reports and the provision of shipping forecasts;

(2) That the terms of reference of the working group shall be as follows :

(a) To review the present system of areas of responsibility and the procedures relating to the collection and dissemination of ships' weather reports;

(b) To make a fact-finding study of the difficulties encountered in the collection of ships' weather reports, for submission to the president of CMM;

(c) To review the present system of areas of responsibility for shipping forecasts with a view to determining the areas inadequately covered and to suggesting ways and means of ensuring a more adequate forecast service for shipping in all oceanic areas;

(3) To request the Secretary-General to make available to the working group the results of the inquiry conducted by the president of CMM, concerning the transmission of ships' reports to shore stations and the study prepared by the Netherlands Meteorological Service in response to that inquiry;

(4) To request the working group to submit its report to the president of the commission by 1 January 1962;

(5) To invite, subject to the concurrence of the permanent representatives concerned, the following experts to serve on the working group:

C.E.N. Frankcom (United Kingdom) (chairman)
L. Bonnard (France)
G. Koudijs (Netherlands)
K.U. Siddiqi (Pakistan)
J.J. Taljaard (Union of South Africa)

one expert to be designated by each of the following Members:

Argentina
Cambodia
Portugal
Portuguese East Africa
Portuguese West Africa
United States of America

Res. 8 (CMM-III) - DELETION OF BEAUFORT NUMBERS 13 TO 17 IN CODE 1100

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) That wind speeds are no longer being reported in Beaufort numbers;

(2) That the description of the wind speed in Beaufort numbers is obtained by using definite specifications referring to visual observations of the effects of the wind on the surface of the sea, or on objects on land;

(3) That no specifications are given for Beaufort numbers 13 to 17 in WMO Code 1100; and

(4) That Beaufort numbers above 12 are used in no other code except Code 3940, and that in this code only Beaufort numbers 13 and 14 are used to indicate the intensity of tropical systems (T_i) when T_t is 9;

CONSIDERING,

(1) That the extension of the Beaufort numbers without a corresponding extension of descriptive terms and specifications introduces a fundamental deficiency in the code as customarily used in estimating the wind force; and

(2) That it seems unlikely that specifications corresponding to Beaufort numbers higher than 12 will be established in the near future;

REQUESTS the president of CMM to ask the president of CSM to arrange for consideration of the following proposals by his commission :

(1) That Beaufort numbers 13 to 17 and their speed equivalents be deleted from WMO Code 1100 and that the speed equivalent of the upper limit of Beaufort number 12 be replaced by the term "and over"; and

(2) That the specifications for code figures 2, 3 and 4 for T_i in Code 3940 be changed to read as follows :

2	force	12	up to 71 knots
3	force	12	72 to 80 knots
4	force	12	81 knots or over

and that in the second line of the note to this code the word "extended" be deleted.

Res. 9 (CMM-III) - REVISION OF THE RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION FOR MARITIME METEOROLOGY

THE COMMISSION FOR MARITIME METEOROLOGY,

CONSIDERING that Resolutions 1 to 6 (CMM-II) adopted at its second session, are now obsolete;

NOTING the action taken on the recommendations adopted prior to its third session;

DECIDES,

(1) Not to keep in force Resolutions 1 to 6 (CMM-II);

(2) To note with satisfaction the action taken by the competent bodies on its Recommendations 6, 10, 25 and 27 (CMM-I) and 1 to 33 (CMM-II), which are now redundant.

RECOMMENDATIONS ADOPTED BY THE SESSION

Rec. 1 (CMM-III) - AMENDMENTS TO TECHNICAL REGULATIONS (CHAPTERS 1 AND 2) - DEFINITION OF LIGHT-SHIP STATION

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING the request recorded in paragraph 5.8.1.2 of the General Summary of the work of Third Congress;

RECOMMENDS,

(1) That a light-ship station be defined as follows :

Light-ship station. A surface synoptic station situated aboard a light-ship.

(2) Add as note to paragraph 2.1.2.1 :

N O T E : For reporting purposes, light-ships may be considered as either land or ship stations.

Rec. 2 (CMM-III) - AMENDMENTS TO TECHNICAL REGULATIONS (PARAGRAPHS 2.2.1.6, 2.2.1.7 AND 2.2.1.8) - NETWORK OF MOBILE SHIP STATIONS

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING the request contained in paragraph 5.8.1.5 of the General Summary of the work of Third Congress;

CONSIDERING,

(1) That the substance of paragraphs 2.2.1.7 and 2.2.1.8 is of the nature of an explanatory note complementing the instructions to Members given in paragraph 2.2.1.6;

(2) That paragraph 2.2.1.6 should be amended to indicate more clearly what is required from Members;

(3) That the map mentioned in the note to paragraph 2.2.1.6 and showing the density of voluntary weather reporting ships over the oceans refers only to surface observations;

RECOMMENDS,

(1) That paragraphs 2.2.1.6 to 2.2.1.8 be replaced by the following:

2.2.1.6

In its recruitment programme, each Member should aim at making the maximum possible contribution towards attaining an adequate density of reports from mobile ship stations in each area.

N O T E S :

(1) An adequate density of ships' surface observations from ships of all nationalities over all ocean areas traversed by shipping, is at least one per 300 km for each main standard time of observation;

(2) An adequate density of ships' upper-air reports is at least one per 1000 km for each standard time of upper-air observation;

(3) A map giving an indication of the density of ships' surface reports received from all oceans is included in Publication No. 9. TP.4, Volume D;

(2) That the title of the map referred to in Note (3) above, be amended to read :

Map showing density of voluntary ships reporting surface weather over the oceans.

Rec. 3 (CMM-III) - AMENDMENTS TO TECHNICAL REGULATIONS (CHAPTERS 5 AND 10) - CODE FORMS FOR REPORTS TRANSMITTED BY SEA STATIONS AND WEATHER BULLETINS FOR SHIPPING

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) The request recorded in paragraph 5.8.1.10 of the General Summary of the work of the Third Congress;

(2) The present text of paragraph 5.1.1.2 of the Technical Regulations;

(3) That reports transmitted by sea stations are in appropriate code forms specified in Annex II of the Technical Regulations (Publication No. 9.TP.4, Volume B, Chapter I, Part A);

(4) That SHIP and SYNOP reports transmitted to ships are in abbreviated code forms specified in Publication No. 9.TP.4, Volume D, Part D, Chapter 1, paragraph 11.1.3;

CONSIDERING the need for ships to have information to enable them to receive the weather bulletins relating to the area in which they ply;

RECOMMENDS,

(1) That paragraph 5.1.1.2 be amended to read :

Reports transmitted by sea stations shall be in the appropriate code forms specified in Publication No. 9.TP.4, Volume B (Annex II of the Technical Regulations);

(2) That a new paragraph 10.2.3.16, bearing a note, and reading as follows, be included in Chapter 10 :

Members should provide their ships with detailed information about weather bulletins broadcast for shipping, relating to ocean areas in which they ply.

NOTE : Details of the codes used for reports included in these bulletins are given in Publication No. 9.TP.4, Volume D, Part D, Chapter 1, paragraph 11.1.3.

Rec. 4 (CMM-III) - AMENDMENTS TO TECHNICAL REGULATIONS (CHAPTER 3) - PRECISION REQUIRED IN READING INSTRUMENTS FOR MEASURING ATMOSPHERIC PRESSURE AND SEA SURFACE TEMPERATURE AT SEA STATIONS

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Paragraph 5.8.1.7 of the General Summary of the work of Third Congress;

(2) That the prescribed accuracy in reading thermometers (for psychrometric purposes) and precipitation amounts are already included in the Technical Regulations (paragraphs 3.4.5.1 and 3.4.8.3 respectively);

CONSIDERING,

(1) That it would be desirable to include in the Technical Regulations similar requirements with regard to atmospheric pressure and sea surface temperature;

(2) That the prescribed precision in reading atmospheric pressure and sea surface temperature should only be a "recommended practice" at the present time, due to the special conditions on board ships and the lack of adequate instrumentation on a number of merchant vessels;

RECOMMENDS the following amendments to the Technical Regulations adopted by Third Congress :

(1) Insert following new paragraph after paragraph 3.4.4.2 :

3.4.4.2 (bis)

Instruments for determining atmospheric pressure at sea stations should be read to 0.1 mb.

(2) Insert following new paragraph after paragraph 3.4.10.1 :

3.4.10.1 (bis)

Instruments for determining sea surface temperature should be read to 0.1°C (0.2°F).

Rec. 5 (CMM-III) - SUGGESTED AMENDMENTS TO TECHNICAL REGULATIONS AND PUBLICATION No. 9, VOLUMES B AND D, AS A CONSEQUENCE OF RESOLUTION 30 (Cg-III)

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Resolution 30 (Cg-III);

(2) That coded reports transmitted from and to ships contain wind speeds in knots;

(3) That observations of visibility and of distances at sea are generally made in nautical miles;

CONSIDERING,

(1) That the use of these nautical units should be permitted because mariners are familiar with them, having used them for many years;

(2) That the WMO practice of including in appropriate code tables in Publication No. 9.TP.4, Volume B, the approximate equivalents of the metric units (e.g. inches, feet, yards, etc.) has been very helpful to many Members and should be continued;

RECOMMENDS that WMO Technical Regulations and Publication No. 9, Volumes B and D be amended as shown in the annex to this recommendation.

A N N E X

SUGGESTED AMENDMENTS TO THE TECHNICAL REGULATIONS AND PUBLICATION No. 9.TP.4

Technical Regulations

Paragraph 3.4.5.1

To be amended as follows :

For psychrometric purposes, thermometers shall be read to 0.1°C (0.2°F) or closer.

Publication No. 9.TP.4, Volume B

Code FM 21.A

Note (8)(i) - Delete the words "or feet".

Specifications of symbolic letters

H_w - Note (2) : Delete the words "or in feet".

TT - Delete the words "or Fahrenheit".

- Note (2) : Delete entire instruction for coding negative values of degrees Fahrenheit. To be covered by national instructions hereafter.

T_dT_d - Delete the words "or Fahrenheit".

T_sT_s - Delete the words "or Fahrenheit".

- Note (1) : Delete last sentence.

Code 4377

For the code figures 90 - 99 replace the values in statute miles by values in nautical miles.

Publication No. 9.TP.4, Volume D

Code changes relative to the Celsius-metric scales recommended for inclusion in Volume B, to be incorporated in Volume D, Part E, which is being prepared by the WMO Secretariat.

Relevant paragraphs of Volume D, Part D to be amended to conform with the Technical Regulations and WMO Publication No. 8.

Rec. 6 (CMM-III) - IMPROVEMENT IN THE DISSEMINATION OF SHIPS' REPORTS

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) That several Members have reported that a substantial number of ships' reports received by radio shore stations are apparently not included in territorial broadcasts;

(2) That collectives transmitted in sub-continental broadcasts do not contain in some cases an adequate number of ships' reports;

(3) Technical Regulations, paragraphs 6.1.1, 6.3.2.1 and 6.3.3.1;

(4) That regional associations are responsible for assigning to their sub-continental broadcast centres the specific ocean areas and countries from which reports are collected for inclusion in the broadcasts;

(5) That regional associations are responsible for determining the contents of sub-continental broadcasts after consultation with known or probable recipients within and outside the region;

CONSIDERING,

(1) That all ships' reports,including RETARDS, received from an ocean area by a collection centre, should be made available to all Members concerned with the area, as promptly as possible;

(2) That no specific instructions are given in the Technical Regulations regarding the prompt dissemination of ships' reports;

RECOMMENDS,

(1) That paragraph 6.3.3.1 of the Technical Regulations be amended to read :

Territorial broadcasts shall include :

(a) Reports from surface and upper-air synoptic stations in the territory concerned which, by regional association resolution, are required for international exchanges;

(b) All meteorological reports received directly from ships and from other ships report collecting centres in the areas covered by the territorial broadcast;

(c) Other messages as required by regional association resolution;

(2) That as a matter of urgency the regional associations be requested :

(a) To ensure that all ships' reports, including late reports, available to the sub-continental broadcast centres be included in their broadcasts;

(b) To take into account, when deciding on ocean areas from which reports must be included in their sub-continental broadcasts, the areas of responsibility allocated to Members of the region for the collection of ships' reports.

Rec. 7 (CMM-III) - PRECIPITATION MEASUREMENTS AT SEA

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Recommendation 6 (CMM-II);

(2) Resolution 33 (EC-IX);

CONSIDERING,

(1) That although considerable progress has been made in achieving a better understanding of the problems involved no entirely satisfactory solution has as yet been found;

(2) That wide publication of the results obtained so far and of further investigations would be of great importance in promoting further progress towards obtaining reliable precipitation data from the oceans;

RECOMMENDS,

(1) That the review of the present state of precipitation measurements at sea presented by the Working Group on technical problems to the third session of the commission be published as a WMO Technical Note;

(2) That the maritime countries be invited to make increased efforts in order to improve precipitation measurements at sea;

(3) That Members studying this problem should keep the Secretary-General informed of the results of further investigations on precipitation measurements at sea.

Rec. 8 (CMM-III) - MEASUREMENT OF SEA SURFACE TEMPERATURE

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Recommendation 4 (CMM-II);

(2) Resolution 33 (EC-IX);

CONSIDERING,

(1) That it has not been possible up to now to develop a method of obtaining the temperature of the surface layer of the sea with an accuracy of 0.1°C, which can be applied economically and easily on merchant ships;

(2) That it is unlikely that distant reading methods will be generally introduced on merchant ships;

RECOMMENDS,

(1) That Members continue experimental work to develop a method (if possible a bucket) which will give representative measurements of the temperature of the sea surface and which would be practical for use aboard merchant ships;

(2) That Members exchange technical notes on this subject;

(3) That Members make comparative studies using various methods;

(4) That the distant reading method of measuring sea surface temperature be introduced aboard special ships such as ocean station vessels, research vessels and light-ships, and other ships if the owners are willing to assume the additional cost involved, in order to improve the accuracy of measurement at sea.

Rec. 9 (CMM-III) - INVESTIGATION ON GUSTINESS AT SEA

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Resolution 2 (CMM-II);

(2) The report submitted by the Working Group on technical problems to the third session of the commission;

CONSIDERING that data giving detailed information on the wind structure at sea have important practical applications (e.g. wind effects on ships, sailing vessels, lighthouses and other maritime constructions);

RECOMMENDS,

(1) That maritime countries be encouraged to undertake special studies of wind structure at sea;

(2) That these studies might include investigations on the spectral distribution of wind energy with regard to gust period and wind direction, also taking into account the influence of atmospheric stability;

(3) That Members concerned be invited to inform the Secretary-General of the results of such studies.

Rec. 10 (CMM-III) - CLOUD SHEET FOR USE ON BOARD SHIPS

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Executive Committee, twelfth session, General Summary, paragraph 2.4.1;

(2) The selection of cloud photographs made by the Working Group on the Marine Cloud Album established by CMM second session;

CONSIDERING,

(1) That a sheet showing the main features of clouds with reference to the code figures is required for use on selected, supplementary and auxiliary ships;

(2) That the cloud sheet should be simple, clear and contain only the cloud pictures and the figures of the code;

(3) That the size of the sheet should be kept to about 40 x 80 cm and each picture should have about half the dimension of the plates of the International Cloud Atlas;

(4) That printing should be on only one side of the sheet, so that it may be put on a bulk-head of the chart room;

(5) That all maritime Member countries are not able to print such a sheet themselves;

(6) That the price of the sheet would be greatly reduced if the sheet were printed by the WMO Secretariat and were made available for purchase by Members;

RECOMMENDS,

(1) That an appropriate sheet of cloud pictures be issued by the Secretariat and made available for purchase by Members;

(2) That the sheet be kept within a size which is reasonable for use on board a ship;

(3) That the sheet should contain approximately 40 photographs selected by CMM third session for the Marine Cloud Album, together with the proper code figures. Space for printing the title of each picture should be left available for use by individual services;

(4) That the sheet should be printed on only one side and should be of suitable, durable paper.

Rec. 11 (CMM-III) - COMPOSITION OF THE MARINE CLOUD ALBUM

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Recommendation 25 (CMM-II);

(2) Resolution 33 (EC-IX);

(3) Resolution 5 (CMM-II);

(4) The selection of 40 photographs of the Abridged International Cloud Atlas made by the working group established by the commission at its second session;

(5) The special chapter on cloud observation at sea prepared by the working group;

CONSIDERING,

(1) That the legends to the plates of the Marine Cloud Album should be more concise and more easily understood by a voluntary observer at sea than the text prepared by the working group;

(2) That the basic material for the preparation by individual Members of a Marine Cloud Album should now be made available by the WMO Secretariat.

RECOMMENDS,

(1) That the Marine Cloud Album be composed of the following :

(a) The 40 photographs selected by the commission from the Abridged International Cloud Atlas;

(b) The suggested text of the legends to the 40 photographs as given in Part A of the annex to this recommendation;*

(c) A suggested chapter on cloud observations at sea given in Part B of the annex to this recommendation;*

(2) That the Secretary-General be requested to make available for purchase by Members, printed sets of the bare plates of the selected 40 photographs, using the blocks available for these photographs and each bare plate containing no other text than a plate number referring to the Marine Cloud Album;

(3) That the Secretary-General be requested to inform all Members of this recommendation, including its annexes, in order that they may prepare a Marine Cloud Album in their own languages.

NOTE : The commission authorizes the president of CMM to make the necessary editorial changes to the annexes in consultation with the WMO Secretariat.

Rec. 12 (CMM-III) - EQUIVALENT SPEEDS FOR THE BEAUFORT NUMBERS

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Recommendation 1 (CMM-II);

(2) Resolutions 34 (EC-IX) and 23 (EC-X);

(3) The final report of the Executive Committee Working Group on the Beaufort Scale to Third Congress (Cg-III/Doc. 78);

(4) Abridged Report of Third Congress, paragraph 5.8.1.16;

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* See Annex VI.

CONSIDERING,

(1) That the equivalent speeds for the Beaufort numbers proposed in Recommendation 1 (CMM-II) are generally considered accurate for Beaufort numbers up to and including Beaufort force 7 and possibly also up to and including Beaufort force 9 and that although they may be more accurate than present scale values in the higher scale ranges, there is a strong body of opinion that further verification and possible improvement of the equivalents, especially for the higher Beaufort numbers must be made before adoption;

(2) That delay in obtaining adequate verification and possible improvement may continue to prevent adoption of a better table than the existing one for equivalent speeds of the Beaufort numbers;

RECOMMENDS,

(1) That the decision to recommend any alteration in the Beaufort Scale equivalents adopted in 1947 be postponed until CMM fourth session;

(2) That in the meantime Members which have doubts concerning the suitability of the equivalents proposed in the annex to this recommendation be urged to carry out experiments to verify their opinion;

(3) That if by CMM fourth session no better equivalents have been derived, the equivalents included in the annex to this recommendation should then be accepted as the best working solution to the problem.

A N N E X

MARITIME CONVERSION SCALE

Beaufort number	Metres / second		Nautical miles per hour	
	mean	limits	mean	limits
0	0	< 0.6	0	< 1
1	1.5	0.7 - 2.3	3	1 - 4
2	3.4	2.4 - 4.4	7	5 - 8
3	5.6	4.5 - 6.6	11	9 - 12
4	7.8	6.7 - 8.9	15	13 - 16
5	10.2	9.0 - 11.3	19	17 - 21
6	12.6	11.4 - 13.8	24	22 - 26
7	15.1	13.9 - 16.4	29	27 - 31
8	17.7	16.5 - 19.0	34	32 - 36
9	20.4	19.1 - 21.8	39	37 - 42
10	23.3	21.9 - 24.8	45	43 - 48
11	26.5	24.9 - 28.2	52	49 - 55
12	-	> 28.2	-	> 55

Rec. 13 (CMM-III) - IMPROVING THE VOLUNTARY OBSERVING SHIP SCHEME FOR "SPARSE AREAS"

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Resolution 24 (EC-III);

(2) Recommendations 16 and 17 (CMM-II);

(3) Resolution 33 (EC-IX);

O (4) Technical Regulations, paragraph 2.5.2.2;

CONSIDERING,

(1) That the owners or operators of ships plying "sparse areas" are often unaware of the importance of supplying weather messages regularly;

(2) That these reports would enable Members to issue greatly improved daily advice and warnings to ships;

(3) That effective personal contact between ships officers and port meteorological liaison officers offers the best assurance of improvement in an oceanic network;

(4) That WMO can assist Members by providing copies of "sparse area" charts free of charge, for issue to ships;

O (5) That a technical report on port meteorological liaison officer activities and procedures could be helpful, especially for those Members which have not appointed any port meteorological liaison officers;

RECOMMENDS,

O (1) That Members concerned be urged to comply with Technical Regulations, paragraph 2.5.2.2, concerning the appointment and duties of port meteorological liaison officers;

(2) That in addition to ships on the national register of Members concerned, the recruitment programme should include all other merchant ships including "flag of convenience" ships, and especially research ships, whalers and supply ships plying "sparse areas";

(3) That the Secretary-General provide Members, on request, with copies of "sparse area" charts free of charge, for issue to ships and navigation schools;

(4) That Members should inform the Secretary-General of any procedure which has produced results in obtaining more reports from "sparse areas", including information on activities of port meteorological liaison officers; consideration should be given to the possibility of using this information for the preparation of a technical report on port meteorological liaison officer activities, for dissemination to Members in an appropriate form.

Rec. 14 (CMM-III) - SLIDE-RULE WEATHER CODER

THE COMMISSION FOR MARITIME METEOROLOGY,

HAVING EXAMINED the prototype of the slide-rule weather coder presented at the session and designed at present to permit the automatic encoding of short weather reports in a suitable code form, giving information for instance on weather, wind, visibility, cloud amount, pressure and temperature, or alternatively sea temperature;

CONSIDERING that this device could contribute to an increase in the number of auxiliary ships, and particularly fishing vessels, participating in the weather reporting scheme, since it facilitates the task of the marine observer;

RECOMMENDS that the attention of WMO Members be invited to the existence of this new device.

Rec. 15 (CMM-III) - FISHING OPERATIONS AND WEATHER ADVICE

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) The need to improve weather services for fishing operations;

(2) That data available from some ocean areas are insufficient for the issue of accurate and comprehensive daily weather advices and warnings as well as climatological information for fishing operations;

(3) The relationship between certain meteorological factors and the distribution of aquatic fauna throughout oceans of the world;

(4) Resolution 5 (CMM-III);

CONSIDERING,

(1) That fishing vessels are a potential source of valuable meteorological reports essential for improving the network of observations over the oceans, especially in areas remote from shipping routes, where data are scarce;

(2) The need to promote future researches relative to the influence of certain meteorological factors on the distribution and abundance of fish populations in all oceans;

RECOMMENDS,

(1) That WMO bring to the attention of international fisheries organizations the importance of obtaining weather observations from fishing vessels, with a view to promoting the co-operation of fishermen in providing reports;

(2) That Members concerned recruit fishing vessels and issue instructions and aids relative to the preparation and transmission of weather reports;

(3) That Members invite the attention of fishermen to the importance of forwarding weather reports during both good and bad weather, as all such reports are essential for issuing improved daily advices to fishermen;

(4) That Members be urged to provide suitable guidance material relating to the application of meteorology to fishing operations as a means of promoting among fishermen a proper appreciation of the value of weather aids to their operations;

(5) That Members concerned continue their research on the subject of the relationship between meteorological factors and the distribution of aquatic fauna;

(6) That WMO co-ordinate with international oceanographic and fisheries organizations, the international meteorological aspects of studies and research programmes carried out by its Members;

(7) That the Secretary-General be requested to invite FAO, UNESCO and, if necessary, interested international fisheries organizations each to designate a representative to participate in the work of the working group established by Resolution 5 (CMM-III).

Res. 16 (CMM-III) - LOCUST REPORTS FROM SHIPS

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) The request from the Anti-Locust Research Centre for assistance from WMO in arranging for locust reports from ships when plying certain areas;

(2) Resolution 12 (EC-XI);

CONSIDERING,

(1) The importance of appropriate warnings to all countries threatened by locust invasion;

(2) The value of locust reports from ships when such warnings are being issued by the Anti-Locust Research Centre and for the related control operations;

(3) That the cost of such messages will be defrayed by the Desert Locust Information Service in London;

RECOMMENDS,

(1) That Members concerned be invited to instruct reporting ships, regardless of their nationality, operating in the seas around Africa, Arabia, Pakistan and India, to send by radio and in plain language to "Anti-Locust", London, reports on any locusts seen;

(2) That a locust report should contain the following elements :

(a) Date and time (specifying GMT or zone time) when locusts first seen;

(b) Latitude and longitude, if possible to nearest minute, where locusts first seen;

(c) Time and position at which locusts last seen;

(d) Whether dense, thin, or scattered swarms; individual fliers, or floating dead locusts, many or few;

(e) Colour of locusts (yellow, pink, grey);

(f) Wind direction and speed;

Details of such reports should be entered in the ship's meteorological log, even when it has not been possible to send a radio report;

(3) That the Secretary-General be requested to discuss with the Anti-Locust Research Centre the need for providing Members with more detailed guidance on the reporting of locusts seen from ships, including the transmission of reports, and that such details be disseminated to Members together with this recommendation.

Rec. 17 (CMM-III) - FACSIMILE BROADCASTS OF WEATHER CHARTS FOR SHIPPING

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Recommendation 50 (CSM-II);

(2) Resolution 21 (EC-X);

(3) The increasing use of facsimile broadcasts for meteorological purposes;

(4) The advantages afforded to ships by the use of facsimile broadcasts;

(5) That the International Conference on Safety of Life at Sea (London 1960) has encouraged the transmission of suitable facsimile weather charts to ships;

CONSIDERING the possibility of using facsimile equipment on ships also for reception of graphical information other than meteorological;

RECOMMENDS,

(1) That Members concerned take such action as may be appropriate in their countries to encourage the installation of meteorological facsimile recorders on ships;

(2) That the special conditions on board ship be taken into account in the design of equipment for use aboard ships. It should be easy to maintain, compact and rugged;

(3) That Members concerned in compiling schedules for radio-facsimile broadcasts take into consideration the requirements of shipping;

(4) That Members concerned who have not already done so, consider the transmission of information suitable for shipping in facsimile broadcasts;

(5) That information on national meteorological facsimile broadcasts be included in WMO Publication No. 9.TP.4, Volume D;

(6) That Members concerned provide information on facsimile broadcasts to ships equipped with facsimile receivers.

Rec. 18 (CMM-III) - ICE ACCRETION ON SHIPS

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) That the International Convention for Safety of Life at Sea (London 1960), Chapter V, Regulations 1 and 2, requires the transmission of messages by all ships encountering sub-freezing temperatures associated with gale force winds and severe ice accretion on ships' superstructures as "Danger Messages";

(2) That the regulations will become effective as specified in the 1960 Convention;

(3) That the MAFOR-FM 61.B code form provides for indicating the risk and strong risk of ice accumulation on ships' superstructures;

CONSIDERING,

(1) That the inclusion of reports of icing conditions in weather messages supplied by selected, supplementary and auxiliary ships is essential;

(2) The importance of including in plain language the warnings issued to shipping by Members, on occasions when severe icing conditions are indicated;

(3) The report on trawler icing research published by the British Shipbuilding Research Association, London, 1957;

(4) A review of the problem of icing aboard ships, made by the Federal Republic of Germany;

(5) That ice accretion on ships' superstructures depends primarily on certain meteorological conditions and is one of the major seasonal hazards to shipsunderway in high latitudes;

(6) The need for Members to conduct further research on this subject;

RECOMMENDS,

(1) That code forms FM 21.A, FM 22.A and FM 23.B be extended to permit selected, supplementary and auxiliary ships to add at the end of their synoptic weather messages, in plain language, an indication of the thickness of ice when icing on ships' superstructures is being encountered, e.g. ICING 6 CM INCREASING or ICING SEVERE or MODERATE or SLIGHT, as the case may be;

(2) That Members concerned include, whenever possible, in warnings issued to shipping, indications as to when severe icing conditions are expected;

(3) That Members be urged to conduct studies and researches on the relationship between meteorological factors and icing conditions on board ships with a view to improving the issue of advices to ships;

(4) That Members concerned should arrange to obtain by mail from all vessels, special reports on icing conditions encountered, which are essential for making studies of this problem;

(5) That the change in WMO code forms indicated in RECOMMENDS (1), become effective on 1 January 1962.

Rec. 19 (CMM-III) - INTERNATIONAL SYSTEM OF VISUAL STORM WARNING SIGNALS

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Recommendation 2 (CMM-II);

(2) Resolution 35 (EC-IX);

(3) The proposal for amendment of the international visual storm warning signal system, prepared by the Secretariat, and the comments received from members of the CMM on this proposal;

CONSIDERING that the specifications of the signals must be in agreement with the corresponding specifications of the Beaufort Scale;

RECOMMENDS,

(1) That the present system of international visual storm warning signals be amended as detailed in the annex to this recommendation;*

(2) That the attention of Members be invited to the need for keeping the Secretary-General informed of the details of the visual storm warning signals system they use;

(3) That the revised system should come into force on 1 January 1962.

Rec. 20 (CMM-III) - ROUTING OF SHIPS BY MEANS OF EXTENDED WEATHER FORECASTING

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) The increased activity on the part of certain Members in the development of techniques for the economical routing of ships, in the light of the individual requirements of ships, based upon wave and extended weather forecasts;

(2) The promising results already obtained by these experimental programmes;

CONSIDERING,

(1) The limitations imposed on further development of these methods by the present lack of accurate extended weather forecasts;

(2) The dependence of ship routing techniques on accurate synoptic wave observations;

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* See Annex VII.

(3) The need for further development of routing techniques, since wave height has hitherto been the only environmental factor considered;

RECOMMENDS,

(1) That research in the field of wave and extended weather forecasting be intensified;

(2) That Members, especially those operating ocean station vessels and other special purpose vessels, such as light-ships and research vessels, be encouraged to establish as soon as possible a synoptic wave-reporting network based on instrumental measurement of wave height and period;

(3) That Members conducting ship routing programmes attempt to improve ship routing methods by including in their research activity consideration of other environmental factors, especially wave period, and exchange results with interested Members.

Rec. 21 (CMM-III) - PUBLICATION BY WMO OF A HANDBOOK ON "THE PREPARATION AND USE OF WEATHER MAPS BY MARINERS"

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) The proposal of CMM second session that "some guidance on preparing weather maps on shipboard" should be included in WMO Publication No. 9.TP.4, Volume D, (Annex 8 to the Abridged Final Report of CMM second session);

(2) The report of the chairman of the Working Group on organizational and operational matters wherein it has been recommended that a booklet on "Guidance on preparing weather maps on shipboard" be prepared and issued as a separate publication;

(3) Resolution 3 (CMM-III) which establishes a working group to finalize the above handbook in a form suitable for publication after a review by members of CMM;

CONSIDERING the value for ships' officers of a handbook providing guidance on the plotting, analysis, and interpretation or use of weather maps at sea, whether the data be received in the form of plain language, coded analyses, individual reports, or by facsimile;

RECOMMENDS that the handbook "The preparation and use of weather maps by mariners" be published by WMO as a Technical Note.

Rec. 22 (CMM-III) - MARINE SECTION OF THE WORLD CLIMATIC ATLAS AND CLIMATOLOGICAL SUMMARIES

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Resolution 32 (Cg-III);

(2) The request addressed by the Association of Meteorology and Atmospheric Physics of the International Union of Geodesy and Geophysics, to the World Meteorological Organization to consider the publication of mean monthly sea surface temperatures and, if possible, also of other meteorological elements from representative sea areas;

CONSIDERING,

(1) That as no specific nation is responsible for the oceans and seas, outside territorial waters, it is essential that individual Members be invited to accept responsibility for specific areas of the oceans and seas with a view to preparation of the marine section of the World Climatic Atlas and publication of the climatological summaries;

(2) That the Members undertaking to collect data for the eventual preparation of one or more volumes of the marine section of the World Climatic Atlas and for the climatological summaries (henceforth called the Responsible Members) require all available marine climatological data from the areas for which they are responsible;

RECOMMENDS,

(1) That for the purpose of preparing the climatological summaries, and of collecting data with a view to the eventual preparation of a marine section of the World Climatic Atlas, the oceans and seas should be divided into areas of responsibility as indicated in Part A of the annex to this recommendation;*

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* See Annex VIII.

(2) That the Members indicated on the map of Part A of the annex be invited to assume responsibility for their respective areas as shown on the map;

(3) That the map given as Part B of the annex to this recommendation be used as a basis for discussion when a final decision is being made as to the division of responsibility for specific ocean and sea areas, with a view to preparation of the marine section of the World Climatic Atlas;

(4) That, subject to amendments to the charts listed in Part C of the annex, and to the specifications of these charts in the light of further study, the different volumes of the marine section of the World Climatic Atlas should contain the charts listed in Part C of the annex to this recommendation,* and that these charts should be prepared in accordance with the specifications given in the same part, and with the guidance material to be promulgated by the WMO Secretary-General;

(5) That Responsible Members prepare climatological summaries annually for a number of selected representative areas in their area of responsibility, for the fixed ship stations within their area and, upon mutual agreement, for fixed ship stations operated solely by the Responsible Member in an area of a second Responsible Member; the publication of these summaries being undertaken by the Secretary-General;

(6) That the number, dimensions and locations of these selected representative areas should be determined by the Responsible Member taking into account the need to locate these areas in such a way that they are representative of the various climatological regions in the area and that a sufficiently large number of observations may be expected;

(7) That once chosen, the selected representative areas be kept as far as possible unchanged in future years;

(8) That the climatological summaries include the data listed in Part D of the annex to this recommendation;*

(9) That the climatological summaries present these data for each calendar month separately and for each year;

(10) That climatological summaries also be published as far as possible for former years and for the same areas;

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* See Annex VIII.

(11) That Members who operate selected or supplementary ship stations should arrange for :

(a) Making the availability, at half-yearly intervals, of the punch-cards of all these ships, based on checked observations, following the lay-out of the international maritime meteorological punch-card;

(b) Half-yearly sorting of these punch-cards by areas and their dispatch to Responsible Members;

(12) That Members who operate auxiliary ship stations should make available to Responsible Members the observations of those auxiliary ships which were made in areas where the number of reporting ships is quite inadequate, or in areas which are rarely traversed by ocean-going ships, provided that, on being checked, the observations are considered to be of a sufficiently high standard;

(13) That Members who operate fixed ship stations should make the observations of these ships available on punch-cards, using the lay-out of the international maritime meteorological punch-card, to the Member in whose allotted area these stations are situated;

(14) That all Members should advise the Responsible Members of the number and location of the former marine observations they have on file with respect to these areas, and of marine climatological atlases and other publications which they have issued for these areas;

(15) That Members should supply whatever available data for these areas are required by the Responsible Members.

Rec. 23 (CMM-III) - INTERNATIONAL MARITIME METEOROLOGICAL PUNCH-CARD

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING Recommendation 22 (CMM-III);

CONSIDERING,

(1) That the Responsible Members* require all available marine data of the area concerned presented in such a manner as to permit easy and rapid processing;

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* See Recommendation 22 (CMM-III).

(2) That this demand will be satisfied if the punch-card system is used, provided that all cards contain the same elements, punched according to the same instructions and in the same columns, and expressed as far as possible in the same units;

(3) That the existing international maritime meteorological punch-card, originally established by Resolution 23 of the Extraordinary Conference of Directors of the International Meteorological Organization (Paris, 1951) and inserted in the Technical Regulations by Resolution 17 (Cg-III), does not provide for an indication of the units used and does not prescribe uniform punching procedures;

(4) That some Members may require the exchange of data with deviating codes or additional data to facilitate the preparation of the marine section of the World Climatic Atlas and climatological summaries from data of former years;

RECOMMENDS,

(1) That Technical Regulations, paragraph 8.2.1.4 be amended to read : "When supplying synoptic surface observations, made at mobile ship stations, to meteorological services for international use, the international maritime meteorological punch-card reproduced as Appendix F should be used";

(2) That Appendix F to the Technical Regulations be replaced by Part A of the annex to this recommendation;*

(3) That for the punching of data with deviating codes or additional data, the supplementary instructions contained in Part B of the annex to this recommendation* be used.

Rec. 24 (CMM-III) - WMO SYSTEM FOR INDICATING THE "COUNTRY OF ORIGIN" ON THE INTERNATIONAL MARITIME METEOROLOGICAL PUNCH-CARD

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING the present allocation of figure indicators for "country of origin" on the international maritime meteorological punch-card;

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* See Annex IX.

CONSIDERING,

(1) That the WMO system for indicating the "country of origin" on the international maritime meteorological punch-card provides for the allocation of numbers to a maximum of 30 countries;

(2) That it is to be anticipated that this number will not be sufficient in the near future;

RECOMMENDS,

(1) That the "country of origin" be indicated on the international maritime meteorological punch-card by a number consisting of two figures;

(2) That the numbers which have already been allocated be changed in the manner indicated in the annex to this recommendation.

A N N E X

LIST OF NUMBERS INDICATING THE COUNTRY OF ORIGIN ON THE INTERNATIONAL MARITIME METEOROLOGICAL PUNCH-CARD

00	Netherlands
01	Norway
02	United States of America
03	United Kingdom
04	France
05	Denmark
06	Italy
07	India
08	Hong Kong
09	New Zealand
10	Ireland
11	Philippines
12	United Arab Republic
13	Canada
14	Belgium
15	Union of South Africa
16	Australia
17	Japan
18	Pakistan
19	Argentina
20	Sweden
21	Federal Republic of Germany
22	Iceland

Rec. 25 (CMM-III) - FUTURE CODE CHANGES AFFECTING THE INTERNATIONAL MARITIME METEOROLOGICAL PUNCH-CARD

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING Recommendation 23 (CMM-III);

CONSIDERING that on the international maritime meteorological punch-card, the punching for the year has to serve as indicator for the codes and units used on the punch-card concerned;

RECOMMENDS that future changes in units and codes affecting the data which have to be entered on the international maritime meteorological punch-card always become effective on the first of January.

Rec. 26 (CMM-III) - PREPARATION OF THE MARINE SECTION OF THE WORLD CLIMATIC ATLAS

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Recommendation 22 (CMM-III);

(2) Annex 2 to Resolution 30 (EC-IX), paragraph 2.1.6;

(3) General Summary of the work of Third Congress, paragraph 5.8.1.4;

CONSIDERING,

(1) That since Resolution 4 (CMM-II) stated the need for preparing new climatic charts for ocean areas, some new national climatic atlases have been published, among them the U.S. Navy Marine Climatic Atlas of the World;

(2) That the existing national atlases are based on only a part of all available observations, and that, in particular, the important observations made during the International Geophysical Year and International Geophysical Co-operation have not been incorporated;

(3) That the existing national atlases have been compiled according to specifications other than those laid down in Annex C to Recommendation 22 (CMM-III);

(4) That, consequently, the need for a marine section of the World Climatic Atlas, compiled according to the international specifications, while lessened, is not removed;

(5) That it is desirable to exclude marine observations falling outside of the period to be chosen as the standard ones for the marine section of the World Climatic Atlas, for areas where an adequate number of observations within this period is available;

(6) That observations made at sea stations are generally unevenly distributed geographically, and those made at mobile ship stations are so unevenly distributed as regards both time and place, that in some areas where shipping is sparse some observations, whatever their age, may of necessity be included;

(7) That up to now all climatic atlases have been based on widely varying periods of observation, which makes it impossible to discern trends of climatic elements;

(8) That trends of climatic elements may be pronounced in some sea areas;

RECOMMENDS,

(1) That preparatory work on the marine section of the World Climatic Atlas commence as soon as practicable;

(2) That the preparation of the marine section of the World Climatic Atlas be based, in so far as possible, on all reliable observations within the 30-year period 1950-1979;

(3) That the marine section of the World Climatic Atlas include representations of climatic trends for selected elements observed at fixed ship stations and within selected areas.

Rec. 27 (CMM-III) - INCLUSION OF DAYS OF METEOROLOGICAL PHENOMENA IN THE SPECIFICATIONS OF THE MARINE SECTION OF THE WORLD CLIMATIC ATLAS

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING Resolution 32 (Cg-III);

CONSIDERING,

(1) That in 1956 the World Meteorological Organization published the "World distribution of thunderstorm days" (Publ. No. 21.TP.21, 1956)

to meet the requirements of the International Telecommunication Union, but that this publication (dealing with a climatic element) was not a detailed climatological study of thunderstorm activity;

(2) That the Responsible Members* should include thunderstorm frequency and number of days of other meteorological phenomena in the marine section of the World Climatic Atlas;

(3) That land climatological data for certain elements are usually expressed in terms of the number of days of their occurrence, whereas marine climatological data for the same elements from mobile ship stations are expressed in terms of percentage frequency of occurrence of the element;

RECOMMENDS,

(1) That Members be invited to investigate the statistical relations between percentage frequency of occurrence of selected meteorological elements and number of days of the same elements, firstly at the locations of ocean weather stations, and secondly on the basis of data from mobile ship stations, in so far as available, by studying consecutive observations covering periods of one day for fixed, limited, oceanic areas;

(2) That Members be invited to compare the results of these investigations for several varied geographic locations, for the same elements, to determine whether the relationships established in selected geographic locations are applicable in other locations;

(3) That these comparisons be submitted for consideration by the fourth session of the Commission for Maritime Meteorology.

Rec. 28 (CMM-III) - CODES FOR REPORTING SEA ICE

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Recommendation 12 (CMM-II);

(2) Resolution 33 (EC-IX);

(3) Resolution 6 (CMM-II);

(4) General Summary of the work of Third Congress, paragraph 5.14.3;

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* See Recommendation 22 (CMM-III).

CONSIDERING,

(1) That a new set of codes for reporting ice observations from aircraft, ships, and shore stations for the purpose of international exchange should be made available as soon as possible;

(2) Proposals made by the Working Group on sea ice for the adoption of two ice reporting codes : a unified code for reporting individual observations from aircraft, ships, and shore stations (Part A of the annex to this recommendation*); and a special code for converting aerial ice reconnaissance messages in plain language to numerical form (Part B of the annex to this recommendation*);

RECOMMENDS that these codes be adopted for the international exchange of ice data.

Rec. 29 (CMM-III) - ILLUSTRATED INTERNATIONAL ICE NOMENCLATURE

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Resolution 6 (CMM-II);

(2) General Summary of the work of the CMM second session, paragraph 31;

CONSIDERING,

(1) That publication of the Illustrated International Ice Nomenclature would contribute to the quality and standardization of ice observation, facilitate the training of ice observers, and result in freer and more meaningful international exchange of sea ice data;

(2) That, whilst suitable photographs exist for the majority of the ice terms included in the Nomenclature, there are several for which no suitable photographs have as yet been found;

(3) That locating photographs of adequate photographic and scientific quality is difficult, so that a complete set will probably not be collected for some time;

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* See Annex X.

RECOMMENDS,

(1) That the Illustrated International Ice Nomenclature be published as a separate WMO publication;

(2) That publication be in loose-leaf form to permit the addition or replacement of photographs as they become available;

(3) That the Secretary-General invite the attention of Members concerned to the fact that suitable photographs of the ice types listed in annex to this recommendation are not available and urge Members to submit photographs of these types of ice as well as improved versions of the photographs of the preliminary edition of the Illustrated Ice Nomenclature.

A N N E X

ICE TYPES INCLUDED IN THE ABRIDGED INTERNATIONAL ICE NOMENCLATURE FOR WHICH PHOTOGRAPHS ARE MISSING

A. Photos taken from ships or shore

1.131	Medium winter-ice
1.15	Bay-ice
1.16	Ice-shelf (Arctic)
1.161	Ice island
1.212	Winter fast-ice
1.214	Polar fast-ice
2.21	Glacier tongue

B. Photos taken from the air

1.111	Ice crystals
1.1123	Sludge
1.113	Pancake-ice
1.12	Young ice
1.131	Medium winter-ice
1.132	Thick winter-ice
1.141	Young polar-ice
1.142	Arctic pack
1.15	Bay-ice
1.22	Icefoot
1.24	Grounded hummock
1.3211	Vast ice-floe
1.3212	Big ice-floe
1.3213	Medium ice-floe
1.323	Bergy bit
1.324	Growler
1.325	Brash-ice
1.3311	Large ice-field
1.3312	Medium ice-field
1.3313	Small ice-field
1.332	Belt
1.334	Bay
1.335	Tongue
1.421	Rafted ice
1.43	
1.511	Tide crack
1.521	
1.531	Shore Polynya

Rec. 30 (CMM-III) - INDIAN OCEAN OCEANOGRAPHIC EXPEDITION 1960-1964

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING the request from the Special Committee on Oceanic Research (SCOR) for assistance by WMO in providing various meteorological services in connexion with the Indian Ocean Oceanographic Expedition;

CONSIDERING,

(1) That it would be greatly beneficial for the operations and for the subsequent research on the collected material if Members concerned could give as much assistance as possible to the project;

(2) That the great number of research vessels operating in this sparse area would offer a unique opportunity of making and reporting meteorological observations which would benefit the Members providing services for the expedition and contribute to meteorological research in general;

RECOMMENDS,

(1) That Members bordering the Indian Ocean endeavour to extend the coverage of their weather forecasts with a view to covering collectively the whole of that ocean;

(2) That Members concerned examine the possibility of issuing weather charts by facsimile broadcast for the period of the project (in particular the period 1962 - 1964);

(3) That Members concerned endeavour to make available, on request, copies of daily weather maps of the area in question and inform the Secretary-General to what extent such maps will be available for the period of the project;

(4) That Members concerned endeavour to carry out and report the following observations and measurements on board their participating research vessels, whether or not these vessels are operated by governmental or non-governmental institutions :

(a) Surface synoptic observations as a matter of routine;

(b) Radiosonde observations and if possible radiowind observations (if radiowind observations are not possible, pilot-balloon observations would be useful);

(c) Wave measurements, if possible;

(5) That Members, especially those bordering the Indian Ocean, make special efforts to recruit additional reporting ships plying the Indian Ocean during the period in question;

(6) That Members remind their selected, supplementary and auxiliary ships that the Indian Ocean Expedition is in progress and to transmit as many of the synoptic reports as possible;

(7) That Members in receipt of reports from observing ships in this area should take special steps to ensure that all such reports are speedily disseminated for the benefit of all interested Members;

(8) That the Secretary-General be requested :

(a) To continue advising SCOR on the special meteorological observations required for research on energy exchanges between the atmosphere and the ocean and for investigation of the boundary layer, in consultation with the working group established by the International Association for Meteorology and Atmospheric Physics (IAMAP) on this subject;

(b) To co-ordinate the programmes of regular meteorological observations made on board the participating ships in order that maximum benefit can be derived from these observations.

Rec. 31 (CMM-III) - HANDLING OF INSTRUMENTAL MATTERS RELATING TO MARITIME METEOROLOGY

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING,

(1) Resolution 16 (Cg-III);

(2) Eleventh session of the Executive Committee, General Summary, paragraph 5.14.2;

CONSIDERING the suggestions made by the president of the Commission for Instruments and Methods of Observation in Annex 1 of the Abridged Final Report of the second session of CIMO (WMO-No. 64.RP.26);

RECOMMENDS,

(1) That in order to meet the requirements of the Commission for Maritime Meteorology, a commission constituted along the lines of the

present CIMO be established to provide, inter alia, for the determination of general instrumental policy and the solution of problems relating to marine meteorological instruments for use on board ship;

(2) That the president of this commission be allowed to establish such working groups as required in order to expedite the study and resolution of each problem referred to it;

(3) That when necessary, and subject to the concurrence of the permanent representative of each country concerned, the president be empowered to invite non-members of this commission who are specialists having qualifications and experience in the designing and engineering of marine meteorological instruments for use on ships, to assist any working group in solving each problem;

(4) That the president be empowered to co-ordinate with the presidents of technical commissions concerned, recommendations submitted by his working group or groups prior to their submission to WMO for approval;

(5) That the special terms of reference of the Commission for Maritime Meteorology be amended to include responsibility for issuing recommendations relating to the determination of standard observational methods and practices by ships, including accuracy requirements, for approval by the Organization;

REQUESTS the president of CMM to inform the presidents of all other technical commissions of these views so that, in the meeting of all presidents of technical commissions prior to Fourth Congress, consideration can be given to the establishment of appropriate terms of reference for the suggested new commission to replace the present CIMO, and to the revision of the special terms of reference of CMM indicated in paragraph (5) above.

Rec. 32 (CMM-III) - REVISION OF RESOLUTIONS OF THE EXECUTIVE COMMITTEE BASED ON PREVIOUS RECOMMENDATIONS OF THE COMMISSION FOR MARITIME METEOROLOGY

THE COMMISSION FOR MARITIME METEOROLOGY,

NOTING with satisfaction the action taken by the Executive Committee on the previous recommendations of the Commission for Maritime Meteorology;

CONSIDERING that many of these recommendations have become redundant in the meantime;

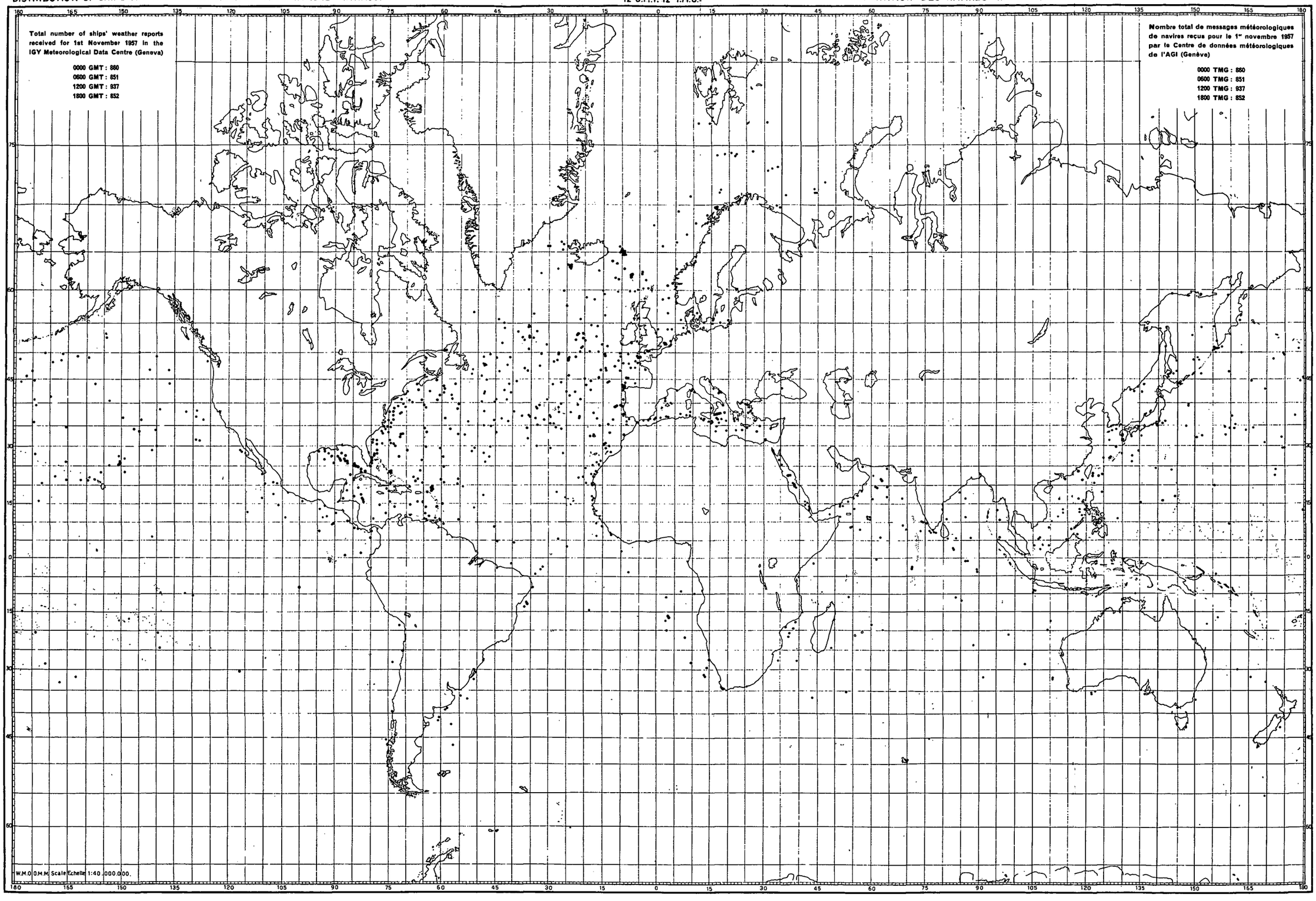
RECOMMENDS,

(1) That the following Executive Committee resolutions be considered as no longer necessary : 4 (EC-VIII), 33 and 37 (EC-IX);

(2) That the following Executive Committee resolutions be maintained in force : 19 and 24 (EC-III).

ANNEX I / ANNEXE I

DISTRIBUTION OF SHIPS MAKING METEOROLOGICAL OBSERVATIONS 1. X1.1957 — 12 G.M.T. 12 T.M.G. — REPARTITION DES NAVIRES EFFECTUANT DES OBSERVATIONS METEOROLOGIQUES 1.XI.1957



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A N N E X II

Annex to paragraph 6.3 of General Summary

EXTRACT FROM THE REPORT OF THE WORKING GROUP ON ORGANIZATIONAL AND OPERATIONAL MATTERS (CMM-III/DOC.42)

The working group decided that in order to get the most comprehensive and favourable picture of the voluntary observing ships scheme it was best to wait until a map could be prepared by the WMO Secretariat showing the results of the "auxiliary" ships scheme (combined with selected and supplementary ships) to the IGY programme. For various practical reasons the Secretariat was unable to prepare these maps until June 1960. Four maps were prepared - showing the distribution of ship observations on 1 November 1957 (a day picked at random) for 0000, 0600, 1200 and 1800 GMT respectively. The maps emphasize the superiority of the oceanic network in the northern hemisphere (particularly in the Atlantic, Mediterranean and Red Sea); the Indian Ocean network being somewhat less dense than these, but vastly superior to any southern hemisphere ocean. The total number of observations shown on these maps during the day in question was as follows :

	Northern hemisphere	Southern hemisphere	World total
0000	757	103	860
0600	745	106	851
1200	828	109	937
1800	755	97	852

These maps were compiled from information extracted from selected, supplementary and auxiliary ships' written records sent in to the IGY Meteorological Data Centre of the WMO Secretariat. In other words it seems probable that many auxiliary ships in the southern hemisphere did send radio weather messages on the day in question, but their written records have not reached the Secretariat.

Figures supplied by the WMO Secretariat as to the activity of auxiliary ships during the IGY (compiled from information provided by countries which actually recruited auxiliary ships) are shown in the following table. Column 1 shows the country which recruited the ship, irrespective of the ship's nationality; columns 2, 3 and 4 show the number of ships which actually participated in 1957, 1958 and 1959 respectively.

Some later statistics received from the WMO Secretariat are in Appendices A and B.

Country	Number of ships which have really participated in 1957	1958	1959
Belgium	8	6	0
Denmark	15	12	16
Federal Republic of Germany	89	133	80
France	1	3	3
Hong Kong	0	0	7
India	3	2	1
Israel	0	11	27
Netherlands	47	52	11
New Zealand	52*)**)	90*)	35*)
Norway	7	4	0
Poland	1	15	26
State of the Community in West Africa	0	4	0
Sweden	40	48	0
Union of South Africa	138	195	96
United Kingdom	2	27	23
United States of America	84	125	276
Total	487	727	601

*) Additional voluntary ships sometimes reporting in full code form.
**) July-December 1957.

*

* *

This total seems to emphasize the potentialities of the auxiliary ships scheme if the port meteorological officers in all countries made maximum efforts to recruit auxiliary ships. (It should be realized, that the number of auxiliary ships that can be recruited by any country is to some extent governed by the number of selected ships which they provide, and selected ships provide a more regular and comprehensive service than auxiliary ships). In particular it seems that if the port meteorological officers of all maritime countries in the southern hemisphere had made strenuous efforts during the IGY to recruit, as auxiliary ships, "non-selected" ships in their ports, the Southern Ocean network would have been vastly superior to that shown on these maps.

Nevertheless, it seems obvious that certain sections of the southern hemisphere oceans are very rarely visited by ships, because the trade routes do not traverse those regions. It seems impossible, therefore, to improve the network very greatly in those areas, by the use of voluntary ship observations, and the only possibility of getting any appreciable increase in the number of observations therefrom seems to be by means of ocean weather ships, or automatic

buoys. In view of the recent successful experiments with "buoyant" moorings of automatic buoys by the U.S. Weather Bureau the working group recommends that the possibilities of these buoys for this purpose be considered by CMM third session.

The working group recommends to CMM third session, that the only practicable way of improving the remainder of the oceanic network is by energetic action on the part of port meteorological officers and that countries bordering the "deficient" areas in particular should make special efforts in this direction. From fishery vessels as well as from merchant ships, such arrangements would be one way of including the co-operation of many "flag of convenience" ships as well as other ships.

Masters and officers of most merchant ships are willing to do this meteorological work to a limited extent, but experience shows that they do need frequent reminders about it.

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A P P E N D I X A

NUMBER OF SHIPS' OBSERVATIONS RECEIVED FOR 19 MAY 1958 IN THE INTERNATIONAL GEOPHYSICAL YEAR METEOROLOGICAL DATA CENTRE (GENEVA)

0000 GMT	Octant 0	396 obs.	Northern hemisphere 844 obs.
	Octant 1	105 obs.	
	Octant 2	152 obs.	
	Octant 3	191 obs.	
	Octant 5	35 obs.	Southern hemisphere 114 obs.
	Octant 6	18 obs.	
	Octant 7	29 obs.	
	Octant 8	32 obs.	

World total at 0000 GMT = 958 obs.

0600 GMT	Octant 0	412 obs.	Northern hemisphere 867 obs.
	Octant 1	104 obs.	
	Octant 2	141 obs.	
	Octant 3	210 obs.	
	Octant 5	31 obs.	Southern hemisphere 112 obs.
	Octant 6	19 obs.	
	Octant 7	27 obs.	
	Octant 8	35 obs.	
			World total at 0600 GMT = 979 obs.
1200 GMT	Octant 0	441 obs.	Northern hemisphere 887 obs.
	Octant 1	96 obs.	
	Octant 2	141 obs.	
	Octant 3	209 obs.	
	Octant 5	33 obs.	Southern hemisphere 116 obs.
	Octant 6	19 obs.	
	Octant 7	29 obs.	
	Octant 8	35 obs.	
			World total at 1200 GMT = 1003 obs.
1800 GMT	Octant 0	445 obs.	Northern hemisphere 872 obs.
	Octant 1	99 obs.	
	Octant 2	136 obs.	
	Octant 3	192 obs.	
	Octant 5	31 obs.	Southern hemisphere 145 obs.
	Octant 6	20 obs.	
	Octant 7	37 obs.	
	Octant 8	57 obs.	
			World total at 1800 GMT 1017 obs.

*

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A P P E N D I X B

NUMBERS OF MESSAGES RECEIVED FROM SHIPS FOR THE DIFFERENT COLLECTING AREAS IN 1958

	Total number	FM 21.A SHIP	FM 22.A SHIP	FM 23.A SHIP	FM 24.A SHIGY
Region I					
British East Africa	3096	2532	396	24	144
Portuguese East Africa(1)	393				
United Arab Republic :					
Mediterranean Area	2943				
Red Sea Area	2555				
Union of South Africa	33199	65%	3%	1%	31%
Region II					
China	approx. total: 55 to 60 per month				
Hong Kong	32901(2)	29601(2)	3207(2)	0	93(2)
India	45668(2)				
Japan (3)	74600(3)	61200(3)	13100(3)		others: 300(3)
Pakistan - Arabian Sea	3420	(majority)			
- Bay of Bengal	558	364	39	0	155
Region III					
no information					
Region IV					
United States of America :					
NW Atlantic	181465(4)	125025	52525		1915
NE Pacific	56357	39450	15089		1818
Region V					
Australia	29104				
Malaya	10056(2)				
New Zealand	27704	95%		5%	0
Region VI					
Denmark	7989	5535		2454	
France (data for 1959)	12000	90%			
Germany, Federal Republic(6)	36480(6)				
Italy (June 1958-June 1959)	1887(9)				
Netherlands 1958	14500	10508	0	0	3992
1959	14627	10597	0	0	4030
Portugal	3550	3120(5)	430(5)		
Sweden	3793	1706	1918		169
United Kingdom	75667	43216(7)	24672(8) 2094	5627	58

(See Notes page 80)

NOTES :

(1) No area of responsibility for collecting, but the station of this country accepts messages from all ships;

(2) Distribution over different areas unknown;

(3) Area 38°N - 130°E, 45°5N - 140°E, 45°5N - 150°E, 50°N - 160°E, 50°N - 180°E, 25°N - 180°E, 25°N - 130°E;

(4) Ships called upon for special observations at 2 or 3 hour intervals in the hurricane season in the North Atlantic;

(5) From Portuguese ships for the area 30°N - 44°N between 40°W and the West coast of Europe;

(6) No area of responsibility allotted, but German ships send their messages to Norddeich (DAN), especially in the NE Atlantic, the North Sea and the Norwegian Sea;

(7) Excluding reports from ocean weather stations;

(8) Messages from ocean weather stations;

(9) For the whole of the Mediterranean.

A N N E X III

Annex to paragraph 7.9 of General Summary

ACCURACY OF MEASUREMENTS AT SEA

Element	Required accuracy of measurement	Approximate maximum error under bad conditions at sea	Prescribed precision of instrumental reading
Apparent mean wind direction	± 5°	± 15°	5°
Apparent mean wind speed	± 1 kts	± 5 kts	1 kts
Dry-bulb temperature Wet-bulb temperature Dew-point temperature	± 0.1°C	± 0.5°C	0.1°C
Atmospheric pressure	± 0.1 mb	± 3 mb	0.1 mb
Pressure tendency	± 0.1 mb	± 3 mb	0.1 mb
Sea-surface temperature	± 0.1°C	± 1°C	0.1°C
Mean wave period	± 0.5 sec	Insufficient information available	0.5 sec*
Mean wave height	± 10%	Insufficient information available	0.2 m**
Precipitation	± 0.2 mm ($\leqslant$10 mm) ± 2 % ($>$10 mm)	Insufficient information available	0.2 mm ($\leqslant$10 mm) 2 % ($>$10 mm)

* Period of individual wave.
** Height of individual wave.

ANNEX IV

Annex to paragraph 8.6 of General Summary

EXAMPLE OF THE LAY-OUT OF A SIMPLIFIED CODE-CARD

Short weather code for fishing vessels and auxiliary ships based on FM 24.B SHRED

(Minimum requirement)

FIRST GROUP

$YQL_aL_aL_a$

Y = Day of the week

Sunday	= 1
Monday	= 2
Tuesday	= 3
Wednesday	= 4
Thursday	= 5
Friday	= 6
Saturday	= 7

Q = Longitude and hemisphere indicator

Northern hemisphere

0° - 90° West	= 0
90° - 180° West	= 1
90° - 180° East	= 2
0° - 90° East	= 3

Southern hemisphere

0° - 90° West	= 5
90° - 180° West	= 6
90° - 180° East	= 7
0° - 90° East	= 8

$L_aL_aL_a$ = Latitude in degrees and tenths

Example :

$L_aL_aL_a$

31°28' South = 315
03°42' South = 037

SECOND GROUP

$L_oL_oL_oGG$

$L_oL_oL_o$ = Longitude in degrees and tenths (if over 100, the hundreds digit 1 is omitted

Example :

$L_oL_oL_o$

24°15' East = 242
137°06' East = 371

GG = GMT of observation

0000	GMT = 00
0600	GMT = 06
1200	GMT = 12
1800	GMT = 18

THIRD GROUP

NddFF

N = Total cloud amount

No clouds at all	= 0
1/8 sky covered	= 1
2/8 sky covered	= 2
3/8 sky covered	= 3
4/8 sky covered	= 4
5/8 sky covered	= 5
6/8 sky covered	= 6
7/8 sky covered	= 7
Overcast (8/8)	= 8
Sky obscured	= 9

dd = True direction of the wind

CALM	= 00
NNE	= 02
NE	= 05
ENE	= 07
EAST	= 09
ESE	= 11
SE	= 14
SSE	= 16
SOUTH	= 18
SSW	= 20
SW	= 23
WSW	= 25
WEST	= 27
WNW	= 29
NW	= 32
NNW	= 34
NORTH	= 36
VARIABLE	= 99

ff = Wind speed in knots

Beaufort Force	knots
Calm	00
1 =	02
2 =	05
3 =	09
4 =	13
5 =	18
6 =	24
7 =	30
8 =	37
9 =	44
10 =	52
11 =	60
12 =	68

FOURTH GROUP

VVwwW

VV = Visibility

	Nautical miles	
Less than 50 m	Less than 0.03	= 90
50 - 200 m	0.03 - 0.11	= 91
200 - 500 m	0.11 - 0.27	= 92
500 - 1000 m	0.27 - 0.54	= 93
1 - 2 km	0.54 - 1.08	= 94
2 - 44 km	1.08 - 2.16	= 95
4 - 10 km	2.16 - 5.4	= 96
10 - 20 km	5.4 - 10.8	= 97
20 - 50 km	10.8 - 27	= 98
Over 50 km	Over 27	= 99

ww = Present weather

Partly cloudy	= 01
Mainly cloudy	= 03
Hazy	= 05
Mist	= 10
Fog	= 45
Drizzle	= 50
Rain	= 60
Snow	= 70
Showers	= 80
Thunderstorm	= 95

W = Past weather (during past 6 hours)

Slightly clouded	= 0
Variable sky	= 1
Mainly overcast	= 2
Fog	= 4
Drizzle	= 5
Rain	= 6
Snow	= 7
Showers	= 8
Thunderstorm	= 9

FIFTH GROUP

PPXTT

PP = Last two figures of barometric pressure in millibars

Example : 1016 = 16
993 = 93

X is unaltered and sent as X

TT = Outside air temperature

Example : 6° = 06
23° = 23

NB. If below 0°C add 50.

A N N E X V

Annex to paragraph 16 of General Summary

PROPOSED ANALYSIS CODE FOR SEA CONDITION CHART MESSAGES

The code should contain provision for encoding the following data :

(1) Identifying groups for synoptic and prognostic sea condition chart messages;

(2) Date and time groups for synoptic and prognostic sea condition chart messages;

(3) Isoheight lines, delineated by points, indicating areas where wave heights are 2 m, 3 m, 4 m and 2-meter invervals thereafter; also the direction from which waves are coming (D) at each point given in the message for the isoheight lines;

(4) Co-ordinates of points given for isoheight lines to be indicated in the form $QL_aL_aL_oL_o$;

(5) Wave period (P_w) at each point given on isoheight lines included in the message;

(6) Inclusion, in synoptic sea condition analysis messages, of the prognostic positions of the centres of maximum wave height areas;

(7) The code should be devised to permit transmission of synoptic and prognostic sea condition chart analyses by separate messages or combined in a single message.

A N N E X VI

Annex to Recommendation 11 (CMM-III)

PART A

DRAFT TEXTS TO LEGENDS OF MARINE CLOUD ALBUM

(Figures in brackets refer to the Abridged International Cloud Atlas)

Plate 1 (1)

$C_L = 1$ Ragged Cumulus with fine weather

The Cumulus is in the form of small, scattered, white patches of cloud with ragged edges. Some clouds, however, have a sharp outline and a somewhat rounded form.

$C_M = 0$, $C_H = 0$. No medium and high clouds seen.

Plate 2 (2)

$C_L = 2$ Cumulus with very little vertical extent and ragged Cumulus

There are some ragged Cumulus, but most of the Cumulus have fairly sharp outlines. The horizontal cloud bases are at the same level and show some shading.

$C_M = 0$, $C_H = 0$.

Plate 3 (4)

$C_L = 2$ Cumulus with great vertical extent

The Cumulus are well developed and many separate tops are pushing up. The cloud outlines are mostly sharp. The bases are dark and almost horizontal.

$C_M = 0$, $C_H = 1$. Some patches of Cirrus are seen in the upper part of the picture.

Plate 4 (5)

$C_L = 2$ Cumulus with great vertical extent

The clouds are large but well separated and have somewhat ragged edges. There is a dark shading on the flat bases.

$C_M = 0$, $C_H = 0$.

Plate 5 (6)

$C_L = 3$ Cumulonimbus without an anvil top

A large, dense Cumulonimbus towers in the sky. Since there is no anvil at the top, the Cumulonimbus is coded $C_L = 3$.

$C_M = 0$, $C_H = 0$.

Plate 6 (7)

$C_L = 3$ Cumulonimbus without an anvil top

The outlines of the heavy mass of Cumulonimbus are smooth rather than sharp. There is no anvil at the top, but veils of almond shaped Altocumulus.

$C_M = 4$, $C_H = 0$.

The almond shaped Altocumulus is coded $C_M = 4$.

Plate 7 (8)

$C_L = 4$ Stratocumulus formed by the spreading out of Cumulus

Cumulus are present, but the clouds rise only a short distance and then begin to spread out horizontally, become less clear cut and form Stratocumulus.

$C_M = 0$, $C_H = 0$.

Plate 8 (9)

$C_L = 4$ Stratocumulus formed by the spreading out of Cumulus

The Stratocumulus is formed from Cumulus. The tops of Cumulus are flattened, the bases spread out and the outlines get diffuse.

$C_M = 4$, $C_H = 0$.

Some almond shaped Altocumulus are present at a higher level.

Plate 9 (10)

$C_L = 5$ Stratocumulus

The cloud fills the sky, but separate parts with dark shading and bright sides are clearly seen.

$C_M = x$, $C_H = x$. Medium and high clouds are not visible.

Plate 10 (11)

$C_L = 5$ Stratocumulus

The waves of Stratocumulus form a grey cover, the outlines of which are not

sharp, but fuzzy and have a soft appearance.

$C_M = x$, $C_H = x$.

Plate 11 (12)

$C_L = 6$ Stratus as a layer

The Stratus appears as a soft, continuous smoke-like layer, which is dark in some parts and thinner in others. It is low and covers the tops of the hills.

$C_M = x$, $C_H = x$.

Plate 12 (13)

$C_L = 6$ Ragged Stratus

Ragged patches of Stratus are formed from dissolving fog and from Stratus of the kind of plate 11. At some places in the picture, the rounded tops indicate a start of Cumulus formation.

$C_M = 0$, $C_H = 0$.

Plate 13 (14)

$C_L = 7$ Ragged Cumulus of bad weather

Against the light background, ragged patches of Cumulus are seen.

$C_M = 2$, $C_H = x$. The light background is formed by Nimbostratus.

Plate 14 (15)

$C_L = 8$ Cumulus and Stratocumulus with bases at different levels

Cumulus tops push upwards through a sheet of Stratocumulus. The Cumulus show distinct horizontal bases. The base of Stratocumulus is more diffuse, but in places there is a definite formation of waves and rows.

$C_M = 0$, $C_H = 0$. The clear sky is seen in the background.

Plate 15 (18)

$C_L = 9$ Cumulonimbus with anvil top

The typical form of the anvil has appeared out of the upper part of a Cumulonimbus.

$C_M = 0$, $C_H = 0$.

Plate 16 (19)

C_L = 9 Cumulonimbus with a rain shower

The dark colour of the sky and the sea indicates that the cloud mass is a very thick one. The rain shower near the centre of the picture makes it clear that this is a Cumulonimbus

C_M = x, C_H = x.

Plate 17 (20)

C_L = 9 Cumulonimbus with hanging "udders"

The hanging udders (mamma) at the base of the cloud are part of a Cumulonimbus.

C_M = x, C_H = x.

Plate 18 (21)

C_M = 1 Thin Altostratus

The sheet of Altostratus is so thin that the sun is visible through it.

C_L = 7, C_H = 0. Below the Altostratus, there are ragged patches of Cumulus. The weather conditions are bad, that is why C_L = 7.

Plate 19 (24)

C_M = 2 Nimbostratus

The sky is dark grey and the falling rain nearly hides the lighter streaks on the cloud base. The Code C_M = 2 is usually used with continuous rain.

C_L = 0, C_H = x.

Plate 20 (26)

C_M = 3 Altocumulus not completely hiding the blue sky and the sun

The sheet of Altocumulus is composed of a large number of small clouds like fish scales. In some places, blue sky shows through the openings, but the layer is always so thin that the position of the sun is evident.

C_L = 0, C_H = 0.

Plate 21 (29)

C_M = 4 Altocumulus in small patches

Although the small patches make the cloud resemble Cirrocumulus, the dark

shading at the lower left indicates that this is Altocumulus. Moreover, the beautiful colours near the sun are typical of Altocumulus.

$C_L = 0$, $C_H = 0$.

Plate 22 (58)

$C_M = 4$ Altocumulus in the form of almonds and fish

The clouds that show the form of almonds or fish are at different levels. The higher clouds above are Altocumulus, the dark clouds below Stratocumulus.

$C_L = 8$, $C_H = 0$. In addition to the Stratocumulus, there are some ragged Cumulus.

Plate 23 (31)

$C_M = 5$ Altocumulus moving across the sky

The Altocumulus has almost covered the sky. The blue sky can be seen through small openings and the clouds appear in long rows.

$C_L = 0$, $C_H = 0$.

Plate 24 (32)

$C_M = 6$ Altocumulus formed by the spreading out of the tops of Cumulus

The large patch of Altocumulus in the centre of the picture is formed by spreading of the darker mass of Cumulus below it.

$C_L = 9$, $C_H = 0$. A light patch of an anvil of Cumulonimbus is seen to the left.

Plate 25 (34)

$C_M = 7$ Altocumulus at two different levels

The dark, upper layer appears in the lowermost right corner of the picture. The patches in the lower level are much lighter because of the sunlight.

$C_L = 0$, $C_H = 0$.

Plate 26 (36)

$C_M = 7$ Altocumulus together with Altostratus

The sky is completely covered by a sheet of Altostratus that is thickest near the horizon. Nowhere is the sheet thick enough to hide the sun. At the left and near the horizon, there are patches of Altocumulus, some of which have an almond shape.

$C_L = 0$, $C_H = 0$.

Plate 27 (38)

$C_M = 8$ Altocumulus with small towers

Long patches of Altocumulus stretch across the sky. Some of them are only very thin lines, others are thicker with flat bases and small towers at the top. Similar clouds are often made by jet aircraft, but such artificial clouds should not be considered in weather reports.

$C_L = 0$, $C_H = 0$.

Plate 28 (39)

$C_M = 8$ Altocumulus in tufts

Some of the tufts are more compact than the others. Most of them are scattered, but near the horizon to the right, the patches seem to be arranged in bands.

$C_L = 0$, $C_H = 0$.

Plate 29 (40)

$C_M = 9$ Altocumulus in a chaotic sky

There are many cloud types at different levels, giving a chaotic or confused appearance to the sky.
In the picture, there are many patches of Altocumulus, some with small towers at the top.

$C_L = 2$. In the shadow of the upper clouds, there are fairly high Cumulus in the clear sky above the horizon.

$C_H = 8$. The continuous white sheet that covers the upper part of the picture is a Cirrostratus.

Plate 30 (42)

$C_H = 1$ Hairlike Cirrus

Hairlike streaks of Cirrus are spread over the sky. In some places they are tangled, in others more regular.

$C_L = 0$, $C_M = 0$.

Plate 31 (44)

$C_H = 2$ Dense patches of Cirrus

A dense patch of Cirrus is moving across the sky. It has an irregular shape and the edges look like tufts of hair. No dark parts are seen because of the direct sunlight of a low sun.

$C_L = 0$, $C_M = 0$.

Plate 32 (45)

C_H = 2 Dense patches of Cirrus

The patches of Cirrus look like tufts of hair and have a silky appearance. They are thick enough to have dark shadows at their bases. The long cloud across the middle of the picture is like Altocumulus with towers (C_M = 8), but here the base is not flat and the cloud is smooth and silky.

C_L = 0, C_M = 0.

Plate 33 (46)

C_H = 3 Dense Cirrus in the form of an anvil

The large patch of Cirrus and a smaller one to the right are clouds remaining from the top of a Cumulonimbus. The hairlike tufts of a Cirrus are clearly seen at the top.
Some small but fairly high Cumulus are seen above the horizon.

C_L = 2, C_M = 0.

Plate 34 (49)

C_H = 4 Cirrus with hooks and tufts entering the sky

Hooks are seen on most of the streaks of Cirrus tufts and in the left part of the figure. Such nearly parallel streaks of Cirrus often come before a storm.

C_L = 0, C_M = 0.

Plate 35 (51)

C_H = 5 Cirrostratus entering the sky, but still not up to 45°

In the upper half of the picture, the Cirrus clouds are thin white patches or tufts. The Cirrus below is joined to form a thin white sheet that is moving across the sky.

C_L = 2, C_M = 0. Cumulus are seen just to the left of the chimneys.

Plate 36 (52)

C_H = 6 Cirrostratus increasing and extending higher than 45 degrees above the horizon

At the top of the picture, long fingers of hairlike cloud extend ahead of the sheet of Cirrostratus that has reached more than 45 degrees above the horizon.

C_L = 2, C_M = 0. There are many Cumulus near the horizon.

Plate 37 (53)

$C_H = 7$ Veil of Cirrostratus

The blue sky appears to be covered by a white veil. In a wide circle around the sun, a halo forms a ring of beautiful colours. The existence of such a halo around the sun or the moon is a characteristic feature of Cirrostratus.

$C_L = 0$, $C_M = 0$.

Plate 38 (54)

$C_H = 8$ Cirrostratus not changing in amount

Bands of Cirrus lie nearly parallel across the sky, but towards the horizon, the cloud cover is a continuous sheet of Cirrostratus that does not show any clear features.

$C_L = 0$, $C_M = 0$.

Plate 39 (56)

$C_H = 9$ Cirrocumulus

This is a typical Cirrocumulus with a very fine pattern of ripples in rows.

$C_L = 0$, $C_M = 0$.

Plate 40 (57)

$C_H = 9$ Cirrocumulus as the most predominant cloud

The cloud layer has typical features of Cirrocumulus. There are areas of tufts, of fine ripples, and near the centre a large white patch.

$C_L = 0$, $C_M = 0$.

PART B

DRAFT TEXT TO A CHAPTER ON OBSERVATION OF CLOUDS

1. Introduction

The observation of clouds should begin with the identification of all the cloud types present. This should be followed by an estimation of the cloud amounts and if possible, measurement of the height of the cloud base.

In order to obtain a correct identification of clouds, it is desirable that the observer should maintain, as far as practicable, a more or less

continuous "picture" in his mind of the cloud structure in the sky and its development. When a ship is on the high sea, the deck officer on watch on the bridge of the ship is usually in a good position to do this, in so far as his normal duties permit. He is thus often able to identify a "difficult" cloud by recalling the recent history of that cloud, in the course of which it may have passed through a more easily recognizable phase.

Furthermore, many of the specifications of the C_L, C_M and C_H codes are based on the assumption that the observer has watched the evolution of the sky. Unless he has done so, he is often unable, for example, to differentiate correctly between $C_L = 4$ and $C_L = 5$.

A more or less continuous watch on the sky is also very helpful when clouds occur in superimposed layers. The relative movement may reveal clouds previously hidden, thereby enabling the observer to obtain some idea of their amount and their height.

During daytime, when actually observing the clouds, it is advisable for the observer to use spectacles with properly oriented polarizing glasses or with red, or dark-yellow, curved glasses. The spectacles should preferably be fitted with opaque side wings. Alternatively, clouds may be observed by reflection in a black mirror. A sheet of glass - 10" x 6" is a convenient size - painted black on one side, works admirably.

2. Identification of clouds

The observation of a cloud involves :

(a) Its identification as one of the basic types;

(b) An estimation of the height of its base expressed in tens or hundreds of metres, or hundreds, or thousands of feet, above the point of observation;

(c) An estimation of its amount expressed as eighths of the sky covered.

The fundamental distinction in structure, which has great significance for forecasting, is between "layer" or "sheet" clouds, and "heap" clouds, i.e. clouds with vertical development. An example of the latter are Cumulus, sometimes known as the "wool pack" or "cauliflower" cloud, and Cumulonimbus, the "thunder" or "anvil" cloud. In the further classification of sheet or layer clouds, height is taken into account, but the classification is not strictly one of height, so much as of appearance and knowledge of the origin of the cloud. The main classification is as follows :

Sheet clouds			Approximate height of base
High	Cirrus	(Ci)	Polar regions : above 3 km (10,000 ft)
	Cirrocumulus	(Cc)	Temperate regions : above 5 km (16,500 ft)
	Cirrostratus	(Cs)	Tropical regions : above 6 km (20,000 ft)

Middle	Altocumulus	(Ac)	Polar regions : 2-4 km (6,500-13,000 ft)
	Altostratus	(As)	Temperate regions : 2-7 km (6,500-23,000 ft)
	Nimbostratus	(Ns)	Tropical regions : 2-8 km (6,500-25,000 ft)
Low	Stratus	(St)	Below 2 km (6,500 ft)
	Stratocumulus	(Sc)	

Heap clouds (with vertical development)

Cumulus	(Cu)	Below 2 km (6,500 ft)
Cumulonimbus	(Cb)	

Precipitation also provides a useful clue concerning the identity of the cloud type present.

Thus :

Continuous precipitation in the form of rain, snow, or ice pellets originates from Altostratus or Nimbostratus;

Drizzle, ice prisms and snow grains from Stratus;

Showers of rain, snow and hail from Cumulus or Cumulonimbus;

Thunder and lightning from Cumulonimbus

3. Estimation of cloud height

It is difficult to estimate the height of middle or high clouds without a great deal of practice. The apparent size of the cloud elements is often an indication of height. For example, when the individual cloudlets of an Altocumulus layer appear large, it is probable that the height is near the lower limit of the middle cloud band, whereas a layer whose clouds appear small is probably nearer the upper limit. Layers having the appearance of Altocumulus with large individual elements are often found at heights between 1,800 m (6,000 ft) and 3,000 m (10,000 ft). The estimation of the height of the stratified cloud, e.g., Altostratus or Nimbostratus, is particularly difficult. The lack of pronounced structure makes it easy to gain a false impression of height. Valuable experience can be gained on occasions when the observer knows that his ship is steaming towards a depression, by watching the gradual lowering of the cloud base. The observer's impressions of the appearance of the sky in the successive stages of lowering will assist his judgement on future occasions. It is only by such experience that an observer can distinguish between a layer of Nimbostratus in the lower middle band and a similar layer at, perhaps, only 600 - 900 m (2,000 - 3,000 ft).

Care must be taken before using the apparent speed of a cloud as an indication of its height. This apparent speed depends not only on the velocity

of the wind at cloud level, but also on the course and speed of the ship itself. A great apparent speed with light or moderate winds and in a cross direction to the course of the ship suggests a lower cloud base than small apparent speeds with strong surface winds.

The estimation of cloud height at night is not easy because of the difficulty of recognizing the various cloud types. On land, the difficulty has been overcome by the use of the "ceiling light projector" or cloud searchlight, which permits the accurate measurement of cloud height during darkness.

4. Total cloud cover and cloud amount

The total cloud cover is the fraction of the celestial dome covered by all clouds visible.

The term cloud amount, formerly called "partial cloudiness", in reference to certain clouds or certain combinations of clouds is the fraction of the sky covered by those clouds or that combinations of clouds.

In making the observation, it is necessary to stand in a position affording an uninterrupted view of the whole sky. To make an estimate for the whole sky at once requires practice and is rather difficult at first. It is convenient to imagine the sky divided into quadrants by two arcs drawn at right angles through the zenith. Each quadrant represents two-eights of the total sky. If we choose the most appropriate of the figures :

0 = clear or almost clear of cloud
1 = about half covered
2 = completely or almost completely covered with cloud

for each separate quadrant, the total amount of cloud for the whole sky is obtained simply by adding the amounts in the separate quadrants.

The estimation of cloud amounts may be difficult if some of the clouds present are only partly visible or temporarily completely concealed. This is often the case when the clouds occur in superposed patches or layers. The observer may then obtain a sufficiently reliable estimate of the cloud amount by observing the sky over a period of time, as clouds previously hidden by other clouds may, owing to their relative movement, become visible. When clouds occur in superposition, the sum of the different cloud amounts may of course exceed the total cloud cover.

It should be noted that, owing to the effect of perspective, gaps existing between clouds near the horizon may not be visible to the observer. Only gaps which are visible from the observer's position should be taken into account in estimating cloud cover or cloud amounts.

When the celestial dome is partially hidden by haze, fog or smoke, the total cloud cover and the cloud amounts should be estimated from the unhidden fraction. When a part of the celestial dome is veiled by precipitation,

the part should be considered as covered by the cloud which produces the precipitation.

5. Night observations

At night, the sky should be examined from a dark place, well away from lights, especially when the atmosphere is hazy. The observer should not attempt to make cloud observations immediately after leaving a brightly lit place; time must be allowed for the eyes to become adapted to darkness.

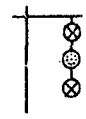
On nights when the moon is more than one-quarter full, it should be possible to identify clouds and to determine the total cloud cover and the amounts of different types almost as well as in daylight. When the moon is less than one-quarter full, there may be difficulty in identifying clouds at large angular distances from it, though their presence and approximate amount may be deduced from the blotting out of stars. The difficulties are of course substantially increased if there is no moon at all, in which case only the total cloud cover can be determined. The observer should supplement his direct observation of the sky by noting the occurrence or non-occurrence of rain and snow (Nimbostratus giving continual precipitation, Cumulonimbus giving showers), drizzle (Stratus), hail, thunder and lightning (Cumulonimbus). In the absence of such assistance it is difficult to differentiate between low, middle and high clouds and reliable observation depends upon the degree of illumination present in the sky and the experience of the observer.

In connexion with the estimation of total cloud cover arrived at from the blotting out of stars, etc., it should be borne in mind that the brighter planets and first magnitude stars are visible through thin veils of Cirrus, Cirrostratus and Cirrocumulus, and that stars near the horizon may be blotted out by haze alone.

ANNEX VII

Annex to Recommendation 19 (CMM-III)

REVISED INTERNATIONAL SYSTEM OF VISUAL STORM WARNING SIGNALS

Day Signals	Description of wind force	Night Signals*)	Remarks
●	Near gale any direction		This signal applies to wind of force 7 Beaufort (28-33 knots) (or force 6 (22-27 knots) if local circumstances - e.g. fishing activities etc. - require such a lower limit)
▲	Gale or storm commencing in the NW quadrant		The cones apply to wind of force 8 Beaufort (34-40 knots) or more (or force 7 (28-33 knots) if local circumstances necessitate the indication of wind direction)
▼	Gale or storm commencing in the SW quadrant		
▲▲	Gale or storm commencing in the NE quadrant		
▼▼	Gale or storm commencing in the SE quadrant		
▬	Wind is expected to veer (clockwise change in direction)		Flags may be of any suitable colour
▬	Wind is expected to back (counter clockwise) change in direction)		
✚	Hurricane (or local synonym) with wind of force 12 Beaufort (64 kts and above) from any direction		

N O T E S :

(1) More than one day signal may be hoisted simultaneously if desired, e.g. :

(a) To indicate a gale commencing in the SW quadrant and veering (in this case the original direction is indicated by the cones);

(b) To indicate the direction of an expected near gale (in this case the ball is hoisted together with the appropriate cones);

(2) Additional signals may be used to meet local requirements, provided their appearance and specifications are distinct from those of the international signals.

*) Legend : white ○ red ⊗ green ◍

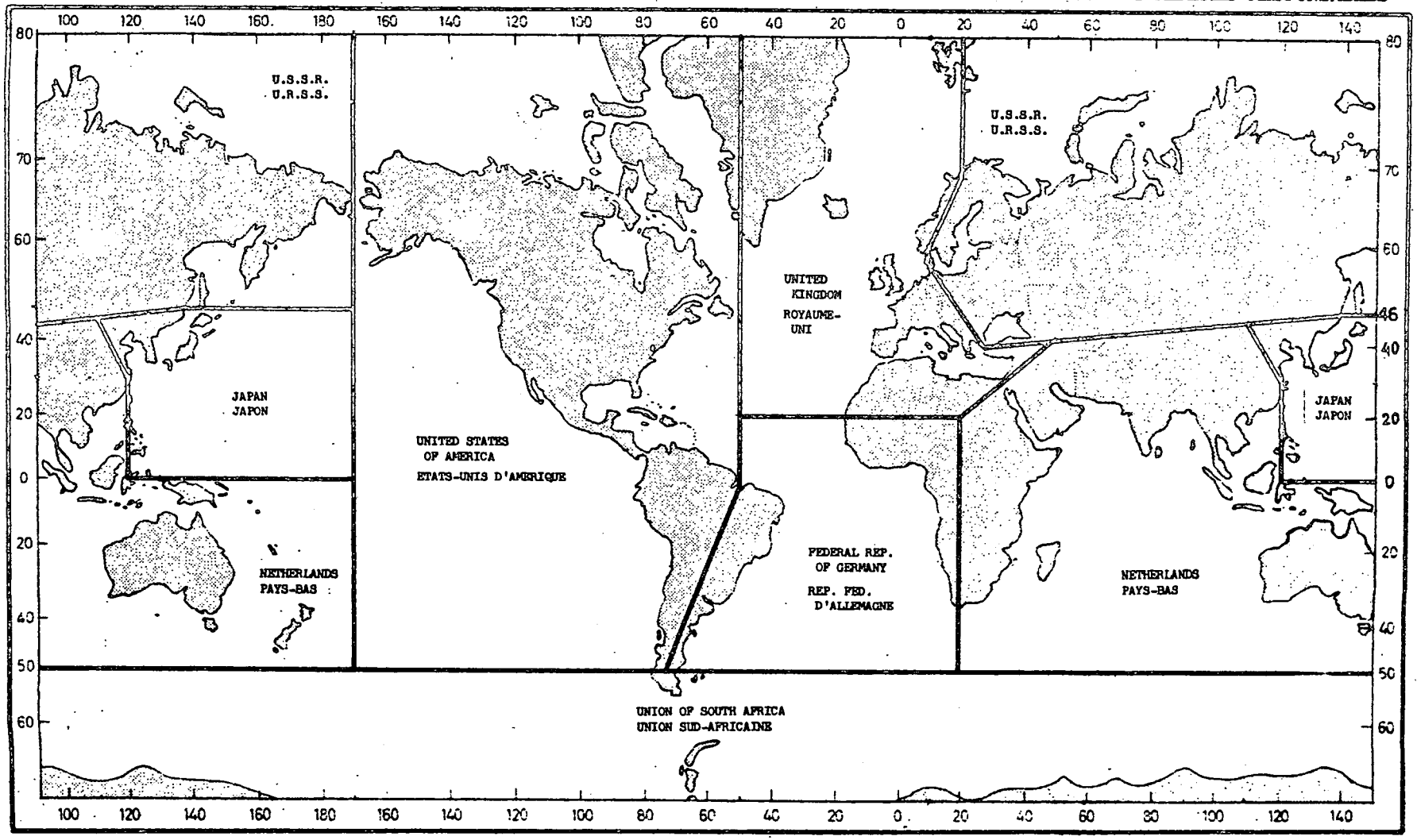
A N N E X VIII / A N N E X E VIII

Annex to Recommendation 22 (CMM-III) / Annexe à la Recommandation 22 (CMM-III)

PART A / PARTIE A

AREAS OF RESPONSIBILITY AND RESPONSIBLE MEMBERS

ZONES DE RESPONSABILITE ET MEMBRES RESPONSABLES



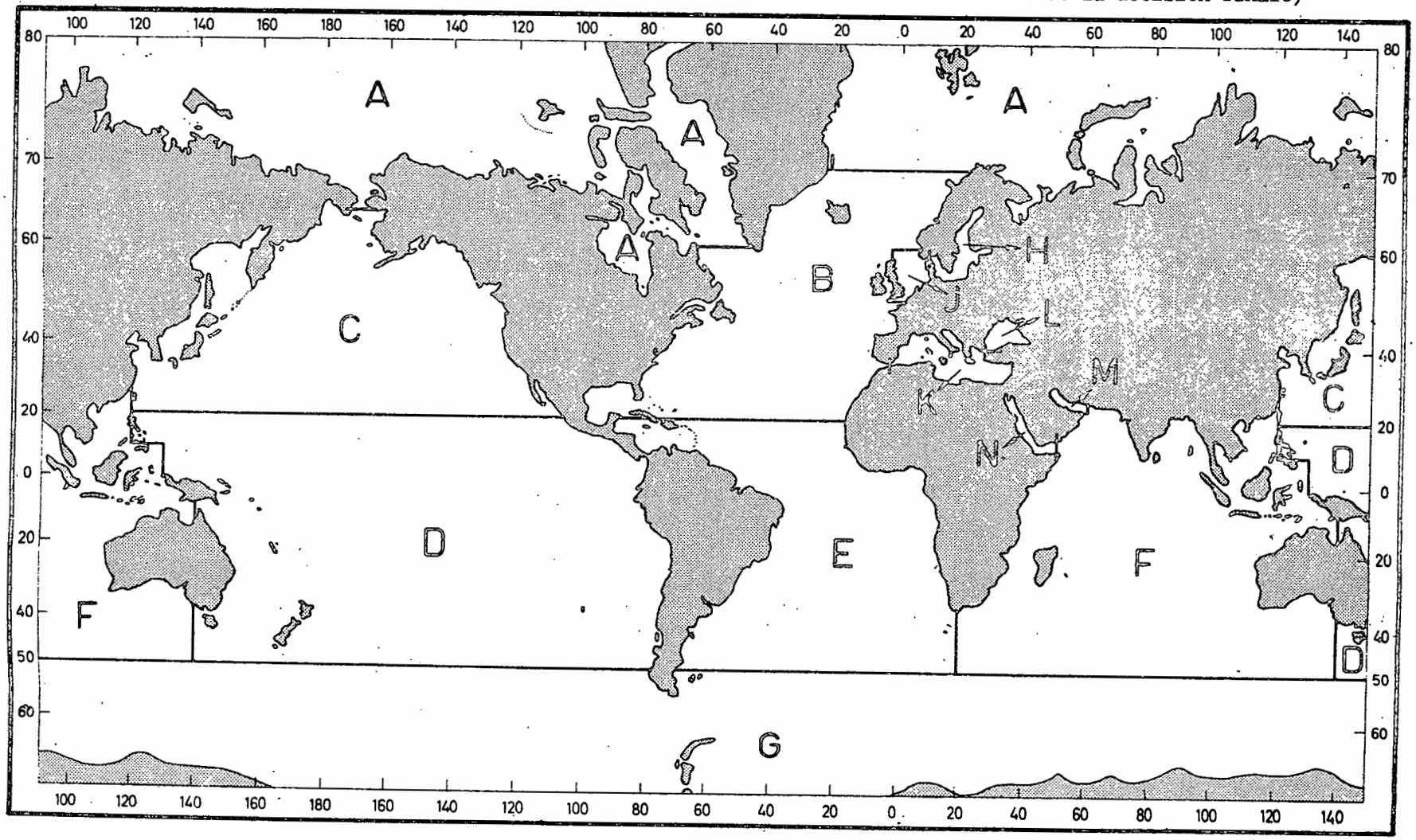
PART B / PARTIE B

AREAS OF RESPONSIBILITY

(Map to be used as a basis for discussion for final decision)

ZONES DE RESPONSABILITE

(Carte à utiliser comme base de discussion lors de la décision finale)



PART C

LAY-OUT OF MARINE SECTION OF THE WORLD CLIMATIC ATLAS

Composition

1. The marine section is composed of a number of volumes each dealing with one of the areas of responsibility in which the oceans have been divided. The volumes are as follows :

Volume A	Arctic Ocean
Volume B	North Atlantic Ocean
Volume C	North Pacific Ocean
Volume D	South Pacific Ocean
Volume E	South Atlantic Ocean
Volume F	Indian Ocean
Volume G	Antarctic Ocean
Volume H	Baltic
Volume J	North Sea
Volume K	Mediterranean
Volume L	Black Sea
Volume M	Persian Gulf
Volume N	Red Sea

Projection

2. In accordance with Technical Regulation 8.6.1.2, Mercator's projection should be employed with the exception of Volumes A and G for which the stereographic projection should be used.

Scales

3. The scale (Mercator at latitude 22°30', stereographic at 90°) of the different charts should be as follows :

(a) Volumes A - G included

Charts 1, 13 and 14	1 : 20,000,000
Charts 15 - 20 included	1 : 80,000,000
The remaining charts	1 : 40,000,000

(b) Volumes H - N included

Charts 1, 13 and 14	1 : 10,000,000
Charts 15 - 20 included	1 : 40,000,000
The remaining charts	1 : 20,000,000

Dimensions of the volumes and disposition of the charts

4. The dimensions of all volumes should be 75 cm high and 50 cm wide.

5. The number of charts on each page should be chosen in such a manner that a most economical use of the available space is made.

6. The charts on the scale 1 : 20,000,000, in the Volumes B - F included, should be placed on two pages facing one another.

7. The area to be depicted on the chart of Volume A should be such that the Hudson Bay and the White Sea are included.

Dimensions of the squares

8. The numerical value should be given :
in Volumes A and G for squares measuring two degrees of latitude and

5	degrees of longitude	up to	70°	latitude
10	degrees of longitude	from 70°	- 80°	latitude
20	degrees of longitude	from 80°	- 86°	latitude
40	degrees of longitude	from 86°	- 88°	latitude
360	degrees of longitude	from 88°	- 90°	latitude

in Volumes B - F included for each two-degree square;
in Volumes H - N included for each one-degree square.

9. The standard vector deviation ellipses of the wind, in the Volumes A - G included, should generally be given for each five-degree square.

Exceptions may be made :

(a) In areas where the number of observations is insufficient;

(b) In high-latitude areas, where the dimension of a degree of longitude is much smaller than at lower latitudes;

(c) In coastal areas.

However, the squares should not cover more than five degrees of latitude.

In the Volumes H - N included, the standard vector deviation ellipses of the wind should generally be given for each two-degree square, with exceptions as indicated above.

The dimensions of the squares for the standard vector deviation ellipses of the currents should generally be based on the same principles, but they may be altered incidentally, when circumstances make this desirable.

10. The selected areas should as far as possible correspond with the areas for which climatological summaries have been or are to be published.

Text

11. The text should be printed in all official languages of the Organization.

12. Besides the explanations of the different charts and the sources, numbers and periods of observations, the text should include as far as applicable:

(a) Tables or diagrams of semi-diurnal variation of air pressure for each month for selected areas in the tropics only;

(b) Tables of frequency of the occurrence of tropical cyclones for each month;

(c) More detailed data obtained from fixed ship stations. This should include the elements enumerated in Part D of this annex;

(d) More detailed data obtained within selected areas. This should include, as far as possible, besides the elements enumerated in Part D, also the number of days of occurrence of these elements;

(e) In so far as possible, diagrams with isopleths of the different elements along the principal shipping routes (see attachment to this part of the annex);

(f) In so far as possible, representation of climatic trends of the different elements observed at fixed ship stations and in selected areas.

Charts

13. The marine section should contain for each month charts with the following data :

Chart 1

(a) Standard vector deviation ellipses of 25%, 50% and 75% probability of the wind with the number of observations;

(b) Percentage frequency of wind speeds 0 - 4, 5 - 9, 10 - 19, 20 - 29 knots, etc., from all directions with each standard vector deviation ellipse;

(c) Isolines of percentage frequency of occurrence of winds of Beaufort 6 and greater;

(d) Isolines of percentage frequency of occurrence of winds of Beaufort 8 and greater.

Chart 2

(a) Numerical values of mean air pressure with the number of observations;

(b) Isobars at 2 mb intervals;

(c) Typical tracks of tropical cyclones;

(d) Primary tracks of extra-tropical cyclones.

Chart 3

(a) Cumulative frequency curves of air pressure for fixed ship stations and selected areas;

(b) Isolines of percentage frequency of occurrence of total cloud amounts 0, 1 or 2 oktas;

(c) Isolines of percentage frequency of occurrence of total cloud amounts 6, 7 or 8 oktas.

Chart 4

(a) Numerical values of mean air temperature with the number of observations;

(b) Isotherms of mean air temperature at 1°C intervals, with thicker isotherms at 5°C intervals;

(c) Isolines of standard deviation of single observations of air temperature.

Chart 5

(a) Numerical values of mean sea surface temperature with the number of observations;

(b) Isotherms of mean sea surface temperature at 1°C intervals with thicker isotherms at 5°C intervals;

(c) Isolines of standard deviation of single observations of sea surface temperature;

(d) Minimum, average and maximum limits of ice cover. Ice cover should include fast ice as well as very close pack ice which prevents the navigation of unreinforced vessels.

Chart 6

(a) Cumulative frequency curves of air-sea surface temperature difference for fixed ship stations and selected areas;

(b) Isolines of the mean difference of air-sea surface temperature at 1°C intervals.

Chart 7

(a) Numerical values of mean dew-point temperature with the number of observations;

(b) Isotherms of mean dew-point temperature at 1°C intervals with thicker isotherms at 5°C intervals.

Chart 8

(a) Cumulative frequency curves of dew-point temperature for fixed ship stations and selected areas;

(b) Isolines of percentage frequency of occurrence of thunderstorms (ww = 95-99 included).

Chart 9

(a) Numerical values of percentage frequency of occurrence of precipitation with the number of observations (ww = 50-99 included);

(b) Isolines of percentage frequency of occurrence of precipitation.

Chart 10

(a) Numerical values of percentage frequency of occurrence of visibility less than 1 km (VV = 90-93 included) with the number of observations;

(b) Isolines of percentage frequency of occurrence of visibility less than 1 km;

(c) Isolines of percentage frequency of occurrence of good visibility (VV = 97-99 included).

Chart 11

(a) Roses depicting the frequency distribution of wave height and direction for fixed ship stations and selected areas;

(b) Isolines of median wave height in metres.

Chart 12

Cumulative percentage frequency of occurrence of all wave periods from all directions for fixed ship stations and selected areas for the following ranges of wave height :

(i)	0	(vii)	5, 5 1/2 m
(ii)	1/2 m	(viii)	6, 6 1/2 m
(iii)	1, 1 1/2 m	(ix)	7, 7 1/2 m
(iv)	2, 2 1/2 m	(x)	8, 8 1/2 m
(v)	3, 3 1/2 m	(xi)	9, 9 1/2 m
(vi)	4, 4 1/2 m	(xii)	$\geqslant$ 10 m

14. The marine section should contain for each quarter of a year(Dec., Jan., Febr., etc.) :

Chart 13

Standard vector deviation ellipses of 25%, 50% and 75% probability of surface currents, with the number of observations.

15. The marine section should contain for each year charts with the following data :

Chart 14

(a) Standard vector deviation ellipses of 25%, 50% and 75% probability of the wind, with the number of observations;

(b) Percentage frequency of wind speeds 0-4, 5-9, 10-19, 20-29 knots, etc., from all directions, with each standard vector deviation ellipse;

(c) Isobars at 2 mb intervals.

Chart 15

Isolines of percentage frequency of occurrence of total cloud amounts 0, 1 or 2 oktas.

Chart 16

Isolines of percentage frequency of occurrence of total cloud amounts 6, 7 or 8 oktas.

Chart 17

Isotherms of mean air temperature at 1°C intervals, with thicker isotherms at 5°C intervals.

Chart 18

Isotherms of mean sea surface temperature at 1°C intervals with thicker isotherms at 5°C intervals.

Chart 19

Isolines of the mean difference of air-sea surface temperature at 1°C intervals.

Chart 20

Isotherms of mean dew-point temperature at 1°C intervals with thicker isotherms at 5°C intervals.

16. Charts with combinations of weather elements should be included, according to specifications to be developed.

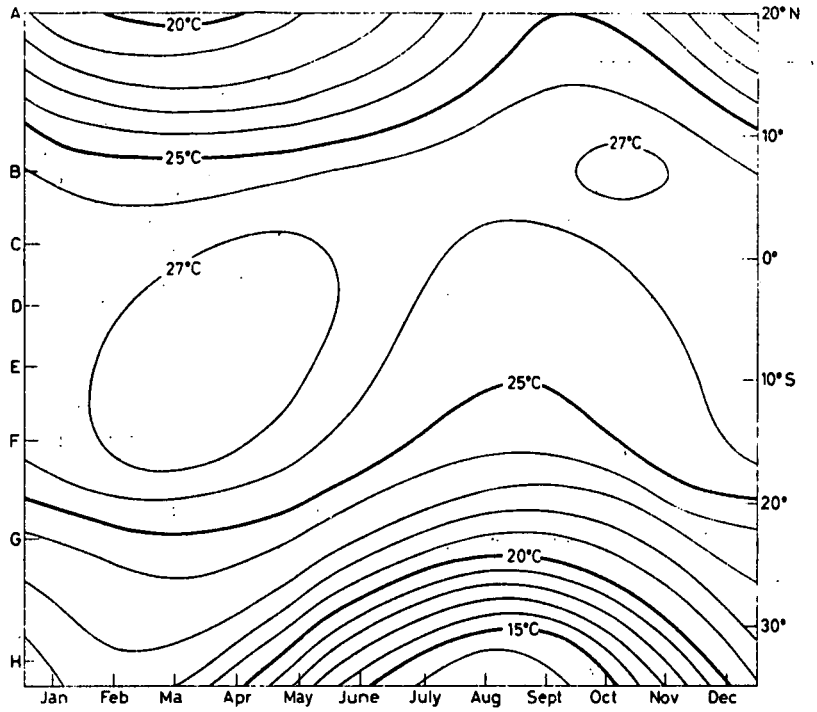
17. Each Responsible Member should decide in consultation with the Secretary-General of WMO for which shipping routes diagrams with isopleths, as indicated on specimen given in the attachment to this part of the annex, should be prepared.

ANNEX VIII

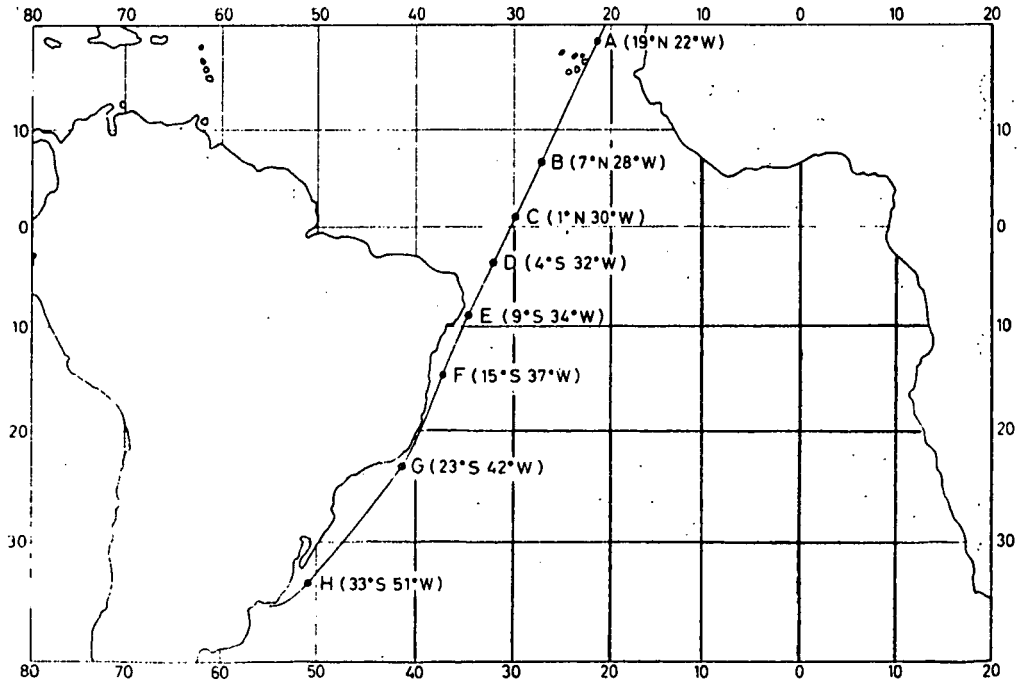
A T T A C H M E N T

SPECIMEN OF ISOPLETHS

Isopleths of mean monthly sea surface temperature
along the Europe - South America sea route
from data at the locations shown in the next figure



Locations A-H of centres of selected representative areas
along the Europe - South America sea route



PART D

DATA TO BE INCLUDED IN THE CLIMATOLOGICAL SUMMARIES

A. Fixed ship stations

(1) Dry-bulb temperature

(a) Monthly means;
(b) Mean for the year, computed from monthly means;
(c) Extremes with dates and hours of occurrence and 5, 25, 50, 75 and 95 percentile values for each month;
(d) Number of observations.

(2) Dew-point temperature

(a) Monthly means;
(b) Mean for the year, computed from monthly means;
(c) Extremes with dates and hours of occurrence and 5, 25, 50, 75 and 95 percentile values for each month;
(d) Number of observations.

(3) Sea temperature

(a) Monthly means;
(b) Mean for the year, computed from monthly means;
(c) Extremes with dates and hours of occurrence and 5, 25, 50, 75 and 95 percentile values for each month;
(d) Number of observations.

(4) Air-sea temperature difference

(a) Monthly means;
(b) Mean for the year, computed from monthly means;
(c) Extremes with dates and hours of occurrence and 5, 25, 50, 75 and 95 percentile values for each month;
(d) Number of observations.

(5) Visibility

(a) Percentage frequency for each month for the following ranges :

(i) less than 1 km
(ii) 1 km or more, but less than 4 km
(iii) 4 km or more, but less than 20 km
(iv) 20 km or more;

(b) Mean percentage for the year for the same ranges;

(c) Number of days for each month and for the year with visibility less than 1 km;
(d) Number of observations.

(6) Weather

(a) Number of days for each month with precipitation;
(b) Number of days for each month with ww = 50-59;
(c) Number of days for each month with ww = 60-69;
(d) Number of days for each month with ww = 70-79;
(e) Number of days for each month with ww = 80-90;
(f) Number of days for each month with ww = 91-94;
(g) Number of days for each month with ww = 95-99;
(h) Number of days for each month with gales, storms and hurricane force winds;
(j) Number of 24-hour observing days for items (a) to (h);
(k) Total number of days annually for each item (a) to (h);
(l) Percentage frequency of occurrence of precipitation at the station at the time of observation;
(m) Mean for the year for item (l);
(n) Number of observations for item (l);
(o) If measured, monthly and annual amount of precipitation;
(p) Monthly percentage frequency of occurrence of each individual ww code figure from 50-99.

(7) Wind direction and speed

(a) Percentage frequencies for each month for the following ranges of speed :

(i) 0 to 4 knots
(ii) 5 to 9 knots
(iii) 10 to 19 knots
(iv) 20 to 29 knots, etc.,

and for direction by sectors of 30 degrees, true North bisecting for the first sector;
(b) Monthly total of observations for each sector irrespective of speed;
(c) Monthly mean percentage frequency of occurrence of observations for each range of speed irrespective of direction;
(d) Mean monthly wind speed in knots, derived from all wind speed observations;
(e) Mean wind speed for the year, computed from monthly means;
(f) Number of observations corresponding to item (d);
(g) Highest wind speed for each month and for the year, with dates of occurrence.

(8) Pressure

(a) Monthly means for each hour of observation;
(b) Monthly means for all hours of observation;
(c) Mean for the year, computed from monthly means;
(d) Number of observations;
(e) Extremes with dates and hours of occurrence and 5, 25, 50, 75 and 95 percentile values for each month.

(9) Cloud

(a) Monthly mean total amount for each hour of observation;
(b) Monthly mean for all hours of observation;
(c) Monthly mean for all hours of observation in respect of low cloud only;
(d) Percentage frequency of observations in the following ranges of total cloud amount (all hours of observation combined) :

(i) two oktas or less
(ii) three to five oktas inclusive
(iii) six oktas or more;

(e) As item (d), but for low cloud only;
(f) Percentage frequency of height of low cloud for each month, subdivided into ranges corresponding to WMO Code 1600;
(g) Mean for the year for items (a) and (f) incl., computed from monthly means;
(h) Number of observations.

(10) Wind waves

(a) Monthly percentage frequencies of occurrence of observations for the following ranges of height :

(i)	0	(vii)	5, 5 1/2 m
(ii)	1/2 m	(viii)	6, 6 1/2 m
(iii)	1, 1 1/2 m	(ix)	7, 7 1/2 m
(iv)	2, 2 1/2 m	(x)	8, 8 1/2 m
(v)	3, 3 1/2 m	(xi)	9, 9 1/2 m
(vi)	4, 4 1/2 m	(xii)	$\geq$10 m

and for direction by sectors of 30 degrees, true North bisecting the first sector;
(b) Monthly percentage frequencies of occurrence of observations for the ranges of height given in (a) and for periods corresponding to WMO Code 3155;
(c) Monthly percentage frequency of observations for each sector irrespective of height;
(d) Monthly percentage frequency of observations for each range of periods irrespective of height;

(e) Monthly percentage frequency of observations for each range of height irrespective of direction and period;
(f) Number of observations;
(g) Annual percentage frequency of observations for each item (a) to (e) included, and annual total number of observations.

(11) Swell waves

(a) Monthly percentage frequencies of occurrence of observations for the following ranges of height :

(i)	0	(vii)	5, 5 1/2 m
(ii)	1/2 m	(viii)	6, 6 1/2 m
(iii)	1, 1 1/2 m	(ix)	7, 7 1/2 m
(iv)	2, 2 1/2 m	(x)	8, 8 1/2 m
(v)	3, 3 1/2 m	(xi)	9, 9 1/2 m
(vi)	4, 4 1/2 m	(xii)	$\geqslant$ 10 m

and for direction by sectors of 30 degrees, true North bisecting the first sector;
(b) Monthly percentage frequencies of occurrence of observations for the ranges of height given in (a) and for periods corresponding to WMO Code 3155;
(c) Monthly percentage frequency of observations for each sector irrespective of height;
(d) Monthly percentage frequency of observations for each range of periods irrespective of height;
(e) Monthly percentage frequency of observations for each range of height irrespective of direction and period;
(f) Number of observations;
(g) Annual percentage frequency of observations for each item (a) to (e) included, and annual total number of observations.

B. Selected representative areas

(1) Dry-bulb temperature

(a) Monthly means;
(b) Mean for the year, computed from monthly means;
(c) 5, 25, 50, 75 and 95 percentile values for each month;
(d) Number of observations.

(2) Dew-point temperature

(a) Monthly means;
(b) Mean for the year, computed from monthly means;
(c) 5, 25, 50, 75 and 95 percentile values for each month;
(d) Number of observations.

(3) Sea temperature

(a) Monthly means;
(b) Mean for the year, computed from monthly means;
(c) 5, 25, 50, 75 and 95 percentile values for each month;
(d) Number of observations.

(4) Air-sea temperature differences

(a) Monthly means;
(b) Mean for the year, computed from monthly means;
(c) 5, 25, 50, 75 and 95 percentile values for each month;
(d) Number of observations.

(5) Visibility

(a) Percentage frequency for each month for the following ranges :

(i) less than 1 km
(ii) 1 km or more, but less than 4 km
(iii) 4 km or more, but less than 20 km
(iv) 20 km or more;

(b) Mean percentage for the year for the same ranges;
(c) Number of observations.

(6) Weather

(a) Monthly percentage frequency of occurrence of observations with ww = 50-59;
(b) Monthly percentage frequency of occurrence of observations with ww = 60-69;
(c) Monthly percentage frequency of occurrence of observations with ww = 70-79;
(d) Monthly percentage frequency of occurrence of observations with ww = 80-90;
(e) Monthly percentage frequency of occurrence of observations with ww = 91-94;
(f) Monthly percentage frequency of occurrence of observations with ww = 95-99;
(g) Monthly percentage frequency of occurrence of observations with gales, storms or hurricane force winds;
(h) Annual percentage frequency for each item (a) to (g);
(j) Monthly percentage frequency of occurrence of precipitation at the station at the time of observation;
(k) Mean for the year for item (j)
(l) Number of observations for item (j).

(7) Wind direction and force

(a) Percentage frequency for each month for each Beaufort number 0, 1, 2, etc., and for direction by sectors of 30 degrees, true North bisecting the first sector;
(b) Monthly total of observations for each sector irrespective of wind force;
(c) Monthly mean percentage frequency of occurrence of observations for each Beaufort number irrespective of direction;
(d) Mean monthly wind force according to the Beaufort scale, derived from all wind observations;
(e) Mean wind force for the year, computed from monthly means;
(f) Number of observations corresponding to item (d).

(8) Pressure

(a) Monthly means for all hours of observation;
(b) Mean for the year, computed from monthly means;
(c) 5, 25, 50, 75 and 95 percentile values for each month;
(d) Number of observations.

(9) Cloud

(a) Monthly mean for all observations;
(b) Monthly mean for all hours of observation in respect of low cloud only;
(c) Monthly percentage frequency of observations in the following ranges of total cloud amount (all hours of observation combined):

(i) two oktas or less
(ii) three to five oktas inclusive
(iii) six oktas or more;

(d) Mean for the year for items (a) to (c) included, computed from monthly means;
(e) Number of observations.

(10) Wind waves

(a) Monthly percentage frequencies of occurrence of observations for the following ranges of height :

(i)	0	(vii)	5, 5 1/2 m
(ii)	1/2 m	(viii)	6, 6 1/2 m
(iii)	1, 1 1/2 m	(ix)	7, 7 1/2 m
(iv)	2, 2 1/2 m	(x)	8, 8 1/2 m
(v)	3, 3 1/2 m	(xi)	9, 9 1/2 m
(vi)	4, 4 1/2 m	(xii)	$\geqslant$ 10 m

and for direction by sectors of 30 degrees, true North bisecting the first sector;

(b) Monthly percentage frequencies of occurrence of observations for the ranges of height given in (a) and for periods corresponding to WMO code 3155;
(c) Monthly percentage frequency of observations for each sector irrespective of height;
(d) Monthly percentage frequency of observations for each range of periods irrespective of height;
(e) Monthly percentage frequency of observations for each range of height irrespective of direction and period;
(f) Number of observations;
(g) Annual percentage frequency of observations for each item (a) to (e) included, and annual total number of observations.

(11) Swell waves

(a) Monthly percentage frequencies of occurrence of observations for the following ranges of height :

(i)	0	(vii)	5, 5 1/2 m
(ii)	1/2 m	(viii)	6, 6 1/2 m
(iii)	1, 1 1/2 m	(ix)	7, 7 1/2 m
(iv)	2, 2 1/2 m	(x)	8, 8 1/2 m
(v)	3, 3 1/2 m	(xi)	9, 9 1/2 m
(vi)	4, 4 1/2 m	(xii)	$\geq$10 m

and for direction by sectors of 30 degrees, true North bisecting the first sector;
(b) Monthly percentage frequencies of occurrence of observations for the ranges of height given in (a) and for periods corresponding to WMO code 3155;
(c) Monthly percentage frequency of observations for each sector irrespective of height;
(d) Monthly percentage frequency of observations for each range of periods irrespective of height;
(e) Monthly percentage frequency of observations for each range of height irrespective of direction and period;
(f) Number of observations;
(g) Annual percentage frequency of observations for each item (a) to (e) included, and annual total number of observations.

A N N E X IX

Annex to Recommendation 23 (CMM-III)

PART A

LAY-OUT FOR AN INTERNATIONAL MARITIME METEOROLOGICAL PUNCH-CARD

Column	Element	Punching procedures
1	Temperature indicator	1 = Celsius, 2 = Fahrenheit
2- 3	Year GMT	Last 2 digits
4- 5	Month GMT	01-12 January to December
6- 7	Day GMT	01-31
8	Octant of the Globe, Q	WMO Code 3300
9-11	Latitude, $L_aL_aL_a$	Tenths of degrees, WMO specifications
12-14	Longitude $L_oL_oL_o$	Tenths of degrees, WMO specifications
15-16	Time of observation, GG	Nearest whole hour GMT, WMO specifications
17	Cloud amount, N	Oktas, WMO Code 2700
18-19	True wind direction, dd	Tens of degrees, WMO Code 0877. If the data for wind direction and speed have been measured an x overpunch is given in column 18
20-21	Wind speed, ff	Tens and units of knots; hundreds omitted; values in excess of 99 knots to be indicated by an x overpunch in column 20
22-23	Visibility, VV	WMO Code 4377
24-25	Present weather, ww	WMO Code 4677
26	Past weather, W	WMO Code 4500
27-31	Air pressure	Tenths of millibars
32-34	Air temperature	Tenths of degrees Celsius or Fahrenheit, as indicated by column 1. Negative temperatures to be indicated by an x overpunch in column 32
35-37	Wet bulb temperature	Tenths of degrees Celsius or Fahrenheit, as indicated by column 1. Negative temperatures to be indicated by an x overpunch in column 35; ice on wet bulb to be indicated by an x overpunch in column 37
38	Amount of lowest clouds, N_h	As reported for C_L or, if no C_L cloud is present, for C_M; in oktas, WMO Code 2700

Column	Element	Punching procedures
39	Type of C_L clouds	WMO Code 0513
40	Height of clouds, h	WMO Code 1600
41	Type of C_M clouds	WMO Code 0515
42	Type of C_H clouds	WMO Code 0509
43-45	Sea temperature	Tenths of degrees Celsius or Fahrenheit, as indicated by column 1. Negative temperatures to be indicated by an x overpunch in column 43
46-48	Air-sea temperature difference*	Difference air minus sea surface temperature in tenths of degrees Celsius or Fahrenheit, as indicated in column 1. Negative differences to be indicated by an x overpunch in column 46
49-50	Direction of wind waves, $d_w d_w$	Tens of degrees, WMO Code 0885
51-52	Period of wind waves	WMO Code 3155 (use column 51 when one figure is punched for P_w)
53-54	Height of wind waves	Half meter values, based on WMO Code 1555
55-56	Direction of swell waves	Tens of degrees, WMO Code 0885
57-58	Period of swell waves	WMO Code 3155 (use column 57 when one figure is punched for P_w)
59-60	Height of swell waves	Half-meter values, based on WMO Code 1555
61-62	Country which has recruited ship	Number to be assigned by WMO
63	Card indicator	0 = punched according to WMO codes, effective in year indicated in columns 2/3
64-73		Not to be punched
74-76	Dew-point temperature*	Tenths of degrees Celsius or Fahrenheit, as indicated in column 1. Negative temperatures to be indicated by an x overpunch in column 74
77	Wind force	Beaufort wind scale 0-9 values 10-12 to be punched 0-2 with an x overpunch in column 77
78-80		Not to be punched

* Should be included, if available, in tenths of degrees.

N O T E S :

(1) Members using the punch-card system for their current maritime observations will reproduce the international maritime punch-cards mechanically from their own punch-cards, punching zero in column 63

and leaving blank the spare columns 64-73, 78-80, which may be used by the responsible Members for computing purposes.

(2) When preparing for exchange of data from former years on request of the responsible Member concerned, a Member may use the columns 64-73, 78-80 for providing additional data. In this case, column 63 is punched 1, 2, 3 or 4 (see Part B) and all columns will be punched according to Annex 1 modified by Part B as far as requested by the responsible Member.

(3) When temperature and pressure are reported in whole units, the column of the tenths of these units is to be punched 0.

(4) The x's appearing in some of the above-mentioned WMO codes must not be punched.

(5) If an element is missing the columns concerned are left blank.

OVERPUNCHES

x/ = x or 11 overpunch in column specified

x/ in column 18 = measured data for wind direction and speed
x/ in column 20 = wind speed, 100 knots or more
x/ in column 32 = negative values of air temperature in °C or °F
x/ in column 35 = negative values of wet-bulb temperature in °C or °F
x/ in column 37 = ice on wet bulb
x/ in column 43 = negative values of sea surface temperature in °C
x/ in column 46 = air temperature lower than sea temperature
x/ in column 74 = negative value of dew point in °C or °F
x/ in column 77 = Beaufort wind scale, 10 or more.

PART B

SUPPLEMENTARY PUNCHING PROCEDURES FOR USE OF AN INTERNATIONAL MARITIME METEOROLOGICAL PUNCH-CARD FOR EXCHANGE OF CARDS WITH DEVIATING CODES OR ADDITIONAL DATA

Column	Element	Supplementary punching procedures
1	Temperature indicator	1 = tenths of degrees Celsius 2 = tenths of degrees Fahrenheit 3 = whole degrees Celsius (col. 34, 37, 45, 48, 76 punched 0) 4 = whole degrees Fahrenheit (col. 34, 37, 45, 48, 76 punched 0) 5 = halves of degrees Celsius 6 = halves of degrees Fahrenheit 7 = tenths of degrees Fahrenheit, but whole degrees for dew point (col. 76 punched 0)
2- 3	Year GMT	Last 2 digits; dates from the 19th century to be indicated by an x over-punch in column 2
63	Card indicator	1 = data with deviating codes or additional groups as indicated in col. 64-68; col. 78-80 left blank; 2 = data with deviating codes or additional groups as indicated in col. 64-68; ship or log number punched in col. 78-80; 3 = data with deviating codes or additional groups as indicated in col. 64-68; col. 74-80 left blank for special purposes (Indian Ocean Survey); 4 = data with deviating codes or additional groups as indicated in col. 64-67, indicator in col. 68 must be 4. Col. 52, 54, 58 and 60 must not be used for punching wave data. Col. 78-80 left blank.
64	Indicator for location	0 = Q $L_aL_aL_aL_oL_oL_o$ in col. 8-14 1 = 10° Marsden square in col. 8-10 1° unit of latitude in col. 11 1° unit of longitude in col. 12

Column	Element	Supplementary punching procedures
		1/10° unit of latitude in col. 13 1/10° unit of longitude in col. 14
		2 = ocean station vessel,* Q $L_aL_aL_aL_oL_oL_o$ in col. 8-14. An ocean station vessel occupying an ocean weather station to be indicated by an x overpunch in col. 64
		3 = ocean station vessel,* location in Marsden squares in col. 8-14. An ocean station vessel occupying an ocean weather station to be indicated by an x overpunch in col. 64
		4 = anchored, Q $L_aL_aL_aL_oL_oL_o$ in col. 8-14
		5 = anchored, location in Marsden squares in col. 8-14
65	Indicator for wind data in col. 18-21 included	dd ff 0 = 36 pts knots 1 = 32 pts knots 2 = 36 pts Beaufort 3 = 32 pts Beaufort 4 = 36 pts metres per second 5 = 32 pts metres per second
66	Indicator for VV	0 = WMO Code 4377 1 = VV = 00-89, WMO Code 1949
67	Indicator for waves	0 = WMO Codes 0885, 3155 and 1555 in col. 49-60
		1 = WMO Code 75 (1954) WMO Code 75 (Nov. 1957), code renumbered 3700 effective 1960, in col. 49-50, 53
		2 = Sea code (Douglas or Copenhagen 1929 scales) in col. 49-50, 53 Swell code (Douglas or Copenhagen 1929, Berlin 1939 scales) in col. 55-56, 59
		3 = Sea code (Paris 1919 scale) in col. 49-50, 53 Swell code (Douglas or Copenhagen 1929, Berlin 1939 scales) in col. 55-56, 59

* By "ocean station vessel" is meant a ship meteorologically equipped to occupy an ocean weather station.

Column	Element	Supplementary punching procedures
68	Indicator for use of additional groups	0 = no additional data 1 = ship's course and speed, pressure tendency and precipitation data in col. 69-77 - col. 69, D_s = ship's course (true) made good during the three hours preceding the time of observation, WMO Code 0700 - col. 70, v_s = ship's average speed made good during the three hours preceding the time of observation, WMO Code 4451 - col. 71, a = characteristic of pressure tendency during the three hours preceding the time of observation, WMO Code 0200 - col. 72-73, pp = amount of pressure tendency during the three hours preceding the time of observation, expressed in tenths of millibars. Tens of millibars are indicated by overpunches, an x overpunch in col. 72 is given for values 10.0-19.9 mb, an x overpunch in col. 73 for values 20.0-29.9 mb - col. 74-75, RR = amount of precipitation, WMO Code 3577 - col. 76-77, T_RT_R = duration of precipitation, WMO Code 4080 2 = ice data in col. 69-73 - col. 69, c_2 = description of kind of ice, WMO Code 0663 - col. 70, K = effect of the ice on navigation, WMO Code 2100 - col. 71, D_i = bearing of ice edge, WMO Code 0739 - col. 72, r = distance to ice edge from reporting ship, WMO Code 3600 - col. 73, e = orientation of ice edge, WMO Code 1000 3 = unassigned 4 = Beaufort weather notation according to note 1 in col. 52, 54, 58, 60, 74-76. Indicator in col. 63 must be 4 5 = Beaufort weather notation according to note 2 in col. 69-72

Column	Element	Supplementary punching procedures
		6 = ship's course and speed, and pressure tendency in col. 69-73 - col. 69, D_s = ship's course (true) made good during the three hours preceding the time of observation, WMO Code 0700 - col. 70, v_s = ship's average speed made good during the three hours preceding the time of observation, WMO Code 4451 - col. 71, a = characteristic of pressure tendency during the three hours preceding the time of observation, WMO Code 0200 - col. 72-73, pp = amount of pressure tendency during the three hours preceding the time of observation, expressed in tenths of millibars. Tens of millibars are indicated by overpunches, an x overpunch in col. 72 is given for values 10.0-19.9 mb, an x overpunch in col. 73 for values 20.0-29.9 mb 7 = precipitation data in col. 69-72 - col. 69-70, RR = amount of precipitation, WMO Code 3577 - col. 71-72, $t_R t_R$ = duration of precipitation, WMO Code 4080 8 = cloud data in col. 69-72 - col. 69, N_s = amount of individual cloud layer or mass, of genus (type) C, WMO Code 2700 - col. 70, C = genus (type) of cloud, WMO Code 0500 (x not to be punched) - col. 71-72, $h_s h_s$ = height of base of cloud layer or mass whose genus (type) is indicated by C, WMO Code 1577 9 = special phenomena in col. 69-72 according to regional codes, viz. : in Region I WMO Code 169 in Region II WMO Code 268 in Region III WMO Code 383 in RegionsIV and V WMO Code 483 in Region VI WMO Code 668 in Antarctica WMO Code 768

N O T E S :

(1) Beaufort weather notation (German system) according to the following code :

Column 52
0 = cloud amount $< 2/8$
1 = $2/8 <$ cloud amount $< 6/8$
2 = cloud amount $> 6/8$
3 = overcast and cloud amount $> 6/8$ combined
4 = overcast
5 = no data concerning cloudiness
6 = unassigned
7 = unassigned
8 = unassigned
9 = no data concerning the weather

Column 54
0 = fog
1 = thick fog
2 = slight mist
3 = mist
4 = abnormal visibility
5 = very abnormal visibility
6 = dust haze
7 = gloom
8 = ugly sky
9 = unassigned

Column 58
0 = drizzle
1 = thick drizzle
2 = rain
3 = heavy rain
4 = rain squalls or showers of rain
5 = heavy rain squalls or heavy showers of rain
6 = unassigned
7 = snow squalls or showers of snow
8 = heavy snow squalls or heavy showers of snow
9 = squalls of drizzle

Column 60
0 = snow
1 = heavy snow
2 = hail
3 = heavy hail
4 = snow and hail
5 = heavy snow and hail together
6 = snow and rain together
7 = heavy snow and rain together
8 = unassigned
9 = unassigned

Column 74
0 = lightning
1 = intense lightning
2 = thunder
3 = heavy thunder
4 = thunderstorm
5 = heavy thunderstorm
6 = drizzle and rain together
7 = heavy drizzle and rain together
8 = rain and hail together
9 = heavy rain and hail together

Column 75
0 = squalls
1 = heavy squalls
2 = ground fog
3 = fog in patches
4 = wet fog
5 = fog on shore
6 = solar halo
7 = solar halo complex
8 = lunar halo
9 = lunar halo complex
x or 11 = waterspout (tornado)

Column 76
0 = dew
1 = heavy dew
2 = sandstorm
3 = hoarfrost
4 = soft rime
5 = glazed frost
6 = ice, pack ice
7 = icebergs
8 = aurora
9 = mirage
x or 11 = St. Elmo's fire
r or 12 = sudden increase of wind

(2) Beaufort weather notation (British system) according to the following code (used from the 1st January 1949 to the 31st March 1953) :

Column 69
0 = no visibility observation
1 = abnormal visibility
2 = unassigned
3 = mist or haze (visibility 1-2 km)
4 = fog (visibility less than 1 km)
5 = unassigned
6 = unassigned
7 = unassigned
8 = unassigned
9 = visibility greater than 2 km

Columns 70-72	000 = no observation of weather
	1 = snow
	2 = squalls
	3 = rain
	4 = showers
	5 = drizzle
	6 = thunder
	7 = hail
	8 = lightning
	999 = none of above reported

OVERPUNCHES

x/ = x or 11 overpunch in column specified
r/ = r or 12 overpunch in column specified
x/ in column 2 = observations from 19th century
x/ in column 64 = ocean weather station
x/ in column 72 = pp = 10 mb + value punched
x/ in column 73 = pp = 20 mb + value punched
x/ in column 75 = waterspout (tornado)
x/ in column 76 = St. Elmo's fire
r/ in column 76 = sudden increase of wind

A N N E X X

Annex to Recommendation 28 (CMM-III)

PART A

PROPOSED WMO UNIFIED ICE CODE

AIRCRAFT OBSERVATIONS

ICE A $YQL_aL_aL_a$ $L_oL_oL_oGG$ gghhh $C_TC_PS_DF_PF_S$ $TT_CW_fC_fS_m$ $C_SS_2C_1C_2V$
I_BBBDD $I_WW_o11w_d$ $9G_AG_AB_BB_B$

SHIP OBSERVATIONS

ICE B $YQL_aL_aL_a$ $L_oL_oL_oGG$ $C_TC_PS_DF_PF_S$ $TT_CW_fC_fS_m$ $I_TD_SS_IL_SV$
I_BBBDD $I_WW_o11w_d$ $9G_AG_AB_BB_B$

SHORE STATION OBSERVATIONS

ICE C IIiii $C_TC_PS_DF_PF_S$ $TT_CW_fC_fS_m$ $I_TD_SS_IL_SV$ $GGG_CB_TI_D$
$9G_AG_AB_BB_B$

INDICATOR GROUP

Y	Day of week (Greenwich time)
Q	Octant of globe (Code 3300, Vol. B, WMO Publ. No. 9)
$L_aL_aL_a$	Latitude in tenths of degrees
$L_oL_oL_o$	Longitude in tenths of degrees
GG	Time in hours GMT
gg	Time in minutes GMT
hhh	True altitude of aircraft in decametres or hundreds of feet
II	Block number
iii	International index number

COMMON GROUPS

C_T - TOTAL CONCENTRATION OF ICE

0	No ice	6	7/10
1	< 1/10 - 2/10	7	8/10
2	3/10	8	9/10
3	4/10	9	10/10
4	5/10	X	Not determined, or unknown
5	6/10		

C_P - CONCENTRATION OF PREDOMINANT FORM OF ICE

0	No ice	6	7/10
1	< 1/10 - 2/10	7	8/10
2	3/10	8	9/10
3	4/10	9	10/10
4	5/10	X	Not determined, or unknown
5	6/10		

S_D - PREDOMINANT STAGE OF DEVELOPMENT

0	Ice crystals, slush or sludge	6	Young polar ice
1	Pancake ice	7	Arctic pack
2	Ice rind	8	Shelf ice or bay ice
3	Young ice	9	Ice island
4	Medium winter ice	X	Not determined, or unknown
5	Thick winter ice		

F_P - PREDOMINANT FORM OF ICE

F_S - SECONDARY FORM OF ICE

0	No form of ice	5	Medium ice floes
1	Ice crystals, slush, sludge and/or pancake ice	6	Big ice floes
2	Brash ice and/or small ice cakes	7	Vast ice floes
3	Ice cakes	8	Fast ice
4	Small ice floes	9	Ice of land origin
		X	Not determined, or unknown

T - CONSTRUCTION AND SURFACE FEATURES

0	Level ice	5	Pressure ridges of great height >3 m
1	Rafted ice	6	Ice breccia /ice mosaic
2	Hummocks of small height <3 m	7	Weathered ice
3	Hummocks of great height >3 m	8	Sastrugi
4	Pressure ridges of small height <3 m	X	Not determined, or unknown

T_C - EXTENT OF RIDGING AND HUMMOCKING

0	No ridging and hummocking	6	7/10
1	1/10 - 2/10	7	8/10
2	3/10	8	9/10
3	4/10	9	10/10
4	5/10	X	Not determined, or unknown
5	6/10		

W_f - TYPE OF OPENING IN THE ICE

0	No openings	5	Pool
1	Crack or cracks	6	Shore polynya
2	Tide crack	7	Polynya off edge of shore ice
3	Lead/lane	8	Open water
4	Shore lead	X	Not determined, or unknown

C_f - EXTENT OF FAST ICE

0	No fast ice	6	10 - 25 km
1	0 - 100 m	7	25 - 50 km
2	100 - 500 m	8	50 - 100 km
3	500 m - 2 km	9	> 100 km
4	2 - 5 km	X	Not determined, or unknown
5	5 - 10 km		

S_m - STAGE OF MELTING OF PREDOMINANT FORM

0	No melting	5	Thawing holes without puddles
1	Few puddles	6	Dried ice
2	Many puddles	7	Rotten ice
3	Many puddles with few thawing holes	8	Brash ice formed by melting
		X	Not determined, or unknown
4	Many puddles with many thawing holes		

SUPPLEMENTARY GROUPS

C_S - CONCENTRATION OF SECONDARY FORM OF ICE

C_1 - CONCENTRATION OF PREDOMINANT STAGE OF DEVELOPMENT

C_2 - CONCENTRATION OF SECONDARY STAGE OF DEVELOPMENT

0	No ice	6	7/10
1	< 1/10 - 2/10	7	8/10
2	3/10	8	9/10
3	4/10	9	10/10
4	5/10	X	Not determined,or unknown
5	6/10		

S_2 - SECONDARY STAGE OF DEVELOPMENT

0	Ice crystals, slush or sludge	5	Thick winter ice
		6	Young polar ice
1	Pancake ice	7	Arctic pack
2	Ice rind	8	Shelf ice or bay ice
3	Young ice	9	Ice island
4	Medium winter ice	X	Not determined, or unknown

V - VISIBILITY

0	< 50 m	6	4 - 10 km
1	50 - 200 m	7	10 - 20 km
2	200 - 500 m	8	20 - 50 km
3	500 -1000 m	9	> 50 km
4	1 - 2 km	X	Not determined, or unknown
5	2 - 4 km		

I_T - THICKNESS OF ICE

0	0 - 4 cm	6	61 - 90 cm
1	5 - 10 cm	7	91 - 150 cm
2	11 - 20 cm	8	151 - 250 cm
3	21 - 30 cm	9	> 250 cm
4	31 - 40 cm	X	Not determined, or unknown
5	41 - 60 cm		

D_S - DEPTH OF SNOW

0	Bare ice or trace	6	26 - 50 cm
1	2 cm	7	51 - 100 cm
2	2 - 5 cm	8	101 - 200 cm
3	6 - 10 cm	9	> 200 cm
4	11 - 15 cm	X	Not determined, or unknown
5	16 - 25 cm		

S_I - WATER SKY OR ICE BLINK

0	Features not present	6	Water sky to E
1	Ice blink to N	7	Water sky to S
2	Ice blink to E	8	Water sky to W
3	Ice blink to S	9	Frost smoke
4	Ice blink to W	X	Not determined, or unknown
5	Water sky to N		

L_S - WIDTH OF SHORE LEAD

0	No shore lead	6	10 - 25 km
1	0 - 100 m	7	25 - 50 km
2	100 - 500 m	8	50 - 100 km
3	500 - 2 km	9	> 100 km
4	2 - 5 km	X	Not determined, or unknown
5	5 - 10 km		

C_C - FORM OF FAST ICE

0	No fast ice	5	Polar fast ice
1	Young shore ice	6	Grounded hummock
2	Shore ice	7	Ice foot
3	Winter fast ice	8	Anchor ice/grounded ice
4	Bay ice	X	Not determined, or unknown

B_T - TREND IN BEHAVIOUR OF ICE NEAR SHORE

0	No change	6	Ice freezing together
1	Ice situation getting better	7	Ice drifting in
2	Ice situation getting worse	8	Ice under pressure
3	Ice breaking up	9	Ice hummocking or screwing
4	Ice opening or drifting away	X	Not determined, or unknown
5	Ice increasing		

I_D - ICE DRIFT NEAR SHORE

0	No drift ice	6	Ice drift to SW
1	Ice drift to N	7	Ice drift to W
2	Ice drift to NE	8	Ice drift to NW
3	Ice drift to E	9	All ice motionless
4	Ice drift to SE	X	Not determined, or unknown
5	Ice drift to S		

OPTIONAL GROUPS

I_B - INDICATOR FOR ICE EDGE OR OPEN WATER FEATURE

1	Ice foot	5	Polynya or pool
2	Fast ice	6	Belt
3	Drift ice	7	Parch
4	Lead	8	Field

BB - TRUE BEARING TO ICE EDGE IN TENS OF DEGREES

No code table necessary

DD - DISTANCE TO ICE EDGE IN NAUTICAL MILES OR KILOMETRES

No code table necessary

I_W - INDICATOR FOR ORIENTATION AND SIZE OF ANY OF THE ELEMENTS IN I_B

(In case where I_B is reported as code 1, 2 or 3, no five-letter group beginning with I_W is reported; in the case where I_B is reported as any

value of code 4 to 8, inclusive, that same code value is reported for I_W and the remainder of the group $I_W W_O llw_d$ is reported).

W_O - ORIENTATION

0	No distinct orientation	5	Parallels shore to N
1	Major axis of feature oriented N-S	6	Parallels shore to E
2	Oriented NE-SW	7	Parallels shore to S
3	Oriented E-W	8	Parallels shore to W
4	Oriented SE-NW	X	Not determined, or unknown

ll - LENGTH IN NAUTICAL MILES OR KILOMETRES

No code table necessary

W_d - WIDTH

0	0 - 50 m	6	2 - 5 km
1	50 - 100 m	7	5 - 10 km
2	100 - 200 m	8	10 - 50 km
3	200 - 500 m	9	> 50 km
4	500 - 1 km	X	Not determined, or unknown
5	1 - 2 km		

G_AG_A - B_BB_B - ICE OF LAND ORIGIN

G_AG_A - Growlers and bergy bits

B_BB_B - Icebergs

00	No growlers and bergy bits, or no icebergs	13	13
01	1	14	14
02	2	15	15
03	3	16	16
04	4	17	17
05	5	18	18
06	6	19	19
07	7	20	20
08	8	21	21- 50
09	9	22	51-100
10	10	23	101-200
11	11	24	201-500
12	12	25	> 500

N O T E S :

(a) First two data groups are common to all observing platforms;

(b) Remaining groups are supplementary groups for particular type of report;

(c) Groups indicated by brackets are sent only if indicated phenomena can be observed. As many of these groups should be sent as are necessary to describe the ice condition;

(d) If no ice is observed, the indicator groups will be sent, followed by C_t, coded 0. The remainder of the code will be omitted. For example :

Ice B 20723 64512 0

(e) Codes were designed to be used separately from meteorological observations. However, if it is desired to append the ice data to a meteorological observation of any type, the appropriate indicator ice A, ice B, or ice C should follow the weather report, followed immediately by the ice data, omitting the above indicator groups.

PART B

PROPOSED SPECIAL NUMERICAL CODE FOR AERIAL ICE SUMMARY

Code for transmitting observation results on ice conditions in the sea from aircraft

SCHEME OF THE CODE

Avialed Aerial ice	YQGGG	laa/aa	$2L_aL_aL_aL_a$	$3L_oL_oL_oL_o$	4cc/cc	5kk/kk

Designation of lettered and numbered symbols in the scheme of code : Avialed (aerial ice) - identifying name preceding the telegram.

GROUP YQGGG

Y = day of the week
Q = the octant of globe in which air reconnaissance takes place
GGG = the starting time of aerial reconnaissance (with decimal fractions of an hour 1 to 10

ANNEX X

GROUP 1aa/aa

1 = identifying number of the group
aa/aa = information on the course of flight and observation objects

GROUP $2L_aL_aL_aL_a$

2 = identifying number of the group
$L_aL_aL_aL_a$ = latitude of the observation point

GROUP $3L_oL_oL_oL_o$

3 = identifying number of the group
$L_oL_oL_oL_o$ = longitude of the observation point (without hundreds of degrees)

GROUP 4cc/cc

4 = identifying number of the group
cc/cc = information on age, concentration, shape and distribution of ice

GROUP 5kk/kk

5 = identifying number of the group
kk/kk = information on the ice surface, on continental ice and on navigational conditions

REMARKS CONCERNING THE USE OF INDIVIDUAL GROUPS OF THE CODE

1. Group YQGGG is a constant group of the code. Symbols GGG indicate the actual time (Greenwich) of the start of ice observations. In order to transmit individual time moments in the report, Group XXGGG is used. Transition of air reconnaissance from one octant to another is indicated in Groups XQXXX or XQGGG.

2. Each of the groups having identifying numbers 1, 4 and 5 (1 aa/aa, 4 cc/cc, 5 kk/kk) contain two concise characteristics of the reconnoitered regions and ice conditions aa/aa, cc/cc, etc., whose arrangement in the group is arbitrary.

If the ice conditions cannot be described by two characteristics, the correspondent group is repeated as many times as necessary. If there is an odd number of characteristics, letters XX substitute the deficient characteristic (always in the place provided for the second characteristic). Arrangement of groups in the text of telegram is arbitrary, i.e., the group 1 aa/aa can be followed by the group 4 cc/cc or 5 kk/kk depending upon the requirements of a report on ice conditions (see the sample of coding).

3. Designations of the co-ordinates of a point (Groups $2L_aL_aL_aL_a$ and $3L_oL_oL_oL_o$) are transmitted with approximation to a minute. Since the group YQGGG contains information on the octant of earth where the aerial reconnaissance takes place, the hundreds of degrees are omitted.

4. The name of geographic locations is expressed verbally (as for instance Magadan, Tilichiki, etc.), but the locations can also be designated by the respective co-ordinates of a point.

5. The characteristics of hummockiness, degree of destruction, snowiness, impurity, compression and freezing together of ice can be expressed by balls according to scales attached to the code.

In instances when observation conditions do not permit accurate determination of the characteristics of ice surface, the fifth group should be utilized where the characteristics are expressed in abbreviated form.

CONTENT OF INDIVIDUAL GROUPS OF THE CODE

Aerial ice (Avialed) = identifying name of the telegram

GROUP YQGGG

Y = the day of week in accordance with the Greenwich time is coded as follows (WMO Code 4900) :

1	Sunday	5	Thursday
2	Monday	6	Friday
3	Tuesday	7	Saturday
4	Wednesday		

Q = the octant of the globe where the aerial reconnaissance is conducted is coded as follows (WMO Code 3300) :

	Northern Hemisphere Longitude in degrees		Southern Hemisphere Longitude in degrees
0	0 - 90 W	5	0 - 90 W
1	90 - 180 W	6	90 - 180 W
2	180 - 90 E	7	180 - 90 E
3	90 - 0 E	8	90 - 0 E

GGG = time of observation according to the Greenwich time in hours with tenths of hours

Example : 12:30 is coded 125
2:00 is coded 020

GROUP laa/aa

1 = identifying number of the group
aa/aa = information on the course and the objects of observation is recorded in accordance with the following table :

	Flight elements and observation conditions
00	take-off
01	visibility
02	altitude of flight
03	course
04	visual observations
05	observations by radar
06	observations are carried on through openings among clouds
07	observations are interrupted (discontinued)
08	surface of the sea is covered by fog
09	landing

GEOGRAPHICAL ELEMENTS

10	bank	20	cape
11	coast	21	island
12	bay	22	shoal
13	outer road (stead)	23	parallel
14	inner road (stead)	24	peninsula
15	horizon	25	port
16	gulf	26	coastal belt
17	sand bar (kosa)	27	strait
18	firth (lima)	28	point (points)
19	meridian	29	estuary

ORIENTATION ELEMENTS

30	in	37	seaward (moristee)
31	along	38	direction
32	farther	39	to (on)
33	to, as far as	40	about, approximately
34	to the left (of the course of aircraft)	41	from
		42	to the right (of the course of aircraft)
35	lines		
36	between (among)	43	everywhere

44	across the course of aircraft	47	at (near)
45	in region (large area)	48	in area
46	in traverse	49	in center

SUPPLEMENTARY TERMS

50	border	58	drifting ice
51	colon	59	turn
52	drift (drifts)	60	I repeat
53	in length	61	passes, lies
54	comma	62	distances
55	much	63	after, beyond
56	ice	64	in width
57	the remainder		

POINTS OF THE COMPASS

70	north	74	south
71	northeast	75	southwest
72	east	76	west
73	southeast	77	northwest

EXTENT

78	0	89	200 m
79	to 50 m	90	400 m
80	50 to 100 m	91	600 m
81	100 - 200 m	92	800 m
82	200 - 500 m	93	1000 m
83	500 m - 1 km	94	1200 m
84	1 - 2 km	95	1400 m
85	2 - 4 km	96	1600 m
86	4 - 10 km	97	1800 m
87	10 - 20 km	98	2000 m
88	20 - 50 km	99	stop

GROUP 4cc/cc

4 = identifying number of the group
cc/cc = information on the age, concentration, shape and distribution of ice is coded in accordance with the following table :

AGE OF ICE

00	ice slush	02	sludge
01	snow slush	03	pancake ice

04 snow slush, sludge, pancake ice
05 ice rind
06 young ice
07 winter ice
08 grayish white ice (medium winter ice) (15-30 cm)
09 white ice (thick winter ice) (30-70 cm)
10 polar ice
11 young polar ice (two-year ice)
12 arctic pack
13 ice shelf
14 ice island (drifting)
15 age of ice has not been determined

FORMS OF FAST ICE

20 fast ice, shore ice
21 young shore ice
22 winter fast ice
23 level fast ice of more than one winter's growth (bay ice WMO)
24 grounded hummock (stamukha)
25 ridges of grounded hummocks
26 temporarily grounded floe (flat in contrast to stamukha)

FORMS OF DRIFT ICE

30 vast ice floes (ice fields over 10 km in diameter)
31 big ice floes (1 - 10 km)
32 medium ice floes (100-1000 m)
33 brash (0.5 - 2 m)
34 small floes (20 - 100 m)
35 ice cakes (2 - 20 m)
36 small ice floes and ice cakes mixed (with small ice floes predominating)
37 ice cakes and small ice floes mixed (predominantly ice cakes)
38 bergy bit (floeberg)
39 growler
40 small brash (less than 0.5 m)

DISTRIBUTION OF DRIFT ICE

41 large field of ice (area over 20 km across)
42 medium field of ice (area 15 - 20 km across)
43 small field of ice (area 10 - 15 km across)
44 patch (of ice)
45 belt (width 2 to > 100 km)
46 bay or bight
47 stream or strip (width 1 km or less)
48 tongue (projection of ice edge up to several kilometres in length)
49 ice edge
50 clear

BALLS

51 1 ball
52 2 balls
53 3 balls
54 4 balls
55 5 balls
56 6 balls

57	7 balls	68	4 - 6 balls
58	8 balls	69	5 - 6 balls
59	9 balls	70	5 - 7 balls
60	10 balls	71	6 - 7 balls
61	1 - 2 balls	72	6 - 8 balls
62	1 - 3 balls	73	7 - 8 balls
63	2 - 3 balls	74	7 - 9 balls
64	2 - 4 balls	75	8 - 9 balls
65	3 - 4 balls	76	8 - 10 balls
66	3 - 5 balls		
67	4 - 5 balls	99	stop

GROUP 5kk/kk

5 = identifying number of the group
kk/kk = information on the surface of ice, on continental ice and on navigational conditions is coded as follows :

CHARACTERISTICS OF ICE SURFACE

00	level ice	19	snow water on the ice, puddles
01	rafted ice	20	few puddles on the ice
02	hummocked ice	21	many puddles on the ice
03	pressure ridges	22	puddles of melted ice on the ice cover
04	hummockiness of ice (in balls)	23	burnt through puddles (thawing holes in the ice)
05	individual ropaks (standing floes)	24	dried ice
06	many ropaks (standing floes)	25	rotten ice
07	snow-free ice	26	degree of disintegration (in balls)
08	snow-covered ice	27	degree of pressure (in balls)
09	snow cover (in balls)	28	ice under slight pressure
10	few cracks on ice	29	ice under strong pressure
11	many cracks on ice	30	ice is clean
12	tide crack	31	dirtiness of ice (in balls)
13	shore lead	32	dirty ice
14	lead in the ice	33	freezing together of the ice (in balls)
15	polynya	34	ice breccia
16	shore polynya		
17	polynya off edge of shore ice		
18	pool of open water		

CONTINENTAL ICE AND CHARACTERISTICS OF ICE AND WATER

41	iceberg	44	many bergy bits
42	many icebergs	45	ice blink
43	bergy bit	46	water sky
		47	frost smoke

ANNEX X

BALLS

51	1 ball	64	2 - 4 balls
52	2 balls	65	3 - 4 balls
53	3 balls	66	3 - 5 balls
54	4 balls	67	4 - 5 balls
55	5 balls	68	4 - 6 balls
56	6 balls	69	5 - 6 balls
57	7 balls	70	5 - 7 balls
58	8 balls	71	6 - 7 balls
59	9 balls	72	6 - 8 balls
60	10 balls	73	7 - 8 balls
61	1 - 2 balls	74	7 - 9 balls
62	1 - 3 balls	75	8 - 9 balls
63	2 - 3 balls	76	8 - 10 balls

NAVIGATIONAL CONDITIONS AND UTILIZATION OF ICE COVER FOR TRANSPORTATION

80	navigation unobstructed	85	the channel behind icebreaker (or ship) closes
81	ships move through leads made by icebreakers	86	pedestrian movement on ice
82	ships move, taking advantage of leads	87	motor vehicle movement on ice
83	ship movement is obstructed	88	light aircraft on ice
84	ship movement impossible	89	heavy aircraft on ice
		99	stop

A SAMPLE OF CODING ICE REPORT

TEXT OF A TELEGRAPHIC ICE REPORT BASED ON DATA OBTAINED BY AERIAL RECONNAISSANCE

Aerial ice reconnaissance of April 5 take-off 10:30 beginning of ice observations 11:00 landing 14:15 flight altitude 600 m stop Course Magadan 5510 15155 comma Cape Levenshtern 5310 14645 farther to Nikolaevsk stop Visibility everywhere 10-20 km edge of drifting ice passes by points 5630 15200 5620 15130 5600 15100 5520 15007 5510 14 827 comma in Chirikov area to the north of Cape Taran clear farther in the direction of parallel 5820 medium floes of young ice concentration 8 balls comma in area 5825 medium ice floes white 7 - 9 balls comma in area between 5600 5650 predominantly small ice floes mixed with ice cakes 2 - 3 balls white grayish-white along ice edge predominantly small ice floes mixed with ice cakes white grayish-white stop In area to the north of point 5455 14800 to meridian 14600 small floes white 3 balls drifting southeast stop In the area from 14400 to Mys Levenshtern big floes white comma at the coast shore ice 4 - 6 km ice evenly snow-covered

When coded the ice report is as follows :

Aerial ice 62110 100XX XX105 109XX XX143 10291 103XX Magadan 25510 35155 120XX Levenshtern 25310 34645 13233 Nikolayevsk 19901 14387 449XX 16128 25630 35200 25620 35130 25600 35100 25520 35007 25510 34827 15448 Chirikov 17020 Taran 450XX 13238 123XX 25820 43206 458XX 15448 25825 43209 474XX 15448 136XX 25600 25650 43663 40908 131XX 44936 40908 19948 17028 25455 34800 13319 34600 43409 453XX 15273 19948 14119 34400 13320 Levenshtern 43109 15447 111XX 420XX 186XX 50008

A P P E N D I X

SCALE OF CALCULATING THE CONDITIONS OF DRIFT AND FAST ICE

SCALE OF HUMMOCKINESS

Balls	Character of the surface of ice cover	Area covered by hummocks (in percentages compared with the area covered by ice)	
		Range	Average
0	Even ice	0	0
1	Even ice with individual hummocks	0 - 20	10
2	Even ice, at places hummocky	20 - 40	30
3	Ice of medium hummockiness	40 - 60	50
4	Hummocky ice, at places even	60 - 80	70
5	Hummocky ice all over	80 - 100	90

SCALE OF ICE DISINTEGRATION

Balls	Characteristics
0	Complete absence of any sign of disintegration
1	On the surface of ice individual snow water in the form of dark spots as well as puddles can be seen. Disintegration of drift fields consisting of conglomerated ice (ice mosaic) blocks and brash occurs

Balls	Characteristics
2	Snow water is distributed throughout the ice surface, puddles appear. In snow-covered areas, in bays and at coasts exposed to the wind ice, when thawing rapidly, is covered by a continuous layer of water. At places land drainage puddles on shore ice and polynyas in estuaries are formed
3	Puddles of melted ice cover the entire surface of ice; thawing holes, appear in the ice; cracks and leads appear in shore ice; hummocks are smoothened; ice floes become circular. The ice becomes dry. Land drainage puddles on shore ice join together and widen; the estuary polynyas expand
4	Burnt puddles and leads eroded by currents are scattered throughout the surface of ice. A continuous belt of land drainage puddles on shore ice has developed. The ice is dry. In bays the shore ice breaks. Mushroom-shaped floes with underwater rams appear among the small floes
5	Ice floes break up into small pieces which are soaked with water, have a deep draft, are darkish-grey reminding of brash ice; only elevated areas appear above the water; surface of ice floes are covered by widening thawing holes, having a lace-shaped appearance from above

SCALE OF SNOWINESS

Balls	Characteristics
0	No snow, or only scattered spots of snow
1	Thin uniform snow cover or alternating uniform snow cover with areas of bare ice ranging between 30 to 70%
2	Snow cover from 5 to 20 cm thick with small snow drifts and ridges of hard packed snow without spots of bare ice, or pronounced snow drifts and bare ice constituting from 10 to 30% of the area. Ridges of hard packed snow cover small hummocks (to 50 cm)
3	Considerable snow cover exceeding 20 cm in depth without spots of bare ice with large ridges of hard packed snow covering sometimes hummocks 1.5 m high

Remark : Information on the depth of snow cover and hummocks is mentioned to characterize conditions in general.

SCALE OF DEBRIS ON ICE

Balls	Amount of debris on ice (in percentages with respect to the area under observation
0	Ice clean, traces of dirt
1	Insignificant dirtiness (10 - 40%)
2	Medium degree of dirtiness (40 - 70%)
3	Ice is dirty all over (70 - 100%)

SCALE OF PRESSURE

Balls	Characteristics
0	Ice "spread out", i.e., with a concentration of 9 - 10 balls, first noticeable displacement at the inception of disintegration
1	Slight pressure. In the area of compression small patches of water can be seen; individual hummocks and rafts are formed. As a result of general pressure smashed ice is pressed upward toward the edges of ice floes
2	Considerable pressure. In the area of compression the open spots with water are closed. Hummocks increase. As a result of intensive hummocking of young ice, which may also involve winter ice, fresh hummocks appear in ridges and rafts. Smashed ice is compressed into a dense buckling mass, forming cushions between floes
3	Dense continuous pressure. Intense hummocking of winter ice, involving also young polar ice and polar ice. Cushions (or walls) of smashed ice and ridges of hummocks are seen everywhere. Young ice is especially hummocky

SCALE OF REFREEZING

Scale	Characteristics
0	Absence of visible signs of refreezing among the ice that has remained from the preceding winter
1	Ice slush, sludge, snow slush, brackish ice crust can be noticed among accumulations of ice left over from the preceding season

ANNEX X

Scale	Characteristics
2	Ice slush, sludge, snow slush, brackish ice crust and even young ice is seen everywhere among the ice left over from the preceding season. At places ice rind can be seen
3	Ice rind predominates among the "old" ice; at places young ice appears; the remaining ice floes begin to freeze together
4	Young ice predominates among the accumulations of old ice; at places young winter (greyish-white) ice appears; formation of fields of ice resulting from freezing together occurs everywhere
5	Young winter (greyish-white) ice predominates among the accumulations of ice left over from the preceding cold season. At places winter (white) ice can be noticed. The ice cover assumes an appearance typical of winter, consisting of fields of ice resulting from freezing together of remnants of older ice.

LIST OF DOCUMENTS

Doc. No.	Title	Agenda item	Submitted by
1	Final agenda Rev. 2	3	
2	Explanatory memorandum to the provisional agenda Add. 1, 2, 3, 4	3	
3	Report of the Working Group on technical problems	6.4	Chairman
4	Report of the chairman of the Working Group on the relations with the international fisheries organizations	6.6	Chairman
5	Icing of ships	9.4	Federal Republic of Germany
6	Report of the Working Group on the Marine Cloud Album for use by observers at sea Add. 1	6.5	Chairman President
7	Report by the chairman of the Working Group on marine climatology Add. 1	6.1	Chairman
8	Maintaining a separate Commission for Instruments and Methods of Observation	15	Secretary-General
9	Relations between maritime meteorology and fishery biology - Relationships between meteorological factors and fish distribution	22	Federal Republic of Germany
10	Indian Ocean oceanographical expedition - Project for the rapid dissemination of climatological data collected in the course of oceanographic expeditions to the Indian Ocean	14	Madagascar, Réunion and the Comoro Islands

Doc. No.	Title	Agenda item	Submitted by
11	Report by the president of the Commission for Maritime Meteorology	5	President
12	Definition of light-ship station	8.3	President
13	Consideration of paragraphs 5.1.1.2 and 5.1.1.1 of the Technical Regulations	9.2	President
14	MAFOR Code Add. 1	9.1	President Secretary-General
15	Required accuracy of measurement	7.9	President
16	Code 4900 : Y - day of the week	7.12	Secretary-General
17	Chapter on marine climatology to be included in the Guide to climatological practices Add. 1 and 2	11.6	President
18	Scientific lectures and discussion of methods of forecasting the state of sea on the basis of meteorological data	17	Vice-President
19	Facsimile broadcasts of weather charts for shipping	9.3	Federal Republic of Germany
20	Report of the Working Group on sea ice	6.2	Chairman
21	Revision of previous resolutions and recommendations of the commission	19	Secretary-General
22	Report of the Executive Committee Working Group on the Beaufort scale Add. 1	7.10	Secretary-General
23	Voluntary observing ship scheme - Plans for the improvement of weather reporting in the "sparse" areas	8.1	Union of South Africa

Doc. No.	Title	Agenda item	Submitted by
24	Methods of forecasting the state of the sea on the basis of meteorological data	12.1	Secretary-General
25	Reporting of sea surface temperature	7.13	Union of South Africa
26	Short meteorological code for whale-catchers, trawlers, etc.	8.6	Union of South Africa
27	Units used in international exchange of meteorological reports	7.11	Secretary-General
28	Marine section of the World Climatic Atlas - Relations between the percentage frequency of occurrence and the number of days with regard to meteorological phenomena	11.4	Federal Republic of Germany
29	Precipitation measurement at sea	7.1	India
30	Code 4900 : Y - day of the week	7.12	India
31	Indian Ocean oceanographical expedition	14	India
32	Marine section of the World Climatic Atlas - Representation of variability of meteorological elements in marine atlases	11.4	United Kingdom
33	Request for changes in forecasting and reporting areas	10.1	India
34	Voluntary observing ship scheme - Organization of a system of professionally observing meteorological stations on board specially selected merchant ships	8.1	Sweden
35	Transmission of ships' reports to shore stations	10.2	Secretary-General

Doc. No.	Title	Agenda item	Submitted by
36	Working Group on the relations with the international fisheries organizations - Experience of the Royal Netherlands Meteorological Institute in obtaining weather observations from fishing vessels	6.6	Netherlands
37	Marine Cloud Album	7.8	Netherlands
38	Consideration of amending Code FM 46.A IAC FLEET analysis in abbreviated form	9.6	United States
39	Facsimile broadcasts of weather charts for shipping	9.3	United States
40	Observations and reporting of ocean waves	12.2	United States
41	Reporting visibility	7.4	Union of South Africa
42	Report by the chairman of the Working Group on organizational and operational matters	6.3	Chairman
43	Reporting of sea surface temperature- Consideration of changing the method for reporting sea-temperature data in Code FM 21.A	7.13	United States
44	Deletion of the Beaufort numbers 13 through 17 in Code 1100	7.10	Netherlands
45	Voluntary observing ship scheme - Decisions by the twelfth session of the Executive Committee	8.1	Secretary-General
46	Marine section of the World Climatic Atlas	11.4	President
47	Indian Ocean oceanographical expedition	14	Secretary-General

Doc. No.	Title	Agenda item	Submitted by
48	Locust reports from ships	8.7	Secretary-General
49	Slide-rule weather coder	8.1 8.6	Union of South Africa
50	Proposals for improving the oceanic network in "sparse" areas	8.1	Hong Kong
51	"Increase of wind" warnings as an alternative to gale warnings	9	United Kingdom
52	Reporting of sea surface temperature	7.13	Japan
53	Results of the International Conference for the Safety of Life at Sea	22	Secretary-General
54	Facsimile broadcasts of weather charts for shipping	9.3	Canada
55	Visual storm warning signals	9.5	Secretary-General
56	Routing of ships by means of extended weather forecasting	16	United States
57	Report by the chairman of the Working Group on marine climatology	6.1	President
58	Requests for changes in forecasting and reporting areas (Request for designation of a forecasting and collecting area for shipping)	10.1	Cambodia
59	Measurement of sea surface temperature	7.2	Chairman Committee B
60	Atmospherics	7.6	Chairman Committee B
61	Precipitation measurements at sea	7.1	Chairman Committee B

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62	Gust (Application of definition)	7.5	Chairman Committee B
63	Measurement of true wind at sea	7.7	Chairman Committee B
64	Consideration of amending the contents of Code FM 46.A - IAC FLEET analysis in abbreviated form	9.6	Chairman Committee A
65	Request for changes in forecasting and reporting areas	10.1	Republic of Korea
66	Reporting visibility	7.4	Chairman Committee B
67	Consideration of paragraphs 5.1.1.2 and 5.1.1.1 of the Technical Regulations	9.2	Chairman Committee A
68	Definition of light-ship station	8.3	Chairman Committee A
69	Reporting of sea surface temperature	7.13	Chairman Committee A
70	Code 4900 : Y - Day of the week	7.12	Chairman Committee A
71	Required accuracy of measurement	7.9	Chairman Committee B
72	Maintaining a separate Commission for Instruments and Methods of Observation Appendix, Rev. 1		Chairman Committee A Ireland
73	Consideration of paragraphs 2.2.1.7 and 2.2.1.8 of the Technical Regulations	8.4	Chairman Committee A

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74	Report by the chairman of the Working Group on the relations with international fisheries organizations	6.6	Chairman Committee A
75	Aeronautical requirements to improve substantially the availability of ships' weather reports from the Red Sea, the Arabian Sea, the Bay of Bengal, the Indian Ocean and the China Sea	8.5	Chairman Committee A
76	Some technical explanatory remarks on the Beaufort scale	7.10	Netherlands
77	Revision of WMO Publication No. 8. TP.3, Chapter 10	7.3	Chairman Committee B
78	Observations and reporting of waves	12.2	Chairman Committee B
79	Deletion of the Beaufort numbers 13 through 17 in Code 1100	7.10	Chairman Committee B
80	Facsimile broadcast of weather charts for shipping	9.3	Chairman Committee B
81	Report of the Working Group on organizational and operational matters	6.3	Chairman Committee A
82	Indian Ocean oceanographical expedition	14	Chairman Committee A
83	Sea ice	13.1, 2 3 and 4	Chairman Committee B
84	Scientific lectures - Methods of forecasting the state of the sea on the basis of meteorological data	12.1	Vice-President

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85	Marine section of the World Climatic Atlas	11.4	Chairman Committee B
86	Specifications for national marine climatic atlases	11.5	Chairman Committee B
87	Voluntary observing ship scheme - Establishing aerological observations from merchant ships	8.1 8.2	Chairman Committee A
88	Short meteorological code for whale-catchers, trawlers, etc.	8.6	Chairman Committee A
89	Request for changes in forecasting and reporting areas	10.1	Chairman Committee A
90	"Increase of wind" warnings as an alternative to "gale" warnings	9	Chairman Committee A
91	Division of responsibility for oceanic areas among Members with respect to the marine section of the World Climatic Atlas and climatological summaries Add. 1	11.1	Chairman Committee B
92	MAFOR Code	9.1	Chairman Committee A
93	Report of the Working Group on the Marine Cloud Album for use by observers at sea	6.5	Chairman Committee A
94	Transmission of ships' reports to shore stations	10.2	Chairman Committee A
95	Punch-card and punching procedures Add. 1 - Lay-out for an international maritime punch-card	11.2	Chairman Committee B Netherlands and United States
96	Climatological summaries	11.3	Chairman Committee B

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97	Icing of ships	9.4	Chairman Committee A
98	Locust reports from ships	8.7	Chairman Committee A
99	Results of the International Conference on Safety of Life at Sea	22	Chairman Committee A
100	Visual storm warning signals	9.5	Chairman Committee A
101	Marine Cloud Album	7.8	Chairman Committee A
102	Units used in international exchange of meteorological reports	7.11	Chairman Committee A
103	Chapter on marine climatology to be included in the Guide to climatological practices	11.6	Chairman Committee B
104	Resolution B.5 (CMM-III) - Working Group on marine climatology	6.1	Chairman Committee B
105	Resolution B.4 (CMM-III) - Working Group on technical problems	6.4	Chairman Committee B
106	Report of the Executive Committee Working Group of the Beaufort scale	7.10	Chairman Committee B
107	Revision of previous resolutions and recommendations of the commission	19	Rapporteur of the Sub-Committee
108	Routing of ships by means of extended weather forecasting Add.	16	Chairman Committee B United States