WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (of UNESCO)

DRIFTING BUOY CO-OPERATION PANEL

Second session

(Geneva, 15-17 October 1986)

FINAL REPORT

(This page left intentionally blank.)

GENERAL SUMMARY OF THE WORK OF THE SESSION

1. ORGANIZATION OF THE SESSION (Agenda item 1)

1.1 Opening of the session

1.1.1 The second session of the Drifting Buoy Co-operation Panel was opened by the panel chairman, Mr. C. Billard, at 10 a.m. on Wednesday 15 October 1986 in the WMO headquarters, Geneva. Mr. Billard welcomed participants to this second session and expressed the hope the session would be successful in solving the various problems which had arisen with regard to the appointment of the technical co-ordinator and, at the same time, make other decisions which were required for the successful accomplishment of the many tasks which had been set for the panel. He then called on the Deputy Secretary-General of WMO, Mr. D. Smith, to address the panel.

1.1.2 On behalf of the Secretary-General of WMO, Professor G.O.P. Obasi, and the Secretary of IOC, Dr. Mario Ruivo, Mr. Smith welcomed participants to the session, to the WMO Secretariat and to Geneva. In so doing, he particularly welcomed the decision of the Executive Council of IOC that IOC should act jointly with WMO as co-sponsor of the panel. This decision, he felt, reflected both the importance to oceanographers of the panel and its work and also the increasing spirit of co-operation between oceanographers and meteorologists, at all levels, on matters of common interest and concern. Mr. Smith then reiterated to the panel the very great importance which WMO and its Members gave to drifting buoys as an essential element of a composite global observing system in support of programmes such as the World Weather Watch and the World Climate Research Programme. At the same time, he said it was clear that if the requirements of these programmes for buoy data were to be met then considerable efforts on the part of Member countries were necessary, involving a high level of co-operation and co-ordination. In this, the Drifting Buoy Co-operation Panel had an essential role to play. At the same time, the panel had many other important tasks to undertake, in areas such as information distribution and data collection, distribution, archival and quality control, etc.

1.1.3 In referring in particular to the present session Mr. Smith expressed the hope that the panel would quickly overcome the various financial and administrative problems associated with the appointment of the technical co-ordinator, in order that it could then concentrate on the major tasks such as are indicated above. Finally, the Deputy Secretary-General welcomed to the session the representatives of the various international organizations present. He assured the panel of the full and continuing support of the WMO Secretariat in its work and wished the session a very successful three days and an enjoyable stay in Geneva.

1.1.4 The list of participants in the session is given in Annex I.

1.2 Adoption of the agenda

1.2.1 The panel adopted the agenda for the session, which is given in Annex II, on the understanding that matters relating to COST-43 would be dealt with under agenda item 7 - Co-ordination activities.

1.3 Working arrangements

1.3.1 Under this agenda item the panel decided on its hours of work and other working arrangements for the session. The list of documents for the session was also introduced by the Secretariat.

2. REPORT (Agenda item 2)

2.1 Report from the chairman of the Drifting Buoy Co-operation Panel

2.1.1 The chairman reported to the session that his activities during the intersessional period had focussed essentially on the recruitment of the technical co-odinator for the panel: statement of requirements, announcement of opportunity, ranking of the applicants, etc. This was undertaken in close co-operation with both Secretariats.

2.1.2 From the administrative point-of-view, the chairman had signed with the General Manager of CLS/Service Argos and the Secretary of IOC, a Memorandum of Understanding in order to state clearly the responsibilities and duties of each body with regard to the arrangements for the position of the technical co-ordinator.

2.1.3 The chairman noted with appreciation the decision of the IOC Executive Council, at its nineteenth session, to co-sponsor the Drifting Buoy Co-operation Panel jointly with WMO. He also gave some details about other matters: a Guide to Drifting Buoys, to be realized in co-operation with the Joint IOC/WMO Working Committee for IGOSS and the IOC Working Committee for IODE; the future of the VHF downlink on NOAA satellites; the planning of the OWSE/NA and related requirements for drifting buoy data; the COST-43 seminar in 1987.

2.2 Report from the WMO Secretariat

2.2.1 The WMO Secretariat representative reported to the panel on activities undertaken by the WMO Secretariat in support of the panel during the current intersessional period. In particular, WMO, as part of its regular monitoring and updating service of the status of the Global Observing System of the WWW, publishes regular reports on the operational status of drifting buoys in the "Monthly letter on the operation of the World Weather Watch (WWW) and Marine Meteorological Services (MMS)".

2.2.2 The formation of the Drifting Buoy Co-operation Panel and its current activities were reported to and discussed by both the fourth session of the Joint IOC/WMO Working Committee for IGOSS (Geneva, November 1985) and the sixth session of the CMM Advisory Working Group (Geneva, May 1986). Both bodies fully supported the panel and its activities and offered to assist, as appropriate, in the implementation of the panel activities.

2.2.3 A report on the first panel session and subsequent activities was also given to the thirty-eighth session of the WMO Executive Council. The Executive Council had approved these activities, re-affirmed its belief in the importance of drifting buoys and called on Members to fully support the panel and its work, including if possible, by increasing financial support for the technical co-ordinator's position.

2.2.4 At the request of the chairman of the Drifting Buoy Co-operation Panel, the WMO Secretariat had raised with NOAA/NESDIS the question of the maintenance of the VHF downlink on future NOAA spacecraft, in view of the importance of this communication link to drifting buoy deployers and operators of Argos Local User Terminals (LUT). As reported by CLS/Service Argos, this link will now be maintained, although with some modifications. A brief report on the question is given in Annex III.

2.2.5 Questions concerning the use of the Argos system to send XBT data in near-real-time to relevant principal investigators were raised at the fourth session of the Joint IOC/WMO Working Committee for IGOSS. This session had agreed to study the matter jointly with Service Argos and the matter will be considered in more detail at the forthcoming sixth meeting on Joint Argos Tariff Agreement.

2.3 Report from the IOC Secretariat

2.3.1 The panel was informed by the IOC Secretariat's representative that, since its first session in October 1985, the IOC Executive Council had held its nineteenth session (Paris, March 1986). At this session, the IOC Executive Council formally accepted "the invitation of WMO to co-sponsor the Drifting Buoy Co-operation Panel, with the participation of interested Member States of IOC and Members of WMO", through Resolution EC-XIX.7. Through the same resolution, the IOC Executive Council reiterated its concern with regard to the legal aspects relating to drifting buoys and instructed the Secretariat "to explore the matter in consultation with IMO and WMO". The panel expressed its satisfaction at the IOC decision and agreed that, should it encounter any problem relating to legal questions, it would submit it to governing bodies of IOC and WMO.

2.3.2 Questions relating to the management of funds provided for the position of the technical co-ordinator's position and to the employment of the technical co-ordinator as a UNESCO/IOC consultant are dealt with under agenda item 3 - Financial matters.

2.3.3 The panel was further informed that a Memorandum of Understanding had been signed by the chairman, the head of Service Argos (now General Manager of CLS) and the Secretary of IOC, in order that a certain number of rules concerning the relationship between the panel and its technical co-ordinator, on the one hand, and the Secretariats and Service Argos, on the other hand, be put together in a document with which all concerned would agree. In particular, the Memorandum of Understanding was felt necessary to clarify all possible problems relating to the financial and administrative relationship between the technical co-ordinator and the other parties.

2.3.4 Lastly, the panel was informed of discussions regarding its relationship with COST-43. This question is dealt with under agenda item 7 - Co-ordination activities.

2.4 Report from the technical co-ordinator

2.4. As the technical co-ordinator had yet to be appointed, there was no report under this agenda item at the present panel session.

3. FINANCIAL MATTERS (Agenda item 3)

3.1 The panel noted that the IOC Secretariat had made administrative arrangements for the acceptance and management of funds earmarked for the support of the technical co-ordinator's position as decided by the first panel session. The procedure should be that cheques, preferably made out in US$, be made payable to the Intergovernmental Oceanographic Commission and sent to the IOC Secretary under a covering letter specifying that the money is to be "deposited in the IOC Trust Fund for the purpose of the Joint WMO/IOC project for the co-operation in drifting buoy activities".

3.2 The panel nevertheless recognized that, in some cases, the procedure of a bank transfer might also be used. This had already occurred, but in such a way that no specific notification of the use of the money was made together with the bank transfer. As a result, the funds had become misplaced within the Unesco system and several months had elapsed before the money was actually credited to the correct account. In order to avoid, in future, such shortcomings it was agreed that the order for bank transfers should clearly carry the reference "IOC Trust Fund - 412 INT 43", which is the code number for this project.

3.3 The panel was reminded that Unesco/IOC administrative procedures require that the necessary funds to finance the position of the technical co-ordinator must be held by IOC before any contract may be signed either with the person selected for the position or with CLS/Service Argos for the support of the position. At the time of the second session of the panel, the situation was as follows:

- US$5,000 were received from Australia on 24 May 1986
- FF45,000 were received from France on 5 June 1986, but were credited to a wrong account number and not definitely recovered as yet in account "412 INT 43"
- US$10,000 were received from Canada on 2 October 1986.

In addition:

- US$5,000 were received from Australia on 2 October 1986, as the Australian contribution for 1987
- US$38,000 were indicated to have been transferred from the USA through a letter signed by Mr. Anthony J. Calio, the US Representative to the IOC, and dated 6 August 1986; this money had not been received by Unesco as of 10 October 1986.

The panel recognized that, under those circumstances, it was not yet possible to contract a person to fill the position of technical co-ordinator.

3.4 In order to avoid, in future, such difficulties the panel urged the countries contributing to the cost of the technical co-ordinator to forward the funds (i) according to the afore-mentioned procedures (see paragraphs 3.1 and 3.2) above and (ii) in due time, viz at the latest some three months before the expected date at which contracts should be signed. If some national administrative problems were foreseen, the corresponding additional delays should be added to the three months.

3.5 The panel was informed of possible problems relating to the employment of the technical co-ordinator as a Unesco/IOC consultant. Pursuant to administrative procedures:

(a) A consultant may not be hired for more than one year. It is nevertheless possible to negociate a new contract with the same person to take effect after the old contract comes to an end;

(b) The amount of the remuneration has to be expressed in US$ and paid in a single currency, (viz french francs in the present case); the rate of exchange will be the official Unesco rate in force on the date of payment. There is no compensation mechanism that would allow for smoothing possible variations in the rate of the US$;

(c) Taxes may be levied on the remuneration and would not be reimbursed;

(d) All "overhead costs" such as health insurance, contribution to a retirement pension, etc. are the responsibility of the consultant;

(e) A consultant is not entitled to annual leave or to sick leave.

3.6 The panel recognized that these considerations might impinge upon the decision of a person to sign a consultant's contract. On the other hand, it considered that all these conditions had been made clear enough to avoid any misunderstanding with the candidates to the position. It recalled that, as a matter of high priority, it had to solve the problem of the technical co-ordinator's position for a trial period of some two years, during which the benefits derived from the position would be assessed. Lastly, it agreed that its main concern lay with the present level of committed funding for the position, viz US$58,000, as compared to US$76,000 which it had previously estimated for a one-year period at its first session. The panel therefore decided to subdivide the problem in the following way:

- First year (or period) of the technical co-ordinator's employment
- Second year (or period) of the technical co-ordinator's employment
- Longer-term questions.

3.7 In the first year (or period) of the technical co-ordinator's employment, the panel considered that it could recruit a technical co-ordinator as an IOC consultant for a one-year period, including one month of leave, with an annual remuneration of US$38,000, if:

(a) Travel expenses were decreased from US$15,000 to US$7,000; and

(b) CLS/Service Argos agreed to host the technical co-ordinator for an eleven-month period at a rate of approximately US$1,200 per month (instead of US$1,500).

CLS/Service Argos kindly agreed to the second condition. The panel noted that the amount of US$7,000 for the travel expenses of the technical co-ordinator during the first year was far from ideal but most probably would prove viable if carefully managed. It therefore decided to proceed along these lines.

3.8 For the second year (or period) of the technical co-ordinator's employment, the panel first reviewed firm commitments from countries contributing to support the position. A total of US$63,000 was noted, made up of: Australia: US$5,000 (already received); Canada: US$10,000; France: US$5,000 (or FF45,000), United Kingdom: US$5,000; USA: $38,000. This allowed for a second-term employment with conditions similar to the ones adopted for the first year and with more flexibility with regard to missions.

3.9 With regard to the longer-term, the panel agreed that it would have first to carefully assess the value of the position during the coming two years. It nevertheless recognized that it might have to consider alternative solutions for the employment of a technical co-ordinator. Amongst possible solutions, it agreed that its members should study three alternatives during the next intersessional period, viz:

(a) A governmental organization of any Member country of the panel might agree to second one of its staff members to act as technical co-ordinator, provided that certain conditions are met (total or partial reimbursement of the salary, for example). In such a case, the parent institution might maintain health and pension arrangements and the administrative status of the person concerned would also be maintained;

(b) A French organization might agree to recruit the candidate selected as the best possible technical co-ordinator and to provide the person with the benefits that are enjoyed by its regular staff members, provided it is reimbursed all of the related expenses (relaying organization). In this case, the cost to the panel would undoubtedly be higher than presently expected;

(c) A staff member be recruited to one or other of the two international organizations sponsoring the panel (i.e. WMO or IOC) and detailed to act as full-time technical co-ordinator in the location of the panel's choice, with full funding support being provided by panel Member countries' contributions. Again in this case the cost to the panel would be higher than at present.

The panel decided to consider this question in depth at its next session. It also agreed that all these foregoing considerations should be brought to the attention of the candidates for the position.

4. NATIONAL AND INTERNATIONAL FOCAL POINTS FOR DRIFTING BUOY PROGRAMMES (Agenda item 4)

4.1 The panel recalled that at its first session it had set, as one of the tasks for its technical co-ordinator, the compilation and maintenance of an appropriate list of focal points for drifting buoy programmes. In this task the technical co-ordinator was to use as a starting point the existing WMO list of national focal points for drifting buoys.

4.2 In noting that this existing WMO list was now very much out of date and recognizing also the difficulties of both the Secretariats in establishing and maintaining such a list of unique national focal points (covering both meteorological and oceanographic communities), the panel therefore carefully reviewed its requirements for a list of such focal points. It also discussed various options available to itself and the Secretariats for establishing this list.

4.3 Following this review and discussion, the panel agreed fully on the need for it to have available a list or lists of contact points in countries involved in any way with drifting buoy programmes, relating to formal, administrative, financial or policy matters concerning drifting buoy programmes, and also to specific technical aspects of buoys, their instrumentation, deployment, data retrieval, etc. It therefore decided that two lists of contact points may be required:

(a) A formal list of national focal points for drifting buoys, nominated by WMO Members or IOC Member States in response to a Secretariat circular letter. This list would be effectively an update of the existing WMO list, involving also the oceanographic community through IOC. The hope was expressed that unique focal points for each country could be found, though it was recognized that more than one focal point may be appropriate in some cases;

(b) A list, to be established informally and over a period of time by the technical co-ordinator as his activities developed, of contact points for specific organizations, institutions, programmes, etc., directly involved in any aspect of drifting buoys. Such a list would particularly facilitate information collection and exchange by the technical co-ordinator.

4.4 Finally, the panel recognized, and indeed hoped, that there would be a degree of duplication between the two lists. However, it agreed that it needed to develop and maintain the widest possible network of contacts throughout the drifting buoy community.

5. REQUIREMENTS FOR DRIFTING BUOY DATA (Agenda item 5)

5.1 With the recognition that such requirements had been reviewed in detail at its first session in 1985, the panel therefore considered in particular the specific requirements as stated by the WCRP and by the WMO OWSE-NA for both buoy data and data evaluation. With regard to the WCRP, it has been clearly recognized that drifting buoys are the most convenient source of high precision ocean surface data (SST and eventually surface wind) which are needed for the calibration of satellite remote sensing observations, in addition to the sea level atmospheric pressure data which are essential for modelling the three-dimensional structure of the atmospheric circulation.

5.2 Although the provisional sea level atmospheric pressure data requirement laid out in the Scientific Plan for the WCRP (WCRP Publications Series No. 2) is identical to that of GARP, i.e. one measurement per day in each 500km x 500km area, subsequent progress in global atmospheric data analysis would permit a relaxation of the horizontal sampling density requirement by a factor of 5 approximately, i.e. one measurement per day in each 1200km x 1200km. This sampling density would, in any case, be adequate for describing the large spatial scales which constitute climatologically significant features of the atmospheric circulation. In principle, 40 ideally-placed buoys in the southern hemisphere oceans could satisfy the sampling requirement but, in practice, because of buoy movements and failures the maintenance of an adequate array will require an annual deployment of 80-100 expendable drifting buoys. The requirement, addressed to the Drifting Buoy Co-operation Panel, calls for the following actions:

(a) Procurement of an annual supply of about 100 buoys equipped with at least a sea level atmospheric pressure sensor and a sea surface temperature sensor (throughout the duration of TOGA 1985-1995);

(b) Assistance in the deployment of buoys from oceanographic research vessels, Antarctic supply vessels, VOS and other vessels reaching high southern latitudes;

(c) Expansion of the present Arctic buoy programme and initiation of a similar activity in the Antarctic;

(d) Assistance in the co-ordinated operation and exploitation of the drifting buoy network as recommended by the Drifting Buoy Co-operation Panel;

(e) Development of new atmospheric, oceanic and sea ice sensors suitable for monitoring on satellite-tracked drifting buoys;

(f) Maintenance of appropriate tracking and data collection capability on future operational meteorological satellites in polar orbits.

5.3 The panel took note of these clearly stated WCRP requirements and agreed that actions required to meet these requirements should be investigated by the technical co-ordinator as a matter of priority.

5.4 The panel discussed the requirements for drifting buoy data in support of the Operational WWW Systems Evaluations (OWSE) and in particular it considered the Operational Evaluation Plan prepared by the Committee on the OWSE-NA (CONA).

5.5 The panel agreed that it should act as a specialist group for drifting buoys. The work will entail:

(a) Participation in the planning for the OWSE-NA during 1986 and early 1987;

(b) Working with CONA and the OWSE-NA Implementation Co-ordination Group (ICG) to make the most effective use of the drifting buoys, within the constraints of the buoy programme;

(c) Co-ordinating the activities of buoy operators, to the extent possible, to achieve the goals of the OWSE-NA and to provide the basic information required for the evaluations; and

(d) Preparing, or arranging for the preparation of, the evaluation reports.

5.6 In connexion with paragraph (d) above the panel reviewed the draft requirements for the information required from the specialist groups (see Annex IV) and agreed that the tasks were appropriate to the panel. Accordingly, it was decided that the chairman of the panel, supported by the technical co-ordinator, should undertake to provide the information.

5.7 It was also noted that COST-43 had been identified as a potential specialist group for the OWSE-NA and would be able to provide much of the required information with respect to the SOBA and SCOS programmes. The panel

requested the chairman to liaise closely with COST-43 through its Technical Secretary so that a co-ordinated response would be given on drifting buoys for the OWSE-NA.

5.8 The panel further considered this matter under agenda item 9 when reviewing its operating procedures and the tasks of the technical co-ordinator.

6. REPORTS ON CURRENT AND PLANNED DRIFTING BUOY PROGRAMMES (Agenda item 6)

6.1 Under this agenda item, participants in the meeting gave brief presentations of their countries' present and/or future buoy activities. Such presentations were made by Canada, France, Greece, the Netherlands, Pakistan, Saudi Arabia, United Kingdom, USSR and USA. Summaries of a number of these presentations are given in Annex V to this report. In addition, Annex V also contains summaries of future plans prepared by countries who were unable to be present in the meeting, viz Australia and Japan. The representative of COST-43 provided the session with a consolidated review of the COST-43 activities, in particular its SOBA and SCOS programmes. This is also included in Annex V.

6.2 The panel noted with interest and appreciation all these plans for involvement in buoy activities. It expressed particular appreciation to those countries which, while unable at the present time to undertake buoy deployments themselves, had nevertheless offered other facilities for the use of the panel such as ship time for deployment and calibration of buoys. The panel agreed that this was a very good example of the type of co-operative activity which it was endeavouring to foster and instructed the technical co-ordinator to take appropriate action on these offers.

7. CO-ORDINATION ACTIVITIES (Agenda item 7)

7.1 A number of separate but important matters were dealt with by the panel under this agenda item. These matters included: relations between the panel and COST-43; the COST-43 seminar; quality control of drifting buoy data; archival of buoy data; real-time reporting codes for buoy data. The results of the discussions are recorded in the respective paragraphs which follow.

Quality control

7.2 As an introduction to the topic of the real-time quality control of drifting buoy data, the panel heard a presentation by Dr. G.D. Hamilton (USA) on the quality control procedures presently employed by the US National Data Buoy Centre (NDBC)for data from the US moored buoys and Coastal Marine Automated Network (C-MAN) stations. Dr. Hamilton also informed the panel of procedures which are under study by NDBC on the real-time quality control of drifting buoy data. A brief summary of this presentation including, in particular, the procedures being developed for the drifting buoy data and the possible relationship between NDBC and the US Argos processing centre in the real-time data flow, is given in Annex VI to this report.

7.3 The panel expressed its appreciation to Dr. Hamilton for this very informative presentation. In doing so, it noted in particular the apparently large proportion of drifting buoy data presently circulating on the GTS which contained possibly serious errors, despite the fact that these data had already passed the gross error checks imposed at the Argos processing centre prior to insertion onto the GTS.

7.4 The panel agreed very strongly on the need for appropriate real-time quality control procedures for drifting buoy data to be implemented globally for data circulating on the GTS as a matter of priority, in view of the importance of large quantities of good quality buoy data, particularly for numerical modelling, satellite data calibration and data archival purposes (see also paragraphs 7.7 and 7.8). At the same time the panel was mindful of the need to introduce such procedures in a well-regulated and unambiguous way, in order that all users of the data were fully aware of and in agreement with the procedures used and also that the same basic procedures were applied globally. In this regard, the panel noted the responsibility of WMO for regulations concerning data circulating on the GTS, and therefore requested WMO to keep the whole matter of drifting buoy data quality control under close review. This included in particular to consider the introduction of global quality control standards and to ensure that buoy data of ambiguous or contradictory quality were not distributed over the GTS.

7.5 The panel also felt that it had an important role to play itself in the implementation of real-time quality control procedures for buoy data, in view of its position as a global co-ordinating body for drifting buoys, and indeed noted that the terms of reference for both itself and its technical co-ordinator included reference to quality control matters. In this regard, it agreed that the experiment which may be conducted by NDBC and the USA processing centre of Service Argos for North American buoy data was of great interest and importance. At the same time it noted that no similar experiment was yet envisaged for data processed by the Toulouse centre, but that such quality control may involve co-ordination and logistics difficulties as well as, eventually, substantial manpower resources.

7.6 The panel therefore agreed that, in view of the importance of the question and in pursuance of his terms of reference, the technical co-ordinator should, as a matter of priority, undertake a study of the requirements for, feasibility of and procedures which might be implemented for the real-time quality control of drifting buoy data processed through Toulouse. Such a study should also investigate how such procedures might eventually be implemented in Europe. It should take careful note of the present NDBC study and indeed be undertaken in close consultation with NDBC, as appropriate, as well as the WMO Secretariat. Finally, the results of the study should be presented to the next panel session for its consideration.

Archival of buoy data

7.7 In discussing briefly the question of the archival of drifting buoy data, the panel took note of the drifting buoy data archival activities of Canada (also designated as the RNODC of IOC for drifting buoy data) and France. In particular it noted that both were presently archiving on a regular basis only data circulating on the GTS, which clearly emphasized the importance of quality control for such data.

7.8 The results of a survey by the joint IOC/SCOR Committee on Climatic Changes and the Ocean (CCCO) of oceanographic users of drifting buoys and, in particular, of their attitude to the archival of their buoy data was noted by the panel with interest. It was agreed that further discussion on this and other archival questions should be deferred to the Argos Joint Tariff Agreement meeting which was to follow, since this latter meeting would involve in particular additional participants with an interest in these questions.

Relationship with COST-43

7.9 The panel was informed that the intergovernmental agreement for the European project COST-43 (setting up of an experimental network of ocean data stations) was to come to an end by 1 December 1988. Participants in the programme, viz meteorological organizations and several kinds of institutes in the countries concerned, were anxious to pursue the activities undertaken under the COST agreement, but needed to find another institutional umbrella, since the present agreement would not be renewed. The Management Committee for COST-43 therefore was exploring the possibility for the programme to become, under a new designation, an "action group" of the Drifting Buoy Co-operation Panel.

7.10 The panel recalled that, through Resolution 10 (EC-XXXVII), the WMO Executive Council decided that one of the principal objectives of the Drifting Buoy Co-operation Panel should be "to encourage and support the establishment of action groups in particular programmes or regional applications to effect the desired co-operation on drifting buoy activities." The panel therefore welcomed the request by COST-43 and invited the Management Committee of COST-43 to develop specific terms of reference for the future action group to be considered by the next panel session.

7.11 The project leader for COST-43 informed the panel that contributions to COST-43 were, for the time being, managed by the Council of the European Community. For the future COST-43 to be viable, similar contributions from participants in the programme would be required that would have to be managed by another organization. WMO and IOC would be approached to that effect. The representatives of the Secretariats indicated that they did not foresee any major difficulty in managing these funds provided that the relevant rules of procedure or regulations of the organizations were taken into account (in particular no funds could be engaged in any way before the money was actually held by the Secretariats).

7.12 The panel was also informed that COST-43 was organizing a Seminar on operational ocean station networks in Brest, France, from 16 to 18 June 1987. The panel was requested to act as "co-operating body" in this undertaking and agreed to do so on the understanding that this would not involve any financial burden on it. COST-43 was also requesting that a presentation be made at the seminar on the panel's activities. The panel authorized its chairman to act as its representative on this occasion.

Codes

7.13 The panel studied a proposal for a modified code form for drifting and fixed buoys based on the DRIBU code. The proposal is to be discussed during the forthcoming meeting of the CBS Working Group on Codes.

7.14 After some discussion the panel decided that more time would be needed to assess the full implications of this particular proposal. However, it endorsed the general principles embodied in the proposal and especially endorsed the requirement for a code group, in the DRIBU code, for reporting measured wave height and period.

8. PUBLICATIONS (Agenda item 8)

8.1 Under this agenda item, the panel discussed first the DBCP newsletter and agreed on the following:

(a) The layout of the newsletter should consist of reports on some or all of the items listed in the outline attached as Annex VII;

(b) The newsletter should be issued on a quarterly basis;

(c) The newsletter should not exceed three to five pages;

(d) The newsletter should not duplicate any regular publication such as the WMO Monthly letter on the operation of the World Weather Watch (WWW) and Marine Meteorological Services (MMS), the IGOSS regular information service bulletion on Ocean Data Buoys and other Ocean Data Acquisition Systems (ODAS) (yearly),the TOGA newsletter, etc. but should refer to these publications as appropriate;

(e) Initially, the distribution list for the newsletter should comprise the national focal points for drifting buoy programmes and the members of the panel (including the participants in the panel's sessions), as well as other international bodies known to be involved in drifting buoy activities;

(f) The Secretariats will be invited to assist in the reproduction and mailing of the newsletter.

8.2 The panel was informed that, at its fourth session (Geneva, November 1985), the Joint IOC/WMO Working Committee for IGOSS decided, through Resolution 6 (JWC-IGOSS-IV), that work should be undertaken with the Joint IOC/WMO Working Committee for IGOSS, and in collaboration with the Drifting Buoy Co-operation Panel and the IOC Working Committee for IODE, for the preparation of a Guide to techniques for the management, processing and archival of drifting buoy data, which could assimilate the Guide to Argos data collection and location system (Report No. 10, Marine Meteorology and Related Oceanographic Activities report series of WMO). The panel examined proposed outlines for the guide and decided to retain the outline reproduced as Annex VIII, subject to the agreement of the chairmen of the Joint IOC/WMO Working Committee for IGOSS and of the IOC Working Committee for IODE. In so doing, the panel recognized that the objectives of the proposed guide would largely exceed the aims stated in the IGOSS resolution. On the other hand, it considered that the Guide should not duplicate Report No. 10, but only summarize, update as necessary, and refer to this publication in the relevant chapter.

8.3 In approving the preparation of this guide, the panel also noted the requirements for a similar Guide to moored buoys and other ODAS. It agreed that the inclusion of such information was inappropriate in the Guide to drifting buoys but requested the WMO Commission for Marine Meteorology (CMM) and the Joint IOC/WMO Working Committee for IGOSS to consider the appointment of a rapporteur (or rapporteurs) for the preparation of such a guide as a separate publication.

8.4 The panel was provided with copies of the most recent issue of the IGOSS regular information service bulletin on Ocean Data Buoys and other Ocean Data Acquisition Systems (ODAS). It considered that such an annual publication was of little value with regard to drifting buoys, in view of the rapid changes in status of such platforms. It therefore suggested that, in future, this publication could be restricted to non-drifting ODAS and requested the Secretariats to present this suggestion to the Joint IOC/WMO Working Committee for IGOSS at its next session. On the other hand, the panel welcomed the proposal by CLS/Service Argos to issue on a quarterly basis all relevant information with regard to drifting buoys, at no cost to the panel.

8.5 The panel was presented with a proposal regarding the contents of, and a preparation schedule for, the annual report of the Drifting Buoy Co-operation Panel (see Annexes IX and X). Consideration was taken in the proposal of the necessity to present a document to IOC and WMO governing bodies in the four official languages of the organizations, namely in English, French, Russian and Spanish. The panel approved this proposal, namely that the annual report should consist essentially of:

- An executive summary, in the four languages, for presentation to the two Executive Councils
- A detailed report, in English, along the lines given in Annex IX.

It welcomed the offer by IOC to publish the first such report for the year 1987 (the report is to be published alternately by IOC and WMO). As far as a logo for the panel was concerned the panel agreed that its members should send proposals to the chairman by the end of July 1987 and that it would examine these proposals at its next session. The panel gratefully welcomed the offer of the USA to provide for artistic support in the final design of the logo.

9. REVIEW OF THE PANEL OPERATING PROCEDURES AND TASKS OF THE TECHNICAL CO-ORDINATOR (Agenda item 9)

9.1 The panel reviewed carefully both its operating procedures and the workplan which it had established for itself and the technical co-ordinator at its first session. It agreed that the operating procedures were both general and on-going in nature and therefore required only minor modification of an editorial nature. These modified procedures are given in Annex XI.

9.2 The panel noted that many of the tasks in the existing workplan were assigned to the technical co-ordinator. In view of the delay in the appointment of the technical co-ordinator, these tasks were yet to be accomplished and therefore should be retained in the next workplan. The panel also took note of the new tasks assigned to the technical co-ordinator during the session, in particular with regard to quality control and OWSE-NA, and agreed that these should be added to the workplan. Finally, the panel also agreed that the workplan should refer explicitly to the terms of reference for the technical co-ordinator as well as those for the panel. The final revised workplan is given in Annex XII.

10. ELECTION OF THE PANEL CHAIRMAN (Agenda item 10)

10.1 The panel elected Mr. C. Billard as its chairman for the coming intersessional period.

11. DATE AND PLACE OF THE NEXT SESSION (Agenda item 11)

11.1 The panel was pleased to accept the offer by the IOC Secretariat representative for the IOC to host the third panel session in Paris in 1987. The panel agreed that the session should be held in conjunction with the seventh Argos Joint Tariff Agreement meeting and that, subject to agreement by the sixth Argos Joint Tariff Agreement meeting, the dates for the panel session would be 21 to 24 October 1987.

12. CLOSURE OF THE SESSION (Agenda item 12)

12.1 In his closing remarks to the session, the chairman, Mr. C. Billard, paid tribute to all members of the panel for the friendly and co-operative spirit in which the session had been conducted, which had contributed substantially to the very positive results which had been achieved. He also thanked the Secretariats for their continuing and very valuable support for the panel and its activities.

12.2 The second session of the Drifting Buoy Co-operation Panel closed at 11.45 a.m on Friday 17 October 1986.

LIST OF PARTICIPANTS

CANADA

A.D.J. (Des) O'NEILL
Regional Director, Atlantic Region
Atmospheric Environment Service
1496 Bedford Highway
BEDFORD, Nova Scotia
Canada B4A 1E5

FRANCE (chairman)

Christophe BILLARD
SCEM/PREVI/MAR
Météorologie nationale
2, Av. Rapp
75340 PARIS CEDEX 07
France

Pierre NOUNOU
Institut français de recherches pour
l'exploitation de la mer (IFREMER)
66, av. d'Iéna
75116 PARIS
France

GREECE

George KASSIMIDIS
Chief, Marine Meteorology Branch
Hellenic National Meteorological Service
P.O. Box 73502
GR 16603 Hellinikon
ATHENS
Greece

NETHERLANDS

Frank GROOTERS
Senior Consultant
Royal Netherlands Meteorological Institute
P.O. Box 201
3730 AE DE BILT
The Netherlands

SAUDI ARABIA

N.I. TAWFIQ
Director-General
Meteorology and Environmental Protection
Administration (MEPA)
P.O. Box 1358
JEDDAH 21431
Saudi Arabia

J. BAHANNAN
Director of Instruments
Meteorology and Environmental Protection
Administration (MEPA)
P.O. Box 1358
JEDDAH 21431
Saudi Arabia

USSR	Mikhail I. BUSHAEV Chief, Meteorological Instruments Division USSR State Committee for Hydrometeorology and Control of Natural Environment 12 Pavlik Morozov Street 123376 MOSCOW D-376 USSR
UNITED KINGDOM	Derek PAINTING Assistant Director (Operational Instrumentation) Meteorological Office (MET 016) Beaufort Park, Easthampstead WOKINGHAM, Berkshire RG11 3DN United Kingdom
USA	Glen D. HAMILTON Chief, Data Systems Division National Data Buoy Center NSTL, MS 39529 USA
	Terry E. BRYAN Office of Climatic and Atmospheric Research NOAA - R/CAR 6010 Executive Boulevard ROCKVILLE, MD 20852 USA
	Kenneth A. MOONEY U.S. TOGA Project Office NOAA - R/CAR 6010 Executive Boulevard ROCKVILLE, MD 20852 USA

ORGANIZATIONS

CLS/SERVICE ARGOS	Michel TAILLADE-CARRIERE Directeur général CLS/Service Argos 18, Av. E. Belin 31055 TOULOUSE CEDEX France
	Alain GOASGUEN Directeur technique CLS/Service Argos
	Tom BABITS Argos Project Manager CLS/Service Argos

CLS/SERVICE ARGOS (Contd.)	Louis MESNIER Ingénieur d'affaires CLS/Service Argos
	Pierre-Yves LE TRAON Département technique CLS/Service Argos
COST-43	Thor KVINGE Project Leader, COST-43 The Chr. Michelsen Institute Fantoftvegen 38 N-5036 FANTOFT Norway
SERVICE ARGOS INC.	Jean-Luc BESSIS President Service Argos Inc. 1801 McCormick Drive, Suite 10 LANDOVER, MD. 20817 USA
OBSERVERS	B. GHAURI Senior Engineer Space Science Division Pakistan Space and Upper Atmosphere Commission P.O. Box 8402 KARACHI-32 Pakistan
SECRETARIATS	
IOC	Yves TREGLOS Assistant-Secretary IOC, UNESCO, 7 place de Fontenoy 75700 PARIS France
WMO	Peter DEXTER Chief, Ocean Affairs Division World Weather Watch Department Case postale No 5 CH-2111 GENEVE Switzerland
	Mikhail KRASNOPEROV Scientific Officer Ocean Affairs Division World Weather Watch Department

(This page left intentionally blank.)

AGENDA

1. ORGANIZATION OF THE SESSION

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

2. REPORTS

   2.1 Report from the chairman of the Drifting Buoy Co-operation Panel
   2.2 Report from the WMO Secretariat
   2.3 Report from the IOC Secretariat
   2.4 Report from the technical co-ordinator

3. FINANCIAL MATTERS

4. NATIONAL AND INTERNATIONAL FOCAL POINTS FOR DRIFTING BUOY PROGRAMMES

5. REQUIREMENTS FOR DRIFTING BUOY DATA

6. REPORTS ON CURRENT AND PLANNED DRIFTING BUOY PROGRAMMES

7. CO-ORDINATION ACTIVITIES

8. PUBLICATIONS

9. REVIEW OF THE PANEL OPERATING PROCEDURES AND TASKS OF THE TECHNICAL CO-ORDINATOR

10. ELECTION OF THE PANEL CHAIRMAN

11. DATE AND PLACE OF NEXT SESSION

12. CLOSURE OF THE SESSION

(This page left intentionally blank.)

VHF DOWNLINK ON NOAA SATELLITES

CLS/Service Argos presented a report on the future of the VHF downlink on NOAA satellites. This information was reported by the NASA TIROS-N Project to CNES Argos Space Segment Project at their last progress meeting.

In 1990, the allowed bandwidth for the VHF downlink will be reduced from 136-138 MHz (2MHz) to 137-138 MHz (1 MHz).

On NOAA-K, -L and -M, the Advanced Data Collection and Location System (ADCLS) requires a 2.5 k bit rate instead of 720 b/s on NOAA-A to -G or 960 b/s on NOAA-H to -J.

Due to the bandwidth restriction, it was decided to maintain a 8320 b/s VHF downlink, in which ADCLS uses 2.5 k bit/s. Some of the other "low bit rate instruments" will no longer be on this VHF downlink, but will be recorded on-board (stored TIP).

S/C	VHF bandwidth MHz	bit rate		
		DCS	VHF beacon	stored TIP
T N N.A - G	136 - 138	720	8320	8320
N-H - J	136 - 138	960	8320	8320
N-K - M	137 - 138	2500	8320	16640

(This page left intentionally blank.)

PROVISION OF INFORMATION IN SUPPORT OF OPERATIONAL WWW SYSTEMS EVALUATIONS - NORTH ATLANTIC (OWSE-NA)

1. The following reports are required from the Drifting Buoy Co-operation Panel and COST-43.

A. Systems characteristics, services and costs

A single report listing:

(i) The general characteristics of each buoy design, including size and weight; drift chracteristics; outline structure of power source, data processing and transmission modules; sensors carried; variables measured and expected range resolution and accuracy of measurements; data processing at buoy and at data reception centres; coding; communications methods; frequency of observations; actual and potential frequency of transmissions; failure characterictics (e.g. average life) of sensors, system modules, and buoy; and average length of useful meteorological data. Results of any field trials or intercomparisons are also useful. Finally an overview is required of any difficulties or restrictions imposed by the system characteristics on its use, location, data transmission or reception, etc;

(ii) Manufacturers of each design and arrangements for procurement, deployment, recovery, maintenance and refurbishment; deficiencies and advantages of these arrangements;

(iii) Capital cost of each design, LUT costs;

(iv) Annual running costs - for deployment, recovery, maintenance, refurbishment, LUT operation, administration, data monitoring, etc. Capital and running costs should be standardized as described in Section 2.4 of the main body of the Plan (not reproduced here);

(v) Expected drift patterns in areas of deployment;

(vi) Likely trends in technology, manufacture and service abilities over the next ten years; trends in costs; likely trends in satellite and LUT usage.

B. Organization and function of co-ordinating groups

A report from each of the Drifting Buoy Co-operation Panel and COST-43 which describes the organization and functions, including:

(i) The objectives, terms of reference, structure, membership, responsibilities and working arrangements; responsibilities of the executive board and sub-committees. The extent of the responsibilities in respect of funding, procurement, ownership, installation, carriers, operation, maintenance and recovery of the observing systems should be described;

(ii) The cost of operating the agency, and its executive bodies or personnel, and any facilities it uses;

(iii) Procedures for real-time and statistical monitoring of observing system performance, for initiating remedial actions based upon monitoring activities and for the exchange of monitoring results;

(iv) The effectiveness of the organization in meeting its objectives and terms of reference; the adequacy of the terms of reference.

C. Yearly plans for the deployment of buoys, their types and location and for the introduction of new LUTs and their service area

D. Notification of the operational introduction of buoys, changes of data collection methods, failure of systems/sensors/LUT services and recovery of buoys

E. Six-monthly retrospective reports including:

(i) Number and types of buoys due for delivery over a six-month period and delivery schedule; actual dates of delivery; number and types of buoys scheduled to be deployed over the last six months; actual dates of deployment; problems of procurement and deployment; number and types of buoys recovered and dates of recovery;

(ii) For each operational buoy: owner; identifier; monthly location; period of serviceability of buoy and of each sensor power supply, data processing and communications modules (if known); period of serviceability of LUTs; number of observations expected from source, estimated number sent and numbers received via LUT; average time delay for receipt at LUTs and standard deviation;

(iii) For each recovered buoy: identifier; details of maintenance, replacement (of sensors/modules) or other refurbishment;

(iv) An overview of faults and problems occuring in period and of problems solved.

2. Reports should be sent to addresses provided elsewhere, by the times indicated in Section 4.2 of the main body of the Plan (not reproduced here).

Information collated by the technical group itself, its executive or secretariat should be sent directly to the distribution point (to be nominated). Normally the single reports described in paragraphs 1A, B, will fall into this category.

Routine information (as described in paragraphs 1C, D, E) will normally be assembled on a national basis by individual participants of the group and should be sent to the distribution point through the national focal points.

INFORMATION REPORTS ON DRIFTING BUOY ACTIVITIES

from the following countries:

A. Australia

B. Canada

C. France

D. Greece

E. Japan

F. The Netherlands

G. Pakistan

H. Saudi Arabia

I. Union of Soviet Socialist Republics

J. United Kingdom

K. United States of America

A. Australia

1. The Bureau of Meteorology has a continuing program to procure up to eight drifting buoys per year and deploy them in the area 25S to 60S and 60E to 150E. The buoys will carry pressure, sea surface temperature and air temperature sensors, and trials are planned for 1987 to evaluate a drifting buoy carrying wind speed and wind direction sensors. Australia will continue to support the TOGA buoy program by deploying up to 20 NOAA supplied buoys each year in the Australian area.

2. The Antarctic Division presently operates three drifting buoys in Antarctica. The Division plans to deploy up to three drifting buoys per year in the sea ice zone for five or more years. The Division also plans to continue operating two PTTs in 1987 as part of a pilot study for the possible future use of the ARGOS location system for studying the long term movement of fast moving outlet glaciers.

3. The Commonwealth Scientific and Industrial Research Organisation (CSIRO) Division of Oceanography operates an average of five drifting buoys per year as a combined CSIRO/Navy drifting buoy program to monitor the East Australian current. The CSIRO/Navy buoys carry sea surface temperature sensors and are drogued. Future programs will be developed to include meteorological and oceanographic sensors if resources allow.

Addresses of Australian Drifting Buoy Operators

Mr. Wally SELESNEW
Bureau of Meteorology
P.O. Box 1289K
Melbourne, Vic. 3001
AUSTRALIA

Dr. George CRESSWELL
CSIRO Marine Laboratories
Division of Oceanography
G.P.O. Box 1538
Hobart, Tas. 7001
AUSTRALIA

Mr. John MORRISSY
Antarctic Division
Department of Science and Technology
Channel Highway
Kingston, Tas. 7150
AUSTRALIA

B. Canada

Drifting buoy programs in Canada are undertaken principally by the Department of Fisheries and Oceans and by the Atmospheric Environment Service (AES) of the Department of Environment with assistance from the Departments of Transport, National Defence and, occasionally, from private oil exploration companies.

THE ATMOSPHERIC ENVIRONMENT SERVICE

1. AES interest in drifting buoys arises out of its responsibility for weather, sea state and ice forecasting for Canadian waters. The Service operates two LUT's, one in Edmonton, Alberta and the second in Downsview (Toronto), Ontario. In addition, AES deploys and maintains drifting buoys in the Pacific, Arctic and Atlantic Oceans as outlined below.

2. Pacific Ocean

The locations of the six AES drifting buoys currently operating in the northeast Pacific are shown in the attached copy of "Status -- Drifting Buoys - North Pacific" dated 22 July 1986.

Parameters:

All drifting buoys except buoy 5319, report barometric pressure and water temperature. Buoy 5319 has additional wind speed and air temperature sensors -- the wind speed sensor failed within two months of deployment.

Buoy data is transmitted, via TIROS N, in WMO DRIBU code and distributed on the GTS.

Future Plans:

Pacific Region has eight drifting buoys on hold for deployment. These buoys were built by Polar Research Laboratories - California - the manufacturer of buoy #5319 referenced above. The manufacturer is modifying the software and retrofitting new wind speed sensors to bring the performance of these eight buoys to an acceptable level. When modified, two of these buoys will be air deployed, with the cooperation of the United States Coast Guard, Anchorage. As an interim step, to maintain a spatial network in the northeast Pacific, it is proposed to air deploy three MetOcean mini drifters in September. These will report barometric pressure, air and water temperature.

STATUS - DRIFTING BUOYS - NORTH PACIFIC

July 22, 1986

IDENTIFICATION NUMBERS OF BUOY	PRESENT POSITION	DATE DEPLOYED	DEPLOYMENT POSITION	DEPLOYED BY	LENGTH OF OPERATION	DROGUE TYPE	COMMUNI-CATE VIA	REMARKS
46664 32F1C 3260	51.5N 131.6W	850508	49.9N 145.0W	Parizeau	14 months	Holey Sock	TIROS N	Buoy refurbished after recovery Sept./84.
46665 32F4F 3261	49.6N 145.7W	860422	50.3N 145.0W	John P. Tulley	3 months	Holey Sock	TIROS N	Recovered in Hawaii Feb./86 refurbished.
46673 52FED 5311	42.7N 159.8W	851011	43.3N 164.8W	Sun Island	9 months	Holey Sock	TIROS N	
46674 53000 5312	57.0N 158.9W	851213	54.4N 144.1W	Bergen Thistle	7 months	Holey Sock	TIROS N	
46676 530A6 5314	53.9N 152.8W	851214	54.4N 151.8W	Bergen Thistle	7 months	Holey Sock	TIROS N	Pressure off.
46677 531EA 5319	42.0N 130.5W	851218	41.1N 152.5W	Novokotovsk	7 months	Rope Line	TIROS N	W/S and A/T added. W/S failed 14/2.

3. Arctic Basin

Under the terms of a NOAA-AES MOU, AES contributes C$100,000/year to the Coordinated Arctic Buoy Program, until 1989. Buoys are procured by the Polar Science Centre, University of Washington, and shipped to Western Region AES, Edmonton. AES then arranges for the air-drop deployment of buoys by Department of National Defence Hercules aircraft onto the ice pack.

Air-dropped buoys generally measure only pressure and internal temperature, which is considered representative of the air temperature. Surface-deployed buoys are set out on the ice on an opportunistic basis as co-operation is secured from exploration interests or research groups. These buoys usually have wind and relative humidity sensors in addition to pressure and temperature. Upon successful deployment, buoys generally transmit for one to two years until the batteries fail or ice damages them.

Real-time transmissions from the buoys are received at the AES satellite reception facility in Edmonton. Information is decoded and data are re-formatted for transmission on the GTS. Data from the buoys are plotted for analysis of mean sea level pressure charts, to study ice motion, and are used for various scientific studies and research.

The latest buoy positions as of August 1, 1986 are given on the attached list. Tentative plans are to deploy approximately four buoys in the fall of 1986 at the following co-ordinates: 74N 130W, 78N 125W, 81N 130W, and 84N 150W.

4. Atlantic Ocean

During 1985/86, four drifting buoys were purchased by AES from MetOcean Data Systems of Dartmouth, Nova Scotia for deployment in the Atlantic. All were deployed by mooring along the continental shelf off Canada's east coast in 100-200 metres of water. Reports were received via the Toronto LUT and relayed via the GTS. Problems were encountered with moorings and buoys and data were available for only short periods.

At present (August 1986) no AES drifters are deployed in the Atlantic and no firm plans are in place for deployments in the immediate future.

STATUS DRIFTING BUOYS-ARCTIC BASIN - 1 August 1986

DATE DEPLOYED	ARGOS ID	WMO ID	POSITION °LAT.	°LONG.	DATE BYTES	PRESSURE	TEMPERATURE	WIND VELOCITY	RELATIVE HUMIDITY
APR. 86	2404		82.272	+20.415	4				
MAY 85	2992		82.608	+85.071	4				
MAY 85	2993		81.102	+96.802	4				
AUG. 85	3161	48544	70.277	+145.439	4	X	X		
AUG. 85	3164	48545	75.881	+157.593	4	X	X		
AUG. 85	3165	48546	72.434	+173.577	4	X	X		
AUG. 85	3168	48549	86.121	+96.336	4	X	X		
MAY 84	3832	65501	85.405	+77.234	4	X	X		
NOV. 84	3843	63542	86.597	+64.446	8	X	X		
OCT. 84	3848	48538	76.715	163.898	4	X	X		
JULY 84	3849	47506	76.571	+134.009	4	X	X		
APR. 85	3874	47502	82.829	+115.242	32	X	X	X	
MAR. 86	3880	47503	73.318	+157.360	32	X	X	X	
MAR. 86	7010	48537	79.197	+146.580	12	X	X	X	X
MAR. 86	7012	48550	79.941	+172.200	12	X	X	X	X
MAR. 86	7021	47505	74.361	+142.797	4	X	X		
MAR. 86	7022	47508	77.149	+154.501	4	X	X		

C. France

The SOBA programme, which is conducted under the COST-43 agreement, continues in the Irminger Sea. France contributes up to three buoys per year to this programme and also undertakes the technical co-ordination. The objective of this experiment is to maintain in permanent operation two drifting buoys in the area 25°-45°W/55°-63°N during a three-year period beginning September 1984. The data from these buoys are collected by the Argos system (full earth segment or LUT) then inserted onto the GTS. The parameters measured must include atmospheric pressure and sea surface temperature.

With regard to the conduct of the experiment since the middle of 1985, it is noted that the objective of two buoys simultaneously in the zone was maintained until the end of March 1986. Following successive technical failures around that time, the coverage was only one buoy until the end of June 1986. Since then, the prerequisite two buoys have again been in operation. An example of the buoy trajectories is given in the attached figure.

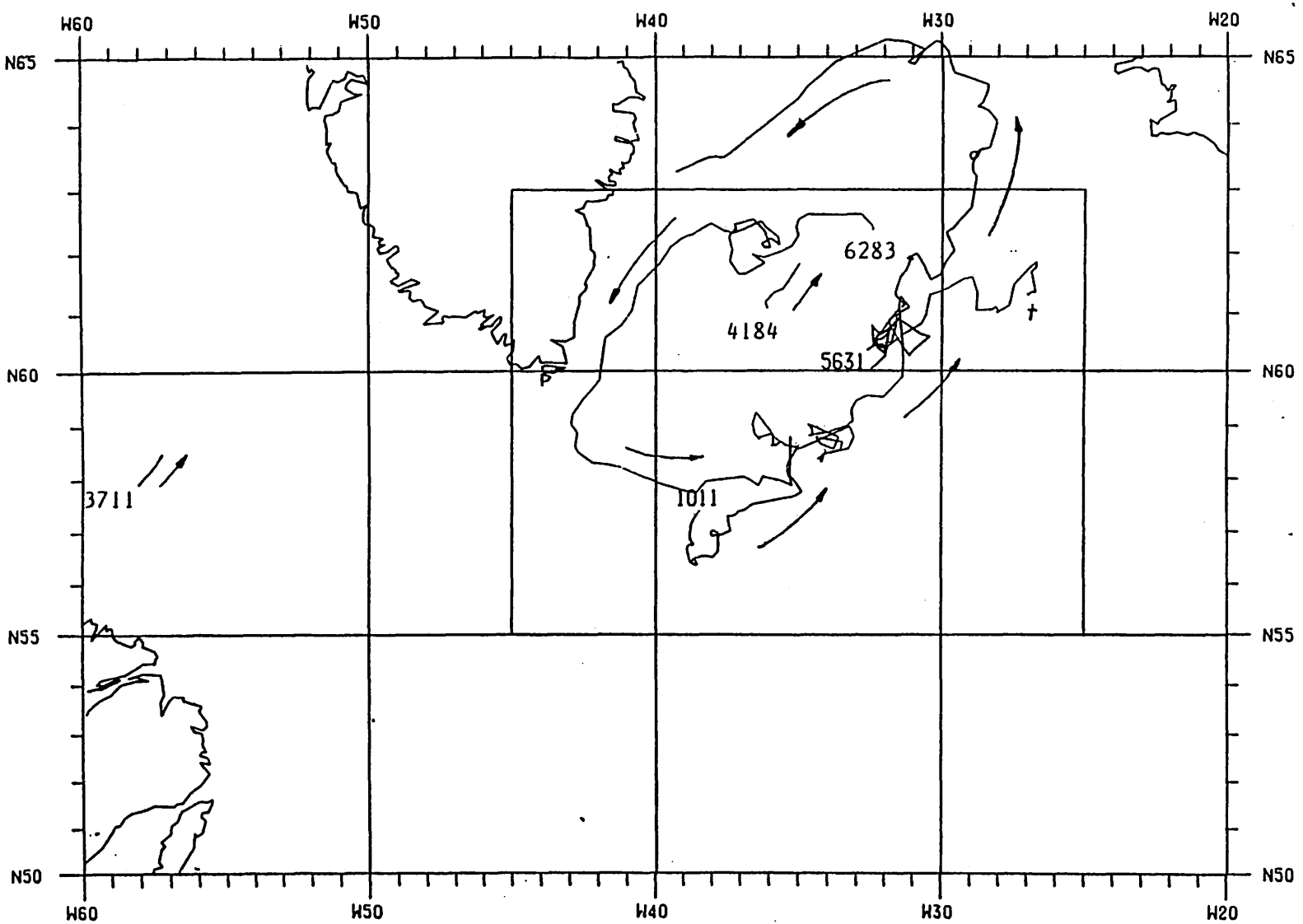
Other than planning the deployment and eventual recovery and repair, the technical co-ordinator is involved in the insertion of the data onto the GTS, as well as in data quality control based on monthly information provided by ECMWF.

The SCOS programme, which is based on principles very similar to those of SOBA, will begin at the end of this year. France will provide four buoys per year and again undertake the technical co-ordination.

In addition, the installation and evaluation of new sensors is continuing: for wind, for which the measurement is not yet fully viable, and for ocean surface layer temperatures. Buoys specially equipped for such temperature measurements are now being tested at Brest.

TRAJECTORIES ON AUGUST 24TH, 1986

ARGOS Icl.



D. Greece

Greece has not had yet any experience with drifting buoys or any other sort of buoy for meteorological/oceanographic services. To operate drifting buoys in the eastern Mediterranean may not be very successful considering the many islands, close sea areas and short distances between coasts. In any case, Greece plans to deploy for the first stage, one or two moored wave buoys.

E. Japan

The Japan Meteorological Agency has carried out oceanographic surveys every summer and winter in the western tropical Pacific onboard Ryofu Maru. The surveys are being made along the meridian at 137°E crossing major zonal ocean currents from south of Japan to north of New Guinea. Japan will co-operate with the Drifting Buoy Co-operation Panel in offering opportunities for the deployment of drifting buoys during the said cruises.

F. The Netherlands

In 1987 the Netherlands will continue to support the COST-43/SOBA programme. In addition to this programme, the Netherlands will start its contribution to the SCOS programme. The contribution to each programme will probably be one drifting buoy since two drifting buoys (supplied by Bergen Ocean Data) have already been appointed for use within COST-43. In 1988, the contribution to the COST-43 programme will also be a total of two buoys.

G. Pakistan

The Pakistan Space and Upper Atmosphere Research Commission is planning to deploy a few drifting buoys in the Arabian Sea near the Pakistani coast. The buoys will be used to transmit meteorological as well as oceanographic data to a station located at Karachi. The use of the Argos system is under consideration for the purpose. The deployment of such buoys will help in weather forecasting, oceanographic studies and marine studies being carried out in the country.

H. Saudi Arabia

The Kingdom of Saudi Arabia has limited experience with the use of drifting buoys in its waters.

This started nearly four years ago when on February 10th, 1983, an Iranian oil platform located in the Arabian Gulf in the NORWUZ oil field at 29.5 degrees north, 49.4 degrees east, collapsed. Oil pollution from this platform and other affected wells was estimated to be from 2000 to 12000 barrels per day, with 4500 barrels per day regarded as the generally accepted rate. As a result of this pollution threat to the Gulf and to the Saudi Arabian marine industries, coast and coastal waters, MEPA established an Oil Spill Response Task Force in Dhahran, Saudi Arabia, to coordinate the Kingdom's response effort. MEPA's environmental team was hampered by the lack of real-time observational data from stations in this area and the team quickly identified drifting buoys as a method of obtaining both meteorological and oceanographic data.

MEPA's responsibilities include the provision of marine forecasts for the Gulf. MEPA also had the additional responsibility of providing specialized forecasts for the Oil Spill Task Force operations which included small boat movements, placement of protective equipments, and preparations for offshore combat of marine pollution in addition to spill movement predictions.

Meteorological observations in the Gulf were limited to infrequent reports from scattered oil platforms which were received through oil company channels in non-standard formats. Reports from ships using the Gulf waters were very limited due to restricted communications procedures practised by vessels in this sensitive area.

With the assistance of the U. S. Department of Commerce - NOAA - in the early stages, our initial buoy purchase included seven (7) conical drifting buoys manufactured by Hermes Electronics, Limited, principally for oceanographic measurements, and six (6) NOAA drifting buoys manufactured by the Polar Research Laboratory, to assist with meteorological measurements. At the same time, negotiations were in progress with "Service ARGOS" to arrange real-time delivery of the data. These efforts succeeded on May 28th, 1983 when the buoys arrived in Dhahran...the first buoy was in the water on the 31st of May, less than 4 months after the reported NOWRUZ incident.

National.

Our National Programme to deploy and recover buoys was formulated with the assistance of numerous Kingdom Ministries, including the Ministry of the Interior, Ministry of Petroleum, Ministry of Defence and Aviation, and the Sea Ports Authority. Some MEPA staff were quickly trained to participate in the programme activities and the flow of data was started to the environmentalists.

Several deployment methods were used. Initially, buoys were hung under Civil Defence helicopters, transported to the launch site, lowered into the sea and released. Oil company workboats and Coast Guard vessels were also used for deployments using the more usual method of lowering "over the side" and releasing with pelican hook devices. After the initial deployments, recovery and subsequent re-use was made prior to land fall by using workboats and small craft. On several occasions, when recovery plans failed, the buoys were beached in neignbouring countries. This delayed the recovery and re-deployment of the buoys. Some buoys were never recovered because they were damaged upon beaching causing a loss of signal. In several cases, the oil companies in the region co-operated very effectively to return the buoys for reuse.

Although our buoy deployments were announced through "Notice to Mariners" and buoy positions were broadcast via the coastal radio stations, buoys were retrieved by unknown parties and returned to port. On separate occasions, two buoys were retrieved in the offshore waters, one was transported to an identifiable port in Qatar and the other to a port in Kuwait. Through "Service Argos" reports, we followed the buoy movements inland until the signal failed. The buoys were never found.

On three other occasions, buoys were retrieved while drifting in the offshore area by oil company vessels. In all these cases, transmission continued allowing vessels to be identified and then contacted. The only penalty imposed on the recoveror was that MEPA asked that the buoy be re-deployed in an offshore area. We received maximum co-operation from the oil companies.

We had an unexpected six-months delay in our programme when explosive mines from unknown sources were found in the area. The maritime agencies stopped the buoy programme to minimize sightings of drifting objects. When it was shown that the buoy programme could provide excellent guidance for the tracking of any mine-like objects, the programme was allowed to continue. However, with this approval, the programme logistics increased. We then were required to notify numerous parties at least twice daily of the location of each drifting buoy. This was done by sending position data via telex from the MEPA Central Forecast Office in Jeddah to the coastal radio stations, oil companies, maritime authorities, and to Governments of the neighbouring states. With these compromises, the buoy programme continued.

During this initial phase, our drifting buoy programme, including "Service ARGOS" relay, did meet some minimal meteorological requirements for the preparation of forecast products.

-Buoy trajectory data from the active drifting buoys has provided baseline data for MEPA analyses on the movement of water parcels in the areas adjacent to the coastline of Saudi Arabia.

-Oil spill trajectory model output comparisons with selected trajectories are being investigated and reviewed.

-Areas with possible onshore current components which might carry oil towards the sensitive coastal industrial facilities have been identified for investigation.

-Sea surface temperature data is being archived.

In MEPA's follow-on drifting buoy programme, an additional ten (10) additional buoys were ordered and were received from CEIS-ESPACE in France. Two short experiments have been conducted off Jeddah in the central Red Sea in an attempt to gain understanding of the currents near the Jeddah Islamic Port and the desalination plant to the north of the city. Similar experiments are scheduled for the sea area west of Yanbu in the northeast Red Sea. One of these buoys has a fault which effects its location accuracy.

MEPA is proceeding with the conversion of the Al-Arabiyah Island (27-46N 50-10E) Automatic Weather Station in the Gulf for ARGOS operations. This AWS is considered vital to both the meteorological and marine components of MEPA products because of its permanent location in an otherwise changing network of weather reporting ships. Other AWS sites in Saudi Arabia may also be considered for modification in the future.

All marine areas near the coastline of Saudi Arabia are considered as data sparse zones by oceanographers. Modelling efforts have shown the need for more oceanographic data to be collected in these areas. A need has been stated to obtain additional track information for the study of seasonal variabilities, identification of slack areas, areas of divergence and boundary current monitoring. Therefore, collection of marine meteorological data from drifting buoys is valued and will be considered to meet future requirements in other data sparse areas.

In the Gulf, we are now looking at using a combination of fixed buoy and fixed platform networks , leaving the drifting buoys for the collection of marine meteorological data in other data sparse areas. Drifting buoys may be considered for use in the Gulf of Aden, Gulf of Oman, and the Arabian Sea, and other remote areas of the Red Sea subject to further development

through the regional organizations to be discussed later. Drifting buoys will be used in future operational networks with a Local User Terminal due to be delivered and installed at the National Meteorology and Environmental Center, Jeddah later this year.

Regional.

There are several Regional Organisations in which MEPA is actively involved. These include ROPME, which means the Regional Organisation for the Protection of the Marine Environment. The area of responsibility is the "sea area" which includes the Gulf, Straits of Hormuz, Gulf of Oman, and portions of the Arabian Sea. Next the GCC, the Gulf Co-operation Council, which includes the "sea area" similar to ROPME. PERSGA is a Regional Organisation for the Protection of the Environment of the Red Sea and Gulf of Aden. The "sea areas" include the Red Sea, Gulf of Aden, Bab Al-Mandab, Gulf of Aqaba, and the Gulf of Suez.

We feel that the experience gained by Saudi Arabia's drifting buoy technologies and systems will be beneficial towards participation as an even stronger member of these regional organisations. MEPA's drifting buoy programme, as a part of the national marine programme, will move toward meeting our program objectives and may well serve as an example for other organisations and institutions in this part of the world. Our activities to date are limited to the enclosed areas of the Gulf and Red Sea. Future developments through regional organisations may well lead to additional areas.

I. Union of Soviet Socialist Republics

The Soviet Union recognizes the value of drifting buoy programmes and fully supports the World Weather Watch and World Climate Research Programmes in their efforts. In response to the requirements for WCRP addressed by the WMO Secretariat to the Drifting Buoy Co-operation Panel, the Soviet Union confirms its previous offer to assist in the deployment of drifting buoys from oceanographic research vessels as well as from Antarctic supply and other vessels reaching high southern latitudes. In addition, research vessels, equipped with reference instruments, could be supplied for buoy data comparison and calibration purposes.

J. United Kingdom

The United Kingdom Meteorological Office will continue to support the COST-43 drifting buoy programmes. At least ten more buoys will be deployed for SOBA (SE of Iceland) and two for SCOS (Azores region) over the next two years. Discussions are taking place to continue this operational activity after the present COST-43 agreement expires in 1988.

During 1986, the British Antarctic Survey deployed two buoys in the Antarctic sea ice as a contribution to the Winter Weddell Sea Project. It is hoped to retrieve these buoys, which have operated successfully, refurbish and redeploy them, together with a previously recovered wavebuoy, towards the end of 1987.

Other United Kingdom programmes for oceanographic research purposes in the Continental Shelf region involving the use of drifting buoys during 1987 are planned by the Institute of Oceanographic Sciences, the Scottish Marine Biological Association and the Sea Mammal Research Unit.

K. United States of America

During 1987, the United States plans to have over 800 platforms deployed which will require about 360 platform years of Argos processing. These platforms, deployed in nearly every ocean area of the world for over 60 meteorological, oceanographic and biological programmes, will be primarily drifting buoys (about 520) of various configurations for ocean and climate research. Many of these drifting buoys will also provide data for operational programmes. The platforms also include 38 land stations primarily in Antarctica, over 60 moored buoys (mainly large meteorological buoys near the U.S. coast and equatorial moorings for ocean climate research), about 27 ship systems, and about 150 systems for tracking birds, turtles, seals, musk ox, big horn sheep, bears, elk, manatees, and caribou. Six rockets will also carry Argos transmitters.

The Tropical Ocean and Global Atmosphere (TOGA) Programme and the related ocean climate research programme, Equatorial Pacific Ocean Climate Studies (EPOCS), will account for a large portion of the U.S. drifting buoys deployed in 1987. EPOCS will continue an array of about 65 buoys in the eastern tropical Pacific. Deployments for TOGA began in 1984 with emphasis on the Southern Hemisphere (about 40). Plans also call for deployments in the Equatorial Pacific (30) and Indian Ocean (44). A total of about 180 drifting buoys are planned for TOGA and related ocean climate research programs in 1987.

In addition to TOGA/EPOCS, several other research programmes using drifting buoys will be conducted. These include: circulation studies in the Gulf of Alaska, Gulf of Maine, Gulf of Mexico, and Great Lakes; investigation of the impact of environmental variability on fish and shellfish populations in the Alaska region; tracking of marine debris such as fish nets; physical and biological oceanographic process studies; and development, test, and evaluation of new systems.

The Arctic Basin Buoy Programme, in co-operation with Canada and Norway, will continue through 1987 to measure and archive the pressure field and ice velocity and their year-to-year variations for climate studies and to provide real-time data for analysis and forecasting of weather and ice conditions. This programme will be expanded to about 30 buoys in 1987. In addition to this programme, drifting buoys will be used for other research programmes in the Arctic Region to study air-sea-ice interaction and marginal ice zone processes, and ice movement and dynamics.

The U.S. Coast Guard uses drifting buoys in the North Atlantic to collect data on currents and sea surface temperature to support their missions of search and rescue and international ice patrol. Drifting buoys are planned for deployment in data-sparse regions of the North Atlantic and in advance of tropical cyclones to support operational environmental analyses and forecasts. About 6 buoys are kept in reserve for rapid deployment to acquire meteorological data in environmental emergencies.

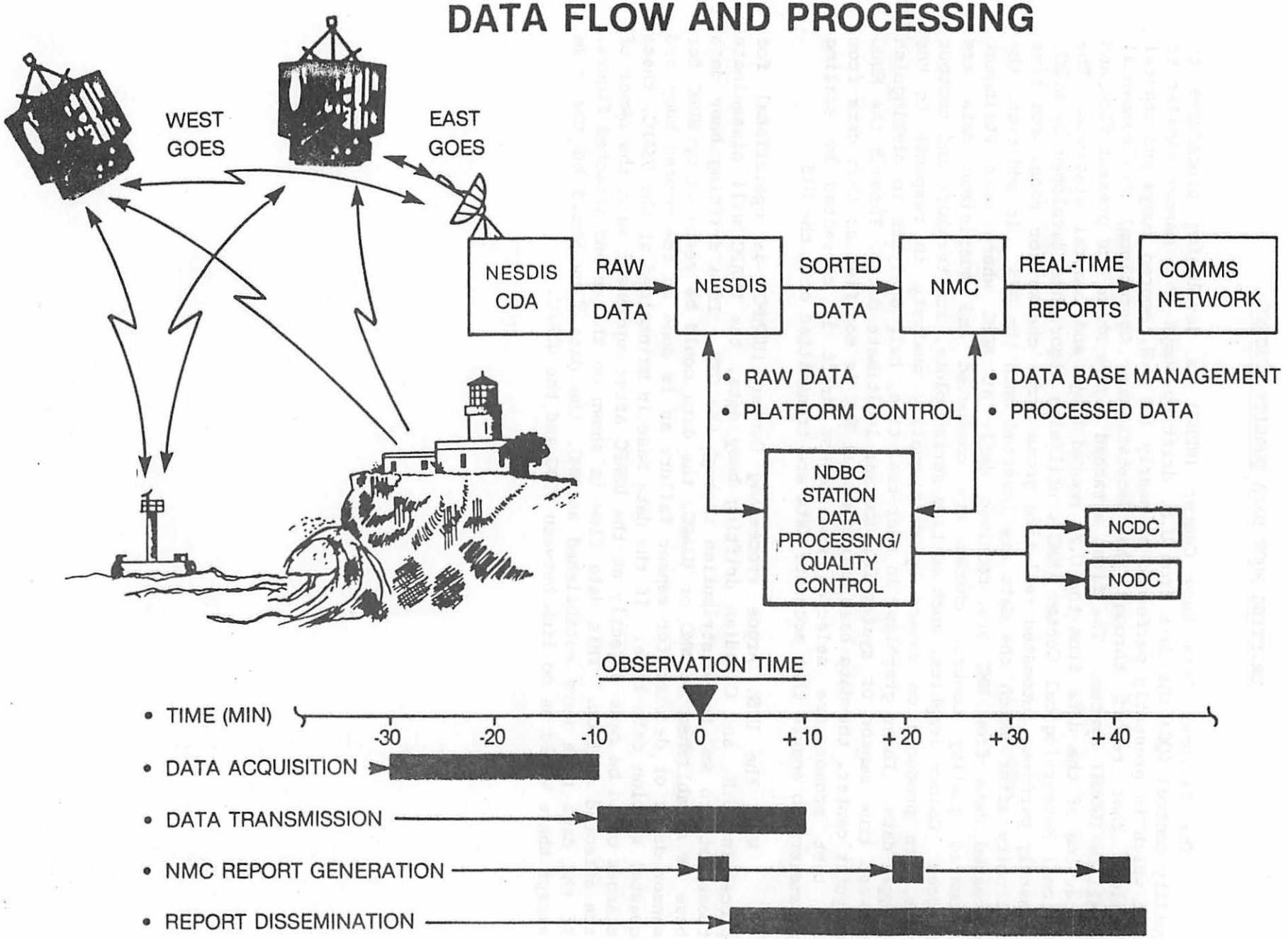
(This page left intentionally blank.)

DRIFTING BUOY DATA QUALITY CONTROL

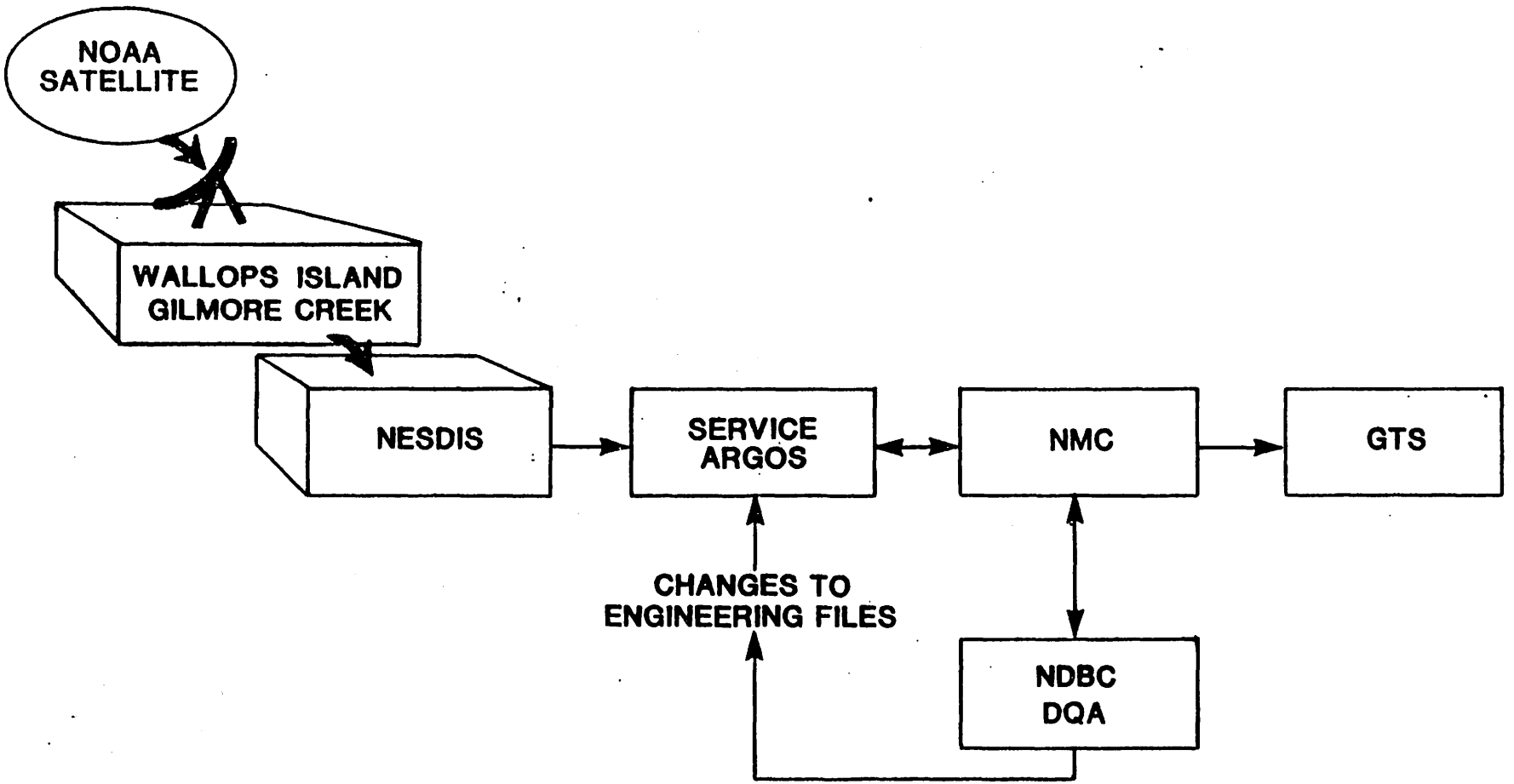
The National Data Buoy Center (NDBC) is developing procedures to quality control (QC) the data from U.S. drifting buoys in a manner similar to that which is presently performed on nearly 100 U.S. moored buoys and coastal stations that report through the Geostationary Operational Environmental Satellite (GOES) system. The first attached figure shows the present flow and processing of the data from the U.S. moored buoys and coastal stations. The National Meteorological Center (NMC), utilizing algorithms developed by NDBC, presently performs automated real-time gross error checks for range and time continuity after which the data are inserted onto the GTS. In addition, the processed data from NMC are received daily at NDBC where more stringent automated quality control checks are conducted and suspicious data are flagged. Colour graphics, such as time-series plots, scatterplots and contour maps, are produced on demand by data quality analysts in response to the flagged data. These graphics, in near-real-time, help analysts to distinguish between true sensor or system failure and legitimate data. Through the NDBC computer center, the data base maintained at NMC is modified so that data from the best sensor are selected and sensor drift is corrected by scaling parameters to ensure that accurate data are transmitted onto the GTS.

When the U.S. Argos Processing Center (USAPC) is operational for processing U.S. and Canadian drifting buoy data, the USAPC will disseminate those data to NMC for distribution through the GTS. If a drifting buoy data base is established at NMC or USAPC, the data could be rescaled by NDBC for sensor drift or deleted for sensor failure as is done on the moored buoy and coastal station data base. If the data base is maintained at the USAPC, these changes could be made directly at the USAPC after agreement with the owner of the affected station. This data flow is shown on the second attached figure. If the data base were established at NMC, the data flow would be the same except there would be no link between NDBC and the USAPC.

DATA FLOW AND PROCESSING



DATA FLOW FOR SERVICE ARGOS USPC



(This page left intentionally blank.)

OUTLINE FOR THE QUARTERLY NEWSLETTER OF THE DRIFTING BUOY CO-OPERATION PANEL

Outline

- Information about new drifting buoy technologies
- Standardization of sensors and calibration procedures
- Current and planned drifting buoy programmes in their context (possible co-operation with oceanographic and meteorological programmes)
- Recent deployments or recoveries of drifting buoys
- Data dissemination: message formats, insertion and circulation on the GTS, Argos developments, etc.
- Data availability: real- or non-real time transmission, archiving
- Quality control
- Updating of national focal points for drifting buoy programmes
- Other panel activities: meetings, etc.

(This page left intentionally blank.)

OUTLINE OF AN IGOSS GUIDE TO DRIFTING BUOYS

1. INTRODUCTION

2. BACKGROUND

   2.1 History of drifting buoy development
   2.2 International and Member country experiments and operations
   2.3 Responsibilities of international bodies

3. DRIFTING BUOY HARDWARE

   3.1 Hulls
   3.2 Sensors
   3.3 Electronics
   3.4 Drogues

4. DRIFTING BUOY OPERATIONS

   4.1 Logistics
   4.2 Deployment techniques

5. DATA TELEMETRY, PROCESSING AND DISSEMINATION

   5.1 Service Argos
   5.2 Local User Terminals
   5.3 Real-time data availability
   5.4 Data quality
   5.5 Data archival

6. SYSTEM COSTS

   6.1 Hardware
   6.2 Logistics and deployment
   6.3 Data processing

(This page left intentionally blank.)

TABLE OF CONTENTS FOR THE ANNUAL REPORT OF THE DRIFTING BUOY CO-OPERATION PANEL

WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (of UNESCO)

DRIFTING BUOY CO-OPERATION PANEL

ANNUAL REPORT 19..

1. Table of contents

2. Foreword
   (to be written by chairman)

3. Executive summary
   (in four languages, to be used as report to both Executive Councils)

   - Introduction
   - Current status of drifting buoy programmes
   - Planned programmes
   - Data flow in real-time
   - Data archival
   - Technical developments
   - Panel subsidiary bodies
   - Relations with other organizations and programmes
   - Panel membership
   - Finances

4. Current status of drifting buoy programmes

   - Numbers, positions, age, instrumentation of buoys currently deployed
   - Additional deployments planned within existing programmes
   - Quality of buoy data

5. Planned programmes

   - Numbers, instrumentation, deployment areas of buoys for new programmes over the coming three-five years
   - Objectives of planned programmes

6. Data flow in real-time

   - Numbers of buoys reporting over the GTS
   - Delays in data insertion and receipt
   - Parameters reported
   - Received data quality
   - Assessment of buoys not reporting in real-time
   - Reporting codes

7. Data archival

   - Status report from RNODC (drifting buoys)

8. Technical developments

   - Buoy instrumentation
   - Hull design
   - Communications

9. Communications system status

   - Satellites
   - Argos system
   - Others

10. Panel subsidiary bodies

   - Reports from panel action groups or regional bodies, if any

11. Relations with other organizations and programmes

   - COST-43, SCOR, Service Argos, TOGA, etc.

12. Panel membership

   - WMO Members and IOC Member States directly involved in panel's activities
   - National contact points or representatives

13. Finances

   - Financial statement regarding funding for technical co-ordinator

Appendices (if required)

PREPARATION SCHEDULE FOR THE ANNUAL REPORT OF THE DRIFTING BUOY CO-OPERATION PANEL

- Annual report to be prepared by the technical co-ordinator, with the assistance from the chairman and the Secretariats, as required
- Translation of the executive summary and publication to be undertaken alternately by the Secretariats of WMO and IOC
- First draft outline report to be considered by the panel session in October/November each year
- Report to be finalized and approved by the chairman and delivered to the appropriate Secretariat by 1 December each year
- Translation (of the executive summary) and publication to be completed by mid-February
- Distribution of the report, end of February
- Presentation to the IOC Executive Council, March
- Presentation to the WMO Executive Council, June.

(This page left intentionally blank.)

OPERATING PROCEDURES FOR THE DRIFTING BUOY CO-OPERATION PANEL

1. To the extent that the panel is a formally established body of the WMO and IOC, panel members will be the representatives of Members of WMO or Member States of IOC which expressed a willingness to participate in the panel activities.

2. The panel will meet annually. Representatives of any institution or programme actively involved in the use, development or deployment of drifting buoys, or which specifically require drifting buoy data, may participate in the meetings.

3. The panel will elect a chairman from among panel members, to carry out the work of the panel between sessions. The chairman will prepare reports for the WMO and IOC as required, and act as the focal point for communications amongst the panel members.

4. The chairman may call on individual panel members for assistance in matters such as representing the panel at meetings of other bodies, preparing of reports on specific topics, etc.

5. The panel will also require the support of a full-time technical co-ordinator. The costs associated with this position will be supported through voluntary contributions to a trust fund specifically designated as being for the purpose. Assuming satisfactory progress the position will be reviewed at the 1987 and 1988 annual meetings.

6. The panel requires support from the Secretariats of WMO and IOC in the dissemination of invitations to panel meetings and the preparation of documents and reports related to meetings.

7. The terms of reference for the panel are those given in WMO Executive Council Resolution 10 (EC - XXXVII) and IOC Executive Council Resolution EC-XIX.7. The panel also adopts as terms of reference for its technical co-ordinator, those suggested by the WMO Executive Council in Resolution 10 (EC-XXXVII) and the IOC Executive Council in Resolution EC-XIX.7.

8. The working language of the panel, including for correspondence, will be English.

9. The panel operating procedures will be revised as required at the annual meeting. The chairman will prepare recommendations to be distributed before the meeting.

(This page left intentionally blank.)

DRIFTING BUOY CO-OPERATION PANEL WORK PLAN AND OBJECTIVES FOR THE SECOND YEAR

PART A

Summary of the tasks

1. Compile and maintain summary of requirements for drifting buoy data to meet expressed needs of the international meteorological and oceanographic communities.

2. Prepare and maintain a catalogue of existing on-going drifting buoy programmes.

3. Identify focal points for national contributions and within other relevant bodies with potential for involvement in drifting buoy programmes.

4. Identify sources of drifting buoy data not currently reported on the GTS and determine the reason for their non-availability.

5. Make proposals to the panel for co-ordination activity as a result of the above actions to address items 2 to 5 and 7 in the terms of reference for the Drifting Buoy Co-Operation Panel, and undertake actions possible before the next panel meeting.

6. Initiate and arrange for the circulation of quarterly newsletter containing information on the panel's activities, current and planned drifting buoy programmes and related technical developments.

7 Undertake tasks appropriate to satisfy the requirements of the OWSE-NA of WMO with regard to drifting buoys.

8 Develop a proposal for the implementation of real-time quality control procedures for drifting buoy data processed by the Argos processing centre in Toulouse.

9. Continue the arrangements (including finance) to secure the services of a technical co-ordinator.

10. Review programme and establish working priorities of the technical co-ordinator.

11. Prepare annual report of the Drifting Buoy Co-operation panel.

Task	Carried out by *	Supported / Assisted by	Reported to / Action by	Relevant terms of reference of the panel
1	Technical co-ordinator (1, 8)	Panel members and WMO/IOC Secretariats	Chairman for presentation to panel	1, 2
2	Technical co-ordinator (1, 3, 8)	Panel members and WMO/IOC Secretariats	Chairman and panel for information	1, 2
3	Technical co-ordinator (1, 3, 5, 8)	Panel members and WMO/IOC Secretariats	Chairman and panel for information	1, 2, 7
4	Technical co-ordinator (1, 7)	Panel members and WMO/IOC Secretariats	Chairman and panel for information	5
5	Technical co-ordinator and chairman (1, 3, 4, 5, 8, 9)	WMO/IOC Secretariats and others as appropriate	To panel for consideration and appropriate action or for direct action by chairman	1, 2, 3, 4
6	Technical co-ordinator (1, 3, 4, 5, 8, 9)	Chairman and WMO/IOC Secretariats	Wide circulation by WMO/ IOC Secretariats	6, 7
7	Technical co-ordinator (1, 5, 7)	Chairman, WMO Secretariat, COST-43 Technical Secretary	Chairman for presentation to Committee for the OWSE-NA	1, 3 7
8	Technical Co-ordinator (1, 2)	Panel members, WMO Secretariat	Chairman and panel	1, 2
9	Chairman and sub-committee	WMO/IOC Secretariats	WMO/IOC Secretariats	8
10	Chairman/panel		Panel (at next session)	8
11	Chairman	Technical Co-ordinator	Executive Councils of WMO and IOC	9

* When the technical co-ordinator is involved in carrying out a task, the figures in parenthesis relate to the terms of reference for the technical co-ordinator.