WORLD METEOROLOGICAL ORGANISATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (of Unesco)

DRIFTING BUOY CO-OPERATION PANEL

Sixth session

Melbourne, 16-19 October 1990

FINAL REPORT

GENERAL SUMMARY OF THE WORK OF THE SESSION

1. ORGANIZATION OF THE SESSION (agenda item 1)

1.1 Opening of the session (agenda item 1.1)

1.1.1 The sixth session of the Drifting Buoy Co-operation Panel was opened by the chairman of the panel, Mr. D. Painting, at 10 a.m. on Tuesday 16 October 1990 at the headquarters of the Australian Bureau of Meteorology, Melbourne. After welcoming the participants to the session, Mr. Painting called on the Director of the Bureau of Meteorology, Dr. J. Zillman, to address the panel.

1.1.2 As Permanent Representative of Australia with WMO, and on behalf of the Australian Government and the Australian permanent delegate to IOC, Dr. R. Green, Dr. Zillman extended a warm welcome to members and observers to the session, to the Bureau of Meteorology and to Melbourne. In doing so, he expressed the particular pleasure of the Bureau in being able to host this sixth session of the DBCP in Melbourne. This pleasure stemmed both from the long-standing involvement of the Bureau in drifting buoy deployment, dating back to the highly successful FGGE drifting buoy programme, and also from the unique geographical position of Australia within the data-sparse Southern hemisphere oceans, and the consequent recognition of the important role to be played by drifting buoys in the collection of data from the oceans. In this respect, Dr. Zillman noted that the DBCP acts as an important catalyst and co-ordinating mechanism for increasing the availability of essential meteorological and oceanographic data in support of both operations and research, and affirmed that the panel has the continuing full support of the Bureau of Meteorology in all its activities. Dr. Zillman also noted that on another level the panel demonstrated the importance of, and possibilities for co-operation between meteorologists and oceanographers, both nationally and internationally, on ocean observing programmes of common interest. In conclusion, Dr. Zillman wished all participants in the meeting a very successful session and an enjoyable stay in Melbourne.

1.1.3 On behalf of the Secretary-General of WMO, Professor G.O.P. Obasi, the WMO Secretariat representative also welcomed all panel members and observers to the sixth session of the panel. In doing so, he expressed the considerable appreciation of WMO to the Australian Government, to Dr. Zillman and to the local meeting Secretariat for hosting the session in Australia and for the excellent facilities which had been provided by the Bureau of Meteorology. In noting the requirements and events which had lead to the establishment of the DBCP in 1985, the WMO representative recalled that the panel had begun its real work with the appointment of its first technical co-ordinator in 1987, and that the value and range of this work had been greatly extended as the funding for employment of the technical co-ordinator had become progressively more secure in subsequent years. Largely through the work of the successive technical co-ordinators and panel chairmen, the DBCP was now firmly established as the appropriate international mechanism to co-ordinate and enhance drifting buoy activities at the global level. With regard to the present meeting, the WMO representative noted that the agenda items dealing with new Argos GTS processing chain, cooperation with TOGA and WOCE in the surface velocity programme and the new low-cost drifter, and the formation of a new action group for an Arctic Buoy Programme should receive particular attention. For the future, he considered that the participation of the panel in the development, implementation and maintenance of the global ocean observing system (GOOS) will constitute a major focus for all its activities. Finally, the WMO representative wished the panel a very

successful session, and assured it of the full and continuing support of the WMO Secretariat in its work.

1.1.4 On behalf of the Secretary IOC, Dr. Gunnar Kullenberg, the representative of IOC welcomed the participants to the session and expressed the Commission's gratitude to the Australian Bureau of Meteorology for kindly hosting the session. He then also drew the panel's attention to the decisions of IOC and WMO governing bodies to initiate the development of a GOOS, on the recognition of "the necessity of systematic global ocean observations for understanding, monitoring and predicting the state of, and changes in, the physical and chemical ocean environment and large-scale biological systems, and related processes involved in climate change and large-scale ocean-atmosphere interactions" (IOC Assembly Resolution XV-4). Obviously, the panel will be closely associated with this undertaking, to the point that it probably should henceforward consider working within the very framework of the GOOS. It is indeed recognized that the initial implementation of a GOOS will be facilitated by strengthening the existing operational systems of IOC and WMO and by improving the national and international co-ordinating mechanisms for these activities. Therefore panel Members should consider increasing their drifting buoy activities, the "internal" panel co-ordination activities) should be maintained and even strengthened, and the Panel itself should consider ways and means of fully co-ordinating its own activities with those of other groups/systems involved in the GOOS. From the IOC standpoint, such an overall co-ordination should be undertaken through its Committee on Ocean Processes and Climate, which usually meets every two years just before the IOC Assembly. The IOC representative further highlighted that one of the main milestones in GOOS development would be the UN Conference on the Environment and Development, to be held in Rio-de-Janeiro, Brazil, from 1 to 12 June 1992. The Conference would represent a unique opportunity to commit governments to, inter alia, participation in a global ocean observing system for the decades to come, through the adoption of a protocol to promote and facilitate such participation in this vast undertaking. This implies that all the basic material, including status report, a strategic plan and an implementation proposal, be prepared in due time, i.e. well in advance of the conference. The IOC representative therefore urged the panel to assist in such a preparation within its terms of reference. He concluded in wishing the participants a successful session and a pleasant stay in Melbourne.

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

1.2 Adoption of the agenda (agenda item 1.2)

1.2.1 The panel adopted the agenda for the session, which was unchanged from the provisional agenda. This agenda is in Annex II.

1.3 Working arrangements (agenda item 1.3)

1.3.1 Under this agenda item, the panel decided its hours of work and other working arrangements for the session. The list of documents for the session, including items to which they referred, was also introduced by the Secretariats.

2. REPORTS (agenda item 2)

2.1 Report by the chairman of the Drifting Buoy Co-operation Panel (agenda item 2.1)

2.1.1 The chairman opened his report by observing that the last intersessional period had seen a significant increase in the activities of the panel. The technical co-ordinator in particular had worked enthusiastically on a large number of projects. These are described further in the report by the technical co-ordinator (item 2.2). The chairman noted that he had participated directly or represented the panel in a number of activities including:

(a) Presenting the annual report of the panel to the forty-second session of the WMO Executive Council in June;

(b) Arranging for the review and revision of the CLS/Service Argos proposal for a new GTS processing chain;

(c) Representing the panel at the organising meeting of the Co-ordination Group on the Composite Observing System - North Atlantic (CGC);

(d) Participating in an ad hoc Meeting of Experts on an Ocean Observing System held in Washington D.C., USA, in September.

Finally the chairman expressed his appreciation for the excellent support given by many panel members, the technical co-ordinator and the Secretariats of WMO and IOC during a busy and productive year.

2.2 Report by the technical co-ordinator (agenda item 2.2)

2.2.1 The technical co-ordinator presented his activities during this intersessional period while employed by UCAR and based in Landover, Maryland, USA, inside the Service Argos Inc building. This position in the USA facilitated contacts with the North American drifting buoy users while contacts have been maintained through the various communication links provided to him by SAI, with the non-north American users. During this period, the technical co-ordinator visited various organizations and attended several meetings (see Annex III for more detail). These were occasions for him to present the panel's activities and to discuss with principal investigators on the possibilities to introduce more platforms onto the GTS.

2.2.2 Using the access provided to him to the Argos computers and to the French Meteorological Services computers, the technical co-ordinator has been able to maintain a monitoring activity mainly related to quality control (QC) of data circulating on the GTS. Tools have been developed and improved in order to detect buoys reporting bad data on the GTS and then to take the appropriate action, i.e. contact the owner and ask him to remove or recalibrate a sensor. Monthly monitoring statistics (ECMWF, UKMO, OPC) as well as regular status reports produced by data analysis centres (UKMO, ABOM, NDBC, the EGOS co-ordination centre) have also been useful to the technical co-ordinator. He has been contacted many times by principal investigators, meteorological centres or drifting buoy users in order to resolve specific problems related to the Argos system (e.g. delays, buoys that disappeared from the GTS, etc.). In relation to the QC activities of various meteorological centres, the technical co-ordinator acted as a focal point between these centres and the drifting buoy owners, who

were requested to take the appropriate actions when needed (e.g. recalibrate a sensor). The technical co-ordinator is indeed in the best position, because of the contacts that he has established with the buoy community, to identify an owner and then to suggest a solution to a given problem.

2.2.3 Users have been contacted in order to understand why only 30% of the approximately 600 buoys processed by Argos report on GTS. This survey showed that for almost 200 buoys, the owner simply doesn't want his data to be disseminated on GTS. Other reasons such as buoys not equipped with any meteorological sensor, poor quality data, or complicated PTT message formats (or transfer functions) may also preclude such a GTS dissemination.

2.2.4 When possible, the technical co-ordinator has studied in detail the formats and transfer functions provided to him by the users in order to suggest a processing that would allow the diffusion of the data on GTS. This action has led to an increase of about 40 platforms that otherwise would not have reported on GTS.

2.2.5 CLS/Service Argos is producing a quarterly report on drifting buoys. New rationalised GTS bulletin headers have been introduced for dissemination from the Argos centres through the National Weather Service, USA, and the RTH Paris. Work has also been done on QC issues (responsibilities, etc.) and statistics have been produced, on a monthly basis, together with the technical co-ordinator's monthly report. Close contacts have been established with the WOCE community (including a visit to the Global Drifter Centre, La Jolla) particularly on the development of the new low cost SVP drifter which may be able to measure atmospheric pressure after 1992.

2.2.6 The new Argos GTS processing chain should allow a certain number of additional platforms to report on the GTS since the present Argos system is not in some cases flexible enough to be able to guarantee the accuracy of the processed data. In other cases scientists who absolutely need the raw data simply don't want their buoys to report on GTS because the Argos system is not able to process raw data on one hand and physical values for GTS purposes on the other hand. The new Argos GTS processing chain should avoid such problems. The full technical co-ordinator's report is given in Annex III.

2.2.7 The panel noted the report of the technical co-ordinator with considerable interest and expressed its appreciation to him for his fine efforts on its behalf. Various issues raised in the report are discussed in detail under appropriate agenda items.

2.3 Report by the Secretariats (agenda item 2.3)

2.3.1 The WMO Secretariat representative reported to the session that the major activities of the WMO Secretariat during the past year in support of the panel had been concerned with the administration of the panel's funds. These administrative activities had included collection of contributions, negotiation and settlement of contracts, preparation of financial statements etc., and full details of these are discussed under agenda item 3. In addition to these administrative matters, the WMO Secretariat had also undertaken a number of other tasks on behalf of the panel, or in support of drifting buoy programmes such as regular contacts and discussions with CLS and Service Argos Inc regarding the GTS distribution of buoy data; assistance in the development of the revised DRIBU code; liaison with EGOS, ITPO and the WOCE IPO; editing and publication of the "Guide to Moored Buoys and other ODAS"; and maintenance and updating of the lists

of national focal points for drifting buoys and of WMO drifting buoy identifier numbers. Finally, the WMO representative noted the continuing strong support expressed by the WMO Executive Council, at its forty-second session, for the panel and all its activities.

2.3.2 The representative of the IOC Secretariat reported that the IOC Executive Council, at its twenty-third session (Paris, March 1990), had made a plea for increased contributions to the financial support of the panel. It further discussed in some depth the question of the development of a global integrated ocean observing system, including providing specific guidelines to the IOC ad hoc Group of Experts on an Ocean Observing System and broadly defining the concept of an "enabling protocol" to facilitate the participation of governments in this vast undertaking. The IOC representative further reported on the outcome of the twenty-eighth session of the Inter-Secretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO), as far as the question of the legal aspects of ODAS and Professor A. Kolodkin's preliminary work on this question was concerned. The ICSPRO Committee recommended that the International Maritime Organization (IMO) and the UN Office on Ocean Affairs and the Law of Sea (UN/OALOS) should explore the legal aspects of the problem and that the panel be requested to take care of certain technical matters, such as the preparation of a technical information document on drifting buoys. The panel agreed in principle to contribute to such a technical study and looked forward to the relevant decisions of the IOC Assembly at its forthcoming session (Paris, March 1991).

2.4 Report by the chairman of EGOS (agenda item 2.4)

2.4.1 After being established in December 1988, the European Group on Ocean Stations (EGOS) has continued to deploy drifting buoys, the reports of which are distributed onto the GTS. Reception of reports from EGOS buoys relies heavily on LUTs. Therefore the Management Committee of EGOS shows considerable interest in the New Argos GTS processing chain, especially in the principles of its QC scheme. A detailed report on the latest status of the EGOS buoys is published each month by the French Centre for Marine Meteorology, located at IFREMER, Brest. For the time being the Technical Secretariat for EGOS is provided by the Christian Michelsen Institute in Bergen, Norway. France has proposed to provide for the Technical Secretariat as from 1 January 1991. This proposal has been discussed by the Management Committee of EGOS at its June 1990 meeting, where a compromise was developed to be submitted to the Director of the French Meteorological Service.

2.4.2 The panel noted with interest a presentation by the technical co-ordinator on the quality of the North Atlantic EGOS air pressure data as compared with the ECMWF first-guess field for the period April 1990 to September 1990. This has shown excellent results, with almost 80% of the buoy reports differing by less than 2 hPa from the model. This is primarily due to the work of the EGOS technical centre at CMM, Brest.

3. FINANCIAL AND ADMINISTRATIVE MATTERS (agenda item 3)

3.1 Financial situation (agenda item 3.1)

3.1.1 The panel first considered the final accounts provided by the WMO Secretariat for the panel's funds for the period from 1 June 1989 to 31 December 1989. While noting the slight complication caused by the non-coincidence of the WMO financial year (a calendar year) with the panel's financial

year (1 June to 31 May), the panel nevertheless agreed that the accounts provided represented a true statement of the financial situation for that period, and approved this statement on that basis. This detailed statement is given in Annex IV.

3.1.2 The panel next considered the interim statement of accounts provided by the WMO Secretariat covering the period 1 January 1990 to 25 September 1990. This statement is given in Annex V. It noted and agreed on the explanations and actions taken by WMO relating to the administration of the funds during the period and accepted the interim statement of accounts as given.

3.1.3 The panel noted and approved the actions taken by the WMO Secretariat with regard to the establishment of a special fund to finance the implementation of the new Argos GTS processing chain. A statement of accounts for this fund is given in Annex VI, and the panel accepted this statement.

3.1.4 Finally on this topic, the panel noted and approved the financial statement provided by UCAR relating to the employment of the technical co-ordinator during 1989/90. It also accepted the interim statement from UCAR for the technical co-ordinator employment during 1990/91. Both these statements are given in Annex VII. In doing so, the panel expressed its considerable appreciation to UCAR for the excellent services which it had so far provided in employing the technical co-ordinator on its behalf.

3.2 Review of contracts (agenda item 3.2)

3.2.1 Under this item, the panel reviewed the four contracts which had been established by WMO on its behalf, respectively with UCAR for the employment of the technical co-ordinator; with Service Argos Inc for the logistic support of the technical co-ordinator; directly with Mr. D. Meldrum for his review of the first draft proposal for the new Argos GTS chain; and with the Dunstaffnage Marine Laboratories (DML) to secure the services of Mr. D. Meldrum to assist in the preparation of various alternative options for the new Argos GTS chain. Copies of these various contracts are given in Annexes VIII, IX, X and XI, respectively.

3.2.2 The panel agreed that the texts of both the UCAR and Service Argos Inc contracts, as well as the final contract sums, were in conformity with what it had agreed at its fifth session, and that these contracts satisfied its requirements for the employment and support for the technical co-ordinator. The panel noted that the UCAR contract had been agreed and signed prior to the commencement date of 1 June 1990, but that the finalization of the Service Argos Inc contract had been delayed due to the delay in receipt of some contributions. It therefore expressed its appreciation to Service Argos Inc for its generosity and co-operation in maintaining the logistic support for the technical co-ordinator despite the lack of a formal contract to this effect.

3.2.3 Finally, the panel approved both the contracts which had been established to obtain the services of Mr. D. Meldrum in support of its activities. It expressed its appreciation to both DML and Mr. Meldrum for their generous support to the panel, and hoped that this support might continue in the future, as and when the need arises.

3.3 Commitments for future funding (agenda item 3.3)

3.4 Future employment status of the technical co-ordinator (agenda item 3.4)

3.3.1 The panel acknowledged that items 3.3 and 3.4 are closely interconnected and therefore should be treated together in the meeting report. In addressing the overall topic, the panel first agreed that the employment and logistic support arrangements, through UCAR and Service Argos Inc respectively, which had now been in place since 1989, had proved to be entirely satisfactory in providing both the type of employment and the necessary logistic support which it required for the technical co-ordinator, within the available funds. Nevertheless, the panel decided that it should continue to review both aspects on an annual basis, to ensure that the technical co-ordinator remains in the best position to provide the services required by the panel.

3.3.2 The panel recalled that, at its fifth session, it had requested the Secretariats to investigate the possibilities for future long-term employment of the technical co-ordinator through a European-based organisation, in the event that it wished to relocate the position e.g. to CLS/Service Argos in Toulouse or some other organisation in Europe. In this regard, it was informed that, while such long-term employment is technically feasible, it would involve substantially enhanced costs to the panel than for the existing employment arrangements through UCAR. Since the only alternative employment arrangement for location of the technical co-ordinator in Europe appears to be a short-term consultancy (through either IOC or WMO), which is satisfactory neither for the panel nor the technical co-ordinator, the panel therefore decided that, at least for the present, it would be necessary to maintain the technical co-ordinator location in North America. In this context, the panel agreed that the existing employment arrangements through UCAR, which in any case had proven so satisfactory, should remain in place.

3.3.3 The panel was next informed of an offer from the National Ocean Service, NOAA, USA, to provide the necessary logistic support for the technical co-ordinator, at no cost to the panel, if the panel felt that a relocation was appropriate. The location proposed by NOS was either within NOS headquarters in Rockville MD, or within the Ocean Products Centre in Camp Springs, MD. The panel expressed its appreciation to NOS for their generous offer. In the ensuing discussion, the following main points were noted:

(a) The logistic support and related services provided to date for the technical co-ordinator by Service Argos Inc have been totally satisfactory from the point of view of the panel;

(b) The main problem with a location within Service Argos Inc has been essentially an image one: buoy deployers and users have regarded the technical co-ordinator as being an employee of Service Argos and not completely independent. However, it was noted that such a problem may occur wherever the technical co-ordinator is located;

(c) The technical co-ordinator requires direct access to the Argos computers wherever he is located, and such access would probably involve a cost to the panel if the location is outside Service Argos.

On the basis of this discussion, the panel decided to retain the existing location for the technical co-ordinator and to therefore seek to establish a new contract with Service Argos Inc for the required logistic support in 1991/92.

3.3.4 The panel next considered the budget proposed by UCAR for the employment of the technical co-ordinator in 1991/92. It noted that the budget total of $90k represents an increase of $4k over that for the previous two years, or approximately 5%, and that the detailed budget includes the following features:

(a) A salary increase for the technical co-ordinator representing a second performance-related increment of $1000 plus inflation-related increments to cove the two years 1989-1990;

(b) No new allocation for relocation expenses, as approximately $15k is already held by UCAR to cover these possible costs;

(c) Some increases in UCAR costs;

(d) A small increase in travel funds.

The panel agreed that the proposed increase in the total UCAR budget was justified, and therefore approved the detailed draft budget, which is given in Annex XII.

3.3.5 In discussing the conditions of employment for the technical co-ordinator, the panel noted that, to date, the technical co-ordinator had essentially been employed on an "overseas posting". Under these circumstances, therefore, the panel agreed that it would be appropriate to grant the technical co-ordinator a home leave entitlement, essentially equivalent to that currently enjoyed by international civil servants, viz. an economy return airfare to his home for the technical co-ordinator and his family after every two years of continuous service. The panel noted that such a home leave could be funded out of the existing relocation fund in 1991, and would not be an additional cost to the panel at least for that year. It requested that provision for this entitlement should be included in the UCAR contract, if necessary, but that otherwise this contract should remain unaltered for 1991/92 from that currently in force, apart from necessary changes in dates.

3.3.6 The panel noted the detailed costings provided by Service Argos Inc for the provision of logistic support for the technical co-ordinator in 1991, which amount to a total of some $19.8k for a full year (see Annex XIII). Following some discussion and taking into account these costings, the panel and Service Argos Inc agreed that the contract total for logistic support in 1991/92 should be $14k. The panel expressed its appreciation to Service Argos Inc for agreeing to carry the balance of the actual cost (approximately $5.8k), which it regarded as a contribution to the work of the panel. The panel further agreed that the Service Argos Inc contract for 1991/92 should be the same as that for 1990/91, apart from necessary changes in dates.

3.3.7 Based on the contract amounts of $90k for UCAR and $14k for Service Argos Inc as agreed above, together with an estimate of $300 to cover WMO direct administrative expenses, the panel noted that a total of $104.3k would be required in 1991 to be covered by contributions by panel member countries. This represents an inflation-related increase of around 5% over the previous year's total, which the panel agreed met its requirement for a zero real-growth budget.

3.3.8 The panel next considered how best to achieve this required sum. It agreed that, ideally, the additional $4.8k required over the 1990/91 contributions should be met by relatively small amounts from new contributing Member countries, which would allow the contributions from existing contributors to remain unchanged. In this regard, the panel warmly welcomed the offer made by the

Netherlands at the session to contribute $1.5k annually to the panel's funds. To raise the remaining $3.3k, the panel eventually agreed:

(a) That the Secretariats should write directly to all other Member States which have nominated national focal points for drifting buoys to request them to consider contributing financially to the panel;

(b) That at the same time the WMO Secretariat should invoice existing contributing countries for the same contributions as in 1991/92, but with an additional line on the invoice detailing a proposed 5% increase in each contribution required to make up the budget shortfall.

The panel expressed the hope that in this way the necessary additional funds required in 1991/92 would be raised without placing undue pressure on existing contributors to increase their contributions. In the event that funds above the budgeted $104.3k are eventually forthcoming, the panel agreed that the additional monies raised should be available for use at the discretion of the chairman, as is already the case for any savings transferred from one year to the next.

3.3.9 On the basis of these considerations, the panel agreed on a provisional table of contributions for 1991/92 which is given in Annex XIV. The draft expenditure budget for 1991/92 is given in Annex XV. The "sundries" item in the expenditure budget represents an estimate of the savings to be eventually transferred from the 1990/91 budget, for use at the discretion of the chairman on items such as travel of the chairman on panel business, additional contracts etc., as agreed at the fifth panel session.

4. RELATIONSHIP WITH INTERNATIONAL PROGRAMMES/ORGANISATIONS (agenda item 4)

4.1 World Climate Research Programme (WCRP) (agenda item 4.1)

4.1.1 The WOCE and TOGA-sponsored Surface Velocity Programme (SVP) was reviewed by Dr. Jeffrey Paduan of the Scripps Institution of Oceanography. Attention was paid to the goals of the programme which are to provide upper ocean velocity and temperature observations on global scales during the time period of WOCE. Attention was also drawn to the scope of the experiment in the context of present drifting buoy measurements. SVP represents a substantial increase in the number of platforms which measure sea surface temperature remotely and transmit those data in real time to the GTS. All meteorologically relevant data collected in SVP will be available through Argos to the GTS in real time provided that future GTS processing chains also allow for the SVP scientists to collect the raw data from their platforms.

4.1.2 A detailed discussion of SVP can be found in Annex XVI where, among other things, figures showing representative array sizes for the Pacific Ocean can be found. For example, an array of 473 drifters will be maintained in the Pacific Ocean which will provide a nominal resolution of 600 km x 600 km. Deployments will begin in early 1991 and include the continuation of deployments in the tropical Pacific as part of the TOGA Pan-Pacific Drift Experiment. Drifter trajectories for the first 22 months of that experiment, which serves as a pilot study for the larger SVP, can also be found in Annex XVI (drogued instruments only).

4.1.3 The design of the standard SVP drifter was put forth and it was explained that much of the efforts in SVP thus far have gone to develop this drifter under the following constraints:

(a) It must be an accurate water follower with a known error, or slip, as a function of wind speed;

(b) It must survive for at least 18 months at sea with drogue intact;

(c) It must have a sensor to determine whether the drogue element is intact; and

(d) It must be low-cost.

A detailed technical report profiling the SVP drifter is available through the Scripps Institution of Oceanography (SIO Reference 90-248).

4.1.4 Finally, plans were outlined to adapt atmospheric pressure measurements to the small surface float of the SVP drifter. These efforts, when successful, will present an opportunity to greatly increase the number of platforms reporting atmospheric pressure to the meteorological community. Preliminary tests are underway at Scripps and the first results will be available in early 1991. It is hoped that SVP drifters with pressure measuring capabilities will be available in late 1992. SVP scientists suggest and look forward to strong co-operation with the DBCP and meteorological agencies during the development and implementation of these pressure measuring capabilities. In particular, it is felt that the meteorological agencies can be a great help in the testing and evaluation of pressure sensors, beginning in early 1992. It was further suggested that SVP and DBCP co-sponsor a workshop on pressure measurement in the second half of 1991 to discuss the technical aspects and problems of pressure measurements from a small submersible surfact float. The venue would be Scripps Institution in San Diego, and the workshop itself would be contingent on promising results from the initial engineering studies now underway.

4.1.5 The panel noted this presentation by Dr. Paduan with considerable interest and appreciation. Actions to be taken by the panel in response to the proposals of the WOCE/TOGA SVP are considered further under agenda item 6.4.

4.2 World Weather Watch (WWW) (agenda item 4.2)

4.2.1 The panel recalled that, at its fifth session, it had considered under this agenda item the preliminary report of the Section Analyst for Drifting Buoys for the Operational WWW Systems Evaluation - North Atlantic (OWSE-NA). The full final report of the OWSE-NA had subsequently been published in early 1990, and the panel noted with interest that its action group EGOS was now considering in detail the parts of this report relating to drifting buoys, and planning to take action on the conclusions and recommendations of the report, as appropriate. The panel considered that the report contains valuable information for all operational buoy deployers and data users, not just those in the North Atlantic area, and therefore urged its member countries to carefully study the report and to take its conclusions and recommendations into account whenever possible when developing new deployment programmes.

4.3 Integrated Global Ocean Service System (IGOSS) (agenda item 4.3)

4.3.1 The panel received with appreciation the report by the RNODC Drifting Buoys operated by the Canadian Marine Environment Data Service (MEDS). It expressed concern that MEDS was currently archiving only some 50% of existing drifting buoy data and encouraged MEDS to pursue its negotiations with the principal investigators to try to obtain the data, at least in delayed mode once some scientific substance has been extracted from them. It further requested its technical co-ordinator to continue pressing the principal investigators to allow the data to be circulated onto the GTS and to report on any relevant problem encountered. In this context, this panel recalled that MEDS might well receive data and keep them out of the public domain for some time, on a case by case basis, through specific agreements with the PIs.

4.3.2 The panel further was informed that a brief report on the functioning of the IGOSS Specialised Oceanographic Centre (SOC) operated by the Service Central d'Exploitation de la Meteorologie (France) was to be found in the national report from France, which will be reproduced as usual in the panel's annual report.

4.4 Global ocean observing system (agenda item 4.4)

4.4.1 The panel was presented with the main results of the first session of the IOC Ad Hoc Group of Experts on a Global Ocean Observing System (established in consultation with WMO), held in Washington DC, USA, from 6 to 7 September 1990. It agreed that it should be closely involved in the development of the GOOS, in particular as far as implementation questions are concerned. Panel members agreed to provide the chairman with written comments on the two main documents they had before them, viz."Toward A Global Ocean Observing System: A Strategic Plan for its Development"; and extracts of "Global Ocean Observing System: Status Report on Existing Ocean Elements and Related Systems". As far as the latter is concerned, it was made clear that it should be considered as an "evolving" document, to be updated regularly (at least yearly).

4.4.2 In this context, the panel noted that some emphasis had been put on the necessity to strengthen the IOC Secretariat for GOOS purposes, with the view to eventually establishing a "GOOS office" that would embrace and hopefully solve all GOOS co-ordination problems. It expressed its full support for this concept and indicated its desire that, once this "GOOS office" is established, it maintains a close relationship with the panel's technical co-ordinator.

5. REPORTS ON CURRENT AND PLANNED DRIFTING BUOY PROGRAMMES (agenda item 5)

5.1 The panel noted the written reports on current and planned drifting buoy programmes which had been received from Australia, Canada, China, France, Germany, Japan, Netherlands, New Zealand, Pakistan, Sweden, United Kingdom, USA and the representative of SCAR. As in previous years, the panel agreed that these reports should be included as annexes to the DBCP annual report. In noting the large disparity in presentation format in these reports, the panel felt that they could be both improved and probably shortened if a standard format were used. It therefore requested its chairman and the Secretariats to develop such a format, for distribution to and recommended use by panel Member countries for the 1991 programme reports.

5.2 The panel noted with considerable interest the reports presented by Dr. G. Hamilton, NDBC, USA, and Mr. P. Blouch, CMM, France, on the technical developmental and monitoring work being undertaken in their respective institutions. It expressed its appreciation to both speakers for their reports and hoped that updated information on this work, and that of other similar institutions, might be made available to future panel sessions.

6. CO-ORDINATION ACTIVITIES (agenda item 6)

6.1 Quality control of drifting buoy data (agenda item 6.1)

6.1.1 The technical co-ordinator submitted a report on the control of the quality of the drifting buoy data circulating on the GTS. A key issue is that meteorological centres are in the best position to undertake valid data quality control (QC). These centres, via the feedback provided to the technical co-ordinator who can act as a focal point between them and the principal investigators, should share with the buoy owners the responsibility of controlling the quality of the data circulating on the GTS. Argos would be responsible only for no "garbage" being inserted on the GTS. Only simple QC procedures need therefore be introduced at the Argos level: on one hand gross error checks and compression index by sensor would optimise the detection and suppression of very bad data; on the other hand checks such as climatological, time continuity, beached platforms, sensor blockage, if used, should generate only flags and warning messages to the technical co-ordinator with (possibly good) data declared doubtful by these tests definitely not to be removed from the GTS. Any flags inserted would probably be ignored by the main centres equipped with the facilities to undertake their own QC, whereas small centres would be able to consider the information provided through the flags.

6.1.2 The monitoring statistics produced by ECMWF, OPC, UKMO, etc, which are a result of comparison of the observed data with the first guess model field, are very useful for the technical co-ordinator to detect buoys reporting bad data on the GTS and then to contact the PI in order to take the appropriate action (e.g. remove a sensor from GTS, recalibrate etc). The panel decided to request ECMWF to provide these statistics on a weekly basis to the technical co-ordinator, since the present monthly basis introduces important delays between the moment a platform fails and the time any action is taken.

6.1.3 The issue of centers operating QC procedures for their own purposes, but wishing the international community to benefit from their work was raised. These centres may collect data from the GTS, control their quality and then re-transmit them on the GTS using the same or another WMO format. The panel recognised that it might be confusing for users to have such duplicate messages distributed on the GTS: users would certainly want to know that a QC process has been applied to the data. It therefore recommended firstly that appropriate flags related to individual variables be inserted and activated in all GTS codes transmitting drifting buoy data, to indicate where QC had been performed on the data (see also agenda item 6.2). At the same time the panel also recognised that, in the particular case of sub-surface data, many data centres look for these data in BATHY/TESAC messages only, and not DRIBU messages. It therefore suggested that in this case only, the QC centre concerned, viz. OPC/NOS/NOAA, should resume its previous practice of re-inserting on the GTS, as BATHY messages, quality controlled data which it had received previously from the Atlas buoys in DRIBU format. However, OPC was strongly urged to make every effort to inform all the data centres concerned of exactly what it was doing in this regard.

6.1.4 The panel noted the potential problem raised by the TOGA buoy reports being collected by the Melbourne, which might be confused with the same reports being disseminated, after QC, through NMC Washington. The panel requested the technical co-ordinator to study the problem and propose an appropriate solution.

6.2 Code matters (agenda item 6.2)

6.2.1 The panel recalled that, at its fifth session, it had agreed on the details of a proposed revision to the SHIP code, to incorporate all possible present and future requirements for the GTS transmission of data from drifting buoys, and had requested that this proposal should be forwarded to the relevant CBS body for consideration. In the event that the proposal was not acceptable, the panel had requested CBS to advise it on how its requirements might be met.

6.2.2 The proposal was presented to the recent session of the CBS Sub-group on Codes (Geneva, February 1990) by two members of the panel's expert codes sub-group, Mr. J.R. Keeley and Mr. A. Hernhuter, where it was essentially rejected, for a variety of reasons. As an alternative, the CBS Sub-group proposed extensive revisions to the existing DRIBU code, to incorporate the panel's requirements. These revisions were undertaken by Mr. Keeley and Mr. Hernhuter during the sub-group session, and presented in the form of a new code DRIFTER, to replace DRIBU. This new DRIFTER code was accepted by the sub-group, and subsequently submitted to the extraordinary session of CBS in London in September 1990, where it was adopted.

6.2.3 The panel noted this development with interest. It agreed that DRIFTER to a certain extent satisfied its stated requirements. Nevertheless, it expressed regret that the approval procedure, and the time-scales involved, had not allowed it to review DRIFTER prior to its submission to CBS. In particular, the panel noted a number of modifications which should be made to DRIFTER to better meet all its requirements:

(a) A change of name from DRIFTER/DRIFT to BUOY. Both the existing DRIBU and DRIFTER can and will allow for the GTS transmission of data from moored as well as drifting buoys, and such a change would therefore overcome any difficulties of perception caused by this fact;

(b) New groups need to be added to Section 1 of the code to allow for the transmission of humidity, wind gust, visibility and possibly other meteorological data;

(c) The flexibility of Section 4 should be increased, to allow for the addition of QC indicators for each individual variable and/or a single indicator to show that any or all data in the report have been quality controlled;

(d) The indicator HL in Section 4, for the number of hours since the last position fix, should be changed to give the actual date/time of the previous position fix.

6.2.4 The panel expressed the hope that the above modifications might be considered and hopefully incorporated into DRIFTER prior to its formal implementation by WMO. It therefore re-established its sub-group of experts on codes (comprising Mr. Keeley, Mr. Hernhuter and Dr. A.D.J. O'Neill), and requested the group to prepare specific proposals, incorporating the above points, for submission to the CBS Sub-group on Codes as soon as possible, and in any case

before the end of 1990. In this regard, the panel requested the Secretariats to circulate DRIFTER to all national focal points for drifting buoys, to seek comments to the sub-group as a matter of urgency.

6.3 New Argos GTS processing chain (agenda item 6.3)

6.3.1 The panel was presented with the results obtained by an Informal Expert Meeting on the New Argos Processing Chain (CLS headquarters, Toulouse, France, 28 May - 1 June 1990) and the further financial estimates prepared by CLS (see Annex XVII). Two points were immediately established: there is a clear consensus on the need to develop new GTS processing facilities at Argos Processing Centres (APCs) and some panel Member States are ready to provide financial support to develop such facilities. As a matter of principle, it was also agreed that LUTs should be provided with information and guidelines enabling them to keep abreast of the developments in the APCs, in order to maintain an acceptable level of compatibility amongst all centres reporting data onto the GTS.

6.3.2 After a thorough discussion on the various technicalities of both solutions proposed, the panel decided: in principle to adopt the so-called solution 2 (Annex XVII), mainly on the grounds of its greater flexibility and of its allowing for a more straightforward flow of raw data for the benefit of those who require them; and in principle to proceed with the implementation of stage 1 of solution 2 (see Annex XVII, Appendix, p. 10). In so doing, the panel recognised that an in-depth study of the various elements, and costs thereof, of stage 1 was needed before any final "go-ahead" could be given to CLS. It therefore entrusted its chairman, technical co-ordinator and an expert to be designated by panel Member countries already committed to fund for the development of the new processing system, to undertake the study. Particular emphasis should be placed on the role of the so-called Meteo Manager Office, and associated costs. Based on this study, the chairman should negotiate a new financial estimate with CLS/Service Argos, hopefully before the end of the present year, and give the definitive go-ahead. It was estimated that stage 1 of solution 2 might be implemented within a timeframe of less than six months, i.e. hopefully before the next panel session.

6.3.3 The panel took note of the comments by the International TOGA Project Office (ITPO), on the new Argos processing chain. It was clear that not all ITPO requirements could be taken into account at once, but that most of them should be at least partially met when the above had been implemented. Since the key problem was now of a financial nature, the panel requested those of its Member countries which had not yet done so to consider participating in the funding of the new processing chain. In this regard, the representative of France stated that the French Meteorological Service was not in a position to support the proposal on the present basis, but was ready to consider it in the frame described below:

(a) The French Meteorological Service stresses the need for a rough quantitative estimation of the number of additional data which could become available on the GTS through this process, before considering any financial investment;

(b) If the expected additional platforms are mainly those involved in a widescale experimental program such as WOCE, then it is suggested to address this issue in the frame of this programme. It would give a better guarantee that the sensor definition and the data processing scheme are dealt with in a consistent way;

(c) Otherwise, and only as a matter of principle the French Meteorological Service considers that if such an action is to be undertaken, after a positive cost advantage evaluation, the corresponding investment cost should be borne by the private operator (CLS/Service Argos). Of course the tariff should be adjusted in consequence taking into account the additional service provided.

6.4 Combined meteorological/oceanographic drifting buoys (agenda item 6.4)

6.4.1 The panel was presented with a draft booklet prepared by the technical co-ordinator in conjunction with Dr. P.P. Niiler, Scripps Institution of Oceanography, USA. The intent of the booklet is to alert national Meteorological Services to the possibilities offered by the low cost drifters to be used in the TOGA/WOCE SVP (see item 4.1 above) provided that a proper barometric pressure sensor can be developed and adapted to the standard SVP drifter. The booklet demonstrates that costs involved, which could be met by national Meteorological Services, are relatively low whereas the number of additional atmospheric pressure measurements to become potentially available onto the GTS is both relatively large and also relevant to data-sparse ocean areas of the world.

6.4.2 The panel expressed appreciation for the work presented by the technical co-ordinator and recognised that such a booklet might have a considerable impact on some national Meteorological Services. On the other hand, the panel considered that the issuing of the booklet might be premature under the present circumstances, since it was not yet possible to ascertain that the design of the air pressure sensor and, more importantly, of the barometer port would be fully successful (in particular since the standard SVP drifter is likely to be regularly submerged during its lifetime). The panel therefore decided that, in the first instance, the draft booklet should be circulated to the national focal points for drifting buoy programmes, under a joint IOC-WMO circular letter, explaining the rationale behind its presentation and seeking comments to be forwarded directly to the technical co-ordinator. It then requested the chairman to keep abreast of the developments under way, and to decide on its behalf when it might be appropriate to publish and distribute the booklet in its final form.

6.4.3 With regard to the development of the pressure sensor and port for the SVP drifter, the panel encouraged Meteorological Services to participate in its operational testing since it became available for this purpose. The panel also agreed to co-sponsor a workshop on the topic once development work had reached an appropriate stage, perhaps in the second half of 1991.

6.5 Formation of other regional action groups (agenda item 6.5)

6.5.1 The panel was presented with a proposal by the representative of Canada for the establishment of an International Arctic Buoy Programme to be operated as an action group of the panel. The proposal contained background information on the development of a buoy network in the Arctic Ocean as a polar component of the Global Weather Experiment in 1979, on the agreement reached between Canada and USA on this topic in 1982, and on additional co-operative undertakings since that time (e.g. with Norway and USSR). Since funding arrangements for the Arctic Buoy Programme expired in 1989, it was felt desirable to re-establish an ongoing programme and the WCRP therefore issued a call for establishing such a new programme. At its forty-second session (Geneva, June 1990), the WMO Executive Council agreed to refer the matter to the panel at its present session. Subject

to the panel's endorsement, Canada has offered to host a preparatory meeting of representatives of interested parties, tentatively in March 1991, with a view to establishing an International Arctic Buoy Programme and related operation arrangements.

6.5.2 The panel recalled that it had been established, inter alia, to encourage and support the formation of such action groups. It therefore welcomed with enthusiasm the proposal by Canada and decided that:

(a) The preparatory meeting to establish an action group of the panel for an International Arctic Buoy Programme should be officially convened through an invitation from the panel chairman;

(b) Both the chairman and the technical co-ordinator should attend the preparatory meeting in order to provide the necessary assistance and guidance, as required.

6.5.3 The panel finally expressed the hope that a satisfactory agreement for the project will have been concluded, by its forthcoming seventh session, to allow it to formally recognise the International Arctic Buoy Programme as an action group of the panel.

6.5.4 The panel was further informed on the status of development of a project planned under the auspices of the South-West Indian Ocean Tropical Cyclone Committee regarding the deployment of some 12 meteorological drifting buoys in the South-West Indian Ocean. It appears that the terms and conditions of funding the project by the European Development Fund (EDF) should be finalised in the course of 1991 and that the project might eventually become implemented by, hopefully, the beginning of 1992.

6.5.5 The panel reiterated its offer to provide the project with the necessary technical and administrative expertise, through its chairman, its technical co-ordinator and other panel members, and it hoped that the project could also eventually become an action group of the panel.

6.6 Other co-ordination activities (agenda item 6.6)

6.6.1 Under this agenda item, the panel noted the opinion expressed by the ITPO that, although a significant proportion of the drifters that are reporting onto the GTS do not carry any geophysical sensors, the position data alone may nevertheless be of value for TOGA-type studies. It therefore recommended that such position data wherever possible be forwarded to the GTS, provided it be made clear that the drifters are good Lagrangian ones, with drogues still attached.

7. PUBLICATIONS (agenda item 7)

Guide to Moored Buoys and other ODAS

7.1 The panel noted with appreciation the finalization of the Guide to Moored Buoys and other ODAS, the preparation of which it had recommended at its second session to serve as a companion to the Guide to Drifting Data Buoys, and expressed its appreciation to Dr. G. Hamilton for having undertaken and completed such an important task. The Guide is in the process of being published by WMO (in the English language as a first step, but possibly in other working languages later) for distribution by the end of 1990.

Annual report

7.2 The panel approved its third annual report (1989), as published in early 1990, and agreed that the layout of the report would remain unchanged for its fourth annual report (1990). In so doing, it reminded all contributors to the report of the deadlines to be strictly adhered to: early November 1990 for national reports, 1 December 1990 for any other input. The decision of the panel regarding a standard format for national reports is recorded under agenda item 5.

Quarterly information service bulletin on drifting data buoys

7.3 The panel reviewed the quarterly information service bulletin on drifting data buoys. As requested by the panel at its previous sessions, CLS/Service Argos has developed software to maintain and issue a quarterly report on drifting buoys which was issued and distributed to a limited number of addressees by CLS/Service Argos on 1 April and 1 July and officially by the Secretariats on 1 July. The report contains the list of all the drifting buoys processed by Argos (including first and last positions, lists of the sensors, etc.).

7.4 The technical co-ordinator reported that the information contained in the reports is not as reliable as desired or expected (e.g. bad list of sensors, missing platforms, etc). This has led the technical co-ordinator and the Argos User Office to spend a great deal of time in checking and as far as possible correcting the report before dissemination. It was further noted that at least one panel Member country had indicated errors regarding its own buoys.

7.5 The panel expressed the view that the issuing of the quarterly bulletin, while being a matter of substance, and considered as very useful by several agencies in different countries, should not take up too much work time on the part of the technical co-ordinator. The processes of producing the bulletin should therefore (as far as possible) be fully automated, although this may be at the cost of a few remaining errors. CLS/Service Argos kindly offered to study and improve the existing software. The panel decided to review again the status and value of the quarterly bulletin at its next session.

Logos

7.6 With reference to its existing (one) and potentially existing (two) action groups, the panel discussed possible logos, or other distinguishing features. It eventually recommended that each action group should be provided with a specific letter-head including its title, the note "action group of the DBCP" and the DBCP logo.

7.7 Finally on this topic, the panel recommended that its chairman explore, with the assistance of the Secretariats, the possibility of producing ties and/or badges (lapel pins) containing the DBCP logo, as a means of further publicizing the panel.

8. REVIEW OF THE PANEL'S OPERATING PROCEDURES AND THE TASKS OF THE TECHNICAL CO-ORDINATOR (agenda item 8)

8.1 Following established procedures, the panel reviewed its operating procedures as confirmed at its fifth session. It saw no need to change these operating procedures, which are reproduced in Annex XVIII.

8.2 The panel further reviewed its workplan as adopted at its fifth session. In the light of discussions under previous agenda items, of achievements during the past intersessional period, and of developments expected in the future, it undertook some revisions to a number of the items listed in the workplan. The revised workplan is given in Annex XIX.

9. ELECTION OF THE CHAIRMAN AND VICE-CHAIRMAN OF THE PANEL (agenda item 9)

9.1 The panel unanimously elected Mr. D. Painting as its chairman and Dr. A.D.J. O'Neill as its vice-chairman for the coming intersessional period.

10. DATE AND PLACE OF THE NEXT SESSION (agenda item 10)

10.1 The panel agreed that its sessions should continue to be of four days. It welcomed the tentative offer of France to host the seventh panel session at its new national Meteorological Centre in Toulouse. It agreed that the session should be held in conjunction with the eleventh meeting on the Argos Joint Tariff Agreement and that, subject to agreement by the tenth meeting on the Argos Joint Tariff Agreement, the dates for the panel's seventh session should be 15 to 18 October 1991.

11. CLOSURE OF THE SESSION (agenda item 11)

11.1 In closing the session, the chairman expressed his thanks to all panel members and observers for their valuable contributions to the work of the session, and to the Secretariats for their continuing excellent support for the panel. The chairman then offered his particular appreciation to the Director of Meteorology, Australia, Dr. J. Zillman, and to all his staff, for hosting the session and for the excellent support and hospitality they had provided for the panel.

11.2 On behalf of all panel members, Mr. F. Grooters offered his thanks to the chairman for his fine conduct of the session and continuing guidance provided to the panel, and also to the Australian Bureau of Meteorology for their generosity to and support for the session participants.

11.3 On behalf of the Secretariats, the WMO representative thanked the chairman for his kind remarks and offered his appreciation also to the local Secretariat for their excellent support throughout the session.

11.4 On behalf of the Australian Bureau of Meteorology, Mr. W. Selesnew expressed his pleasure at being able to host the session, and for the opportunity this had provided to the Bureau to interact with the panel and its members.

11.5 The sixth session of the Drifting Buoy Co-operation Panel closed at 11 a.m on Friday 19 October 1990.

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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 by the chairman of the Drifting Buoy Co-operation Panel
   2.2 Report by the technical co-ordinator
   2.3 Report by the Secretariats
   2.4 Report by the chairman of EGOS

3. FINANCIAL AND ADMINISTRATIVE MATTERS

   3.1 Financial situation
   3.2 Review of contracts
   3.3 Commitments for future funding
   3.4 Future employment status of the technical co-ordinator

4. RELATIONSHIP WITH INTERNATIONAL PROGRAMMES/ORGANIZATIONS

   4.1 World Climate Research Programme (WCRP)
   4.2 World Weather Watch (WWW)
   4.3 Integrated Global Ocean Services System (IGOSS)
   4.4 Global ocean observing system

5. REPORTS ON CURRENT AND PLANNED DRIFTING BUOY PROGRAMMES

6. CO-ORDINATION ACTIVITIES

   6.1 Quality control of drifting buoy data
   6.2 Code matters
   6.3 New Argos GTS processing chain
   6.4 Combined meteorological/oceanographic drifting buoys
   6.5 Formation of other regional action groups
   6.6 Other co-ordination activities

7. PUBLICATIONS

8. REVIEW OF THE PANEL'S OPERATING PROCEDURES AND THE TASKS OF THE TECHNICAL CO-ORDINATOR

9. ELECTION OF THE CHAIRMAN AND VICE-CHAIRMAN OF THE PANEL

10. DATE AND PLACE OF THE NEXT SESSION

11. CLOSURE OF THE SESSION

REPORT OF THE TECHNICAL CO-ORDINATOR

1) Introduction

This report covers the period October 1st 1989 to September 30th 1990 during which the Technical Coordinator of the DBCP was based in Landover at Service Argos Inc., and was employed by the University Corporation for Atmospheric Research (UCAR).
This position in the United States lead to facilitated contacts with the American and Canadian Drifting Buoy Users. Many Organizations based in the Washington DC area have also been visited. Contacts have been maintained with the non-North American Users using the various telecommunication tools provided by SAI to the TC DBCP such as Telephone, Argos Electronic Mail, Omnet Electronic Mail, Fax, Telex, Regular and Express mail.
The following paragraphs describe in detail the various activities of the TC DBCP during the period.

2) Missions, Visits, Meetings

2.1) Visit to the Stennis Space Center (Mississippi), October 2nd-3rd 1989. The TC DBCP visited the National Data Buoy Center (NDBC), the Institute for Naval Oceanography and the Commander, Naval Oceanography Command.

2.2) October 9th-11th 1989, the TC DBCP attended the WOCE Surface Velocity Program session in Toulouse. He met Oceanographers involved in drifting buoy matters such as P. Niiler, P. Richardson, D. Olson...

2.3) CLS/Argos, Toulouse, October 12th-13th 1989, discussed various topics with CLS.

2.4) DBCP V session, Geneva, October 17th-20th 1989.

2.5) Joint Tariff Agreement IX session, Geneva, October 23rd-25th 1989.

2.6) Visit to the Ocean Product Center of NOAA, Washington DC, December 7th 1989 and February 7th 1990. Discussions concerning the Quality Control Procedures working at OPC.

2.7) First session of the US Working Group on Marine Environmental Services, Rockville, Maryland, January 31st 1990. The TC DBCP attended this session where many people involved in drifting buoy matters at the US level were present. He particularly did a presentation on the DBCP activities, stressing GTS matters.

2.8) Ocean Sciences Meeting, New Orleans, February 12th-16th 1990. This meeting was the opportunity for the Technical Coordinator to meet oceanographers deploying drifting buoys and to discuss how data can be

inserted onto the GTS. He particularly talked to Dr. Donald Hansen who deploys more than 100 buoys for the TOGA program. 80% of these buoys report Sea Surface Temperature data to the GTS. He also met Peter Niiler of the Scripps Institution of Oceanography, Roger Colony of the Polar Science Center and Carol Pease of the NOAA Pacific Marine Environmental Laboratory. Drifting Buoy manufacturers such as Aanderaa and Meteocean were also present at the meeting.

2.9) Meeting with Terry Bryan, Kenneth Mooney, Peter Dexter and the TC DBCP at NOAA, Silver Spring Maryland, April 3rd 1990. Discussions concerning the New Argos GTS processing chain.

2.10) Visit to the Ocean Observation Division of the National Ocean Service of NOAA, Washington DC, April 12th 1990. Met Bill Woodward and Michael Szabados.

2.11) May 18th 1990, meeting with Paul Julian, head of the Quality Insurance Group, at the NOAA National Meteorological Center, Camp Springs, Maryland, to prepare the meeting of experts on a New Argos GTS Processing Chain (Toulouse, May 28th-31st 1990).

2.12) Visit to the Polar Research Laboratory drifting buoy manufacturer, in McLean, Virginia, on May 22nd 1990. Specific algorithms implemented on board buoys have been discussed (e.g. How to compute Air Pressure Tendency, Wind gusts, Multiplexing methods...). The possibility to implement transfer functions (to convert raw data into physical values) directly on board the buoys rather than at the Argos Center level may lead to an increase of the number of platforms reporting to the GTS since the Argos System is sometimes not able to handle such functions.

2.13) May 25th 1990. The TC had to go to the US embassy in Paris in order to renew his Visa as an Exchange Visitor in the United States working for UCAR. He then met Mr. Guy Le Goff of the French Direction de la Meteorologie Nationale to discuss the possibility to implement Quality Control procedures in Paris so that monitoring statistics (e.g. ECMWF) can be produced on a monthly basis. He then spent one hour at IOC with Yves Treglos, discussing on the New Argos GTS processing chain.

2.14) Meeting of experts on a New Argos GTS Processing Chain, Toulouse, May 28th-31st 1990. See paragraph 7.4) and the meeting report.

2.15) Joint Ice Center, June 19th 1990.
The TCDBCP met Frank Kniskein and David Benner of the Joint Ice Center which is now going to coordinate the Polar Drifting Buoy Program mainly involving the NOAA and the US Navy. The TCDBCP particularly stressed the fact that it would be of considerable interest for the meteorological agencies producing weather forecasts that the data of these newly deployed buoys (including those of the Navy) be disseminated on the GTS. This obliges the users to respect Argos standards for GTS dissemination especially regarding sensor order.

2.16) Global Drifter Center at Scripps Institution of Oceanography, La Jolla, California, June 25th-27th 1990.
The purpose of the visit was to discuss with Peter Niiler a possible collaboration between Oceanographers and Meteorologists on the Surface Velocity Program of WOCE, TOGA and ACCP. The question of GTS dissemination has been raised as well as an eventual participation in SVP of Meteorological Agencies willing to pay for the upgrade of the standard SVP drifter to produce accurate Air Pressure measurements (+/-1 hPa). This drogued drifter already measures accurately the Surface Currents (+/-1 cm/s), the Sea Surface Temperature (+/-0.1 C) and the presence of the drogue. 100% of the data would be disseminated on the GTS. See the report on Combined Meteorological/Oceanographical Drifting Buoys for more detail.

2.17) Travel to Seattle, June 28th-29th 1990. The TC DBCP visited the Seattle Argos Office, the Polar Science Center of the University of Washington, the NOAA Pacific Marine Environmental Laboratory and the Coastal Climate Company (Drifting Buoy Manufacturer).
At PSC, he met Roger Colony who kindly presented his programs and the results of his work on Ice Motion. PSC's drifting buoys are deployed in the Arctic and already report to the GTS through the Edmonton LUT. It is not possible to let all of them report to the GTS via Argos because the Transfer Functions used are too complicated for the Argos System. Many use less complicated functions and Roger agreed that they should also report via Argos since the Edmonton LUT is only able to process the local data and since the Argos locations are better. The TCDBCP therefore asked Argos to introduce them onto the GTS.
At PMEL, The TCDBCP discussed GTS with the various people involved in drifting buoy or moored buoys (ATLAS). Paul Freitag is in charge of the PROTEUS (Profile Telemetry of Upper Ocean Currents) project which intends to deploy 4 moored buoys especially designed to measure sub/surface currents using Acoustic Doppler Current Profiler (ADCP). Paul would like the data being disseminated on the GTS but only TESSAC is able to support sub/surface currents and the Argos system is not able to handle this code.
The TCDBCP also met Nancy Soreide who works with Linda Mangum on the ATLAS project. The ATLAS moored buoys, deployed in the Equatorial Pacific Ocean, measure accurately atmospheric and oceanographical parameters (Air Pressure, Air Temperature, Air Humidity, Wind, Sea Surface Temperature, Sub/Surface Temperatures). Since the PTT format used is complicated (Multiplexing...), a specific application, operational in Landover, is processing the data for GTS dissemination. The TC stressed the fact that the software implemented in Landover is not operational in Toulouse and therefore GTS diffusion can not be guaranteed if for any reason the USGPC fails. A solution could be to allow the standard Argos processing chain to support multiplexing or to introduce in Toulouse the same software as the one that has been implemented in Landover.
PMEL would also like Air Humidity data to be sent to the GTS, but the DRIBU code which is the only one supported by Argos for drifting or moored buoys doesn't allow the coding of such data.
Then the TCDBCP spent some time with Carol Pease who deploys drifting buoys in the Arctic Ocean equipped with accurate Air Pressure and Air

Temperature sensors. The calibration functions used to convert raw data in physical values are too complicated for the Argos system to produce accurate enough data for Carol's requirements. The Air Pressure data therefore cannot be sent to the GTS, but the TC suggested that the Air Temperature data be distributed on the GTS since they use linear transfer functions handled by Argos. Carol agreed.

At the Coastal Climate Company, the TC DBCP stressed the fact that in some cases, complicated transfer functions used for the Air Pressure measurements don't allow GTS dissemination and suggested implementing these functions on board the buoys themselves in order for physical units to be directly coded in the PTT message. The buoys are already equipped with a microprocessor able to support such mathematic functions.

3) Monitoring

The monitoring activities of the TC include the following points, mainly related to GTS and Quality Control. The TC indeed, using the different tools and reports available to him (e.g. access to the Argos files, Status reports, ECMWF monitoring statistics...) has contacted the drifting buoy owners each time an action had to be taken on a specific buoy transmitting bad data to the GTS. Either the data of a failed sensor or all the data concerning one given platform have then be removed from the GTS diffusion. In some cases, only a recalibration of the sensor was needed.

3.1) Check for bad data using the TC tools: check the position and look for beached platforms, compare the data with climatological limits, draw tracks and time series.

3.2) Check for bad data using the monitoring statistics produced by the European Center for Medium range Weather Forecasts (ECMWF), the Ocean Product Center of NOAA (OPC) and the United Kingdom Meteorological Office. Contacts have also been established with the French Direction de la Meteorologie Nationale in order to obtain such statistics from it.

3.3) Check the various status reports produced on a regular basis by the National Data Buoy Center (bi-weekly), the United Kingdom Meteorological Office (bi-annual), the Australian Bureau Of Meteorology (monthly) and the European Group on Ocean Stations (EGOS, monthly).

3.4) Since November 1989, a program has been executed on a bi-weekly basis, which checks for bad "User Limits" introduced in the Argos System. The limits provided to Argos by the Principal Investigators, indeed, are not always correct and may lead to bad data being disseminated to the GTS. This program produces a list of the limits that need to be changed. The TC then provides it to the Argos User Office for modifications in the system. Because of this procedure, the number of

bad failed sensor data disseminated on the GTS has substantially decreased.

3.5) Resolve specific problems related to GTS for one given buoy, such as looking carefully on the data and the transfer functions used, finding why the delays are too important, or finding why only a few messages are received at the Meteorological Centers...

3.6) Update the TC files: list of the operational platforms (on GTS or not), list of the new programs...

4) User assistance

Many drifting buoy users requested the TC to look carefully at specific problems.

4.1) Principal Investigators:

4.1.1) Get WMO numbers for the PI for new buoys being disseminated to the GTS. Study in detail the PTT message format and the transfer functions used so that using the appropriate processing type, the Argos System can be able to convert the raw data into physical values and therefore to send the data onto the GTS. See also the paragraph 8.4).

4.1.2) The PI may request the TC to look at a specific problem appearing with one of his buoys. See paragraph 3.5).

4.2) Local User Terminals: From time to time, LUT operators asked the TC to provide them with the transfer functions used with specific platforms so that they can also report to the GTS via their LUT.

4.3) Meteorological Centers: Contact the TC when they need information on one given platform drifting in an area in which they are interested.

4.4) Act as a focal point between the Meteorological Agencies and the Principal Investigators when a specific action is needed on a buoy reporting to the GTS (e.g. remove the data from the GTS, recalibrate a sensor...).

4.5) Other: Provide the user with a status report concerning a specific program; answer specific questions concerning the Argos System...

5) Drifting Buoy Quarterly Report

As discussed during the previous session of the DBCP in Geneva, October 1989, a Report on Drifting Buoy has been issued on a quarterly basis since April 1st 1990, by CLS/Argos in close collaboration with the Technical Coordinator. The report is being updated automatically using the Argos files on one hand and manually using information provided by the owners on the other hand. It includes the following information :

- Argos number,
- WMO number (if any),
- Date of deployment
- Deployment position,
- Date of last location
- Last location,
- List of the sensors installed,
- Presence of a drogue
- Code form used
- Data availability (confidential...)
- Status (operational, experimental...)

6) GTS

6.1) Buoys not reporting on the GTS.

The Drifting buoy users who own buoys that do not report to the GTS have been contacted by the Technical Coordinator of the DBCP in order to understand this situation. For the 594 buoys that transmitted through Argos during the week before February 20th 1990, such information has been collected for 84% of them (i.e. 500 buoys). The remaining buoys correspond to owners who have only one or two buoys or who did not answer the TC's questions. In the following text, we will make the hypothesis that those 500 buoys are representative of the total population of the 594 operational buoys. The table on figure 6.1) shows the figures corresponding to this survey.

Let us see the reason why 314 (i.e. 62.8%) of these 500 buoys do not report to the GTS (the percentage gives the amount of these 500 buoys) :

6.1.1) Confidentiality (27.8%)

The owner does not want his data to go to the GTS.
Action proposed : Continue stressing on him via different canals (e.g. TCDBCP, WMO, financiers...).

6.1.2) No meteorological sensor installed on the buoys (10.2%)

The buoys are deployed only to measure surface currents and eddy fields and are therefore not equipped with any meteorological sensors.
Action proposed : Improve the collaboration between Meteorologists and Oceanographers. For the new planned drifting buoy programs that do not intend to install atmospheric sensors on the buoys: see if weather services interested in meteorological data measured in the same ocean areas could provide the oceanographers in charge of these programs with meteorological sensors for free. The buoys would be equipped with the sensors and would report to the GTS.

6.1.3) Poor quality data (9.2%)

In most of the cases, these buoys reported to the GTS but the dissemination of their data has been removed because of poor quality (e.g. sensor failure).
Action proposed : Improve Quality Control procedures.

6.1.4) The user needs raw data (4.8%)

In most of the cases (66%), the users need raw data because the Argos system is not able to process the data into physical values. The other reasons are that the Argos System is not always able to process the data with a sufficient enough accuracy or that the owner simply needs his raw data in order to look carefully at them. Note that the Argos system is not able to provide the owner with raw data on one hand and the GTS with physical data on the other hand.

Action proposed: The Argos system should be able to manage complicated PTT formats and to convert raw data into physical values using a very large kind of calibration functions (mathematic expressions (e.g. using logarithms, sums...), logical tests, more accurate functions...).

6.1.5) The buoy could report to the GTS (3.4%)

Those 17 buoys correspond to buoys that did not report to the GTS at the time the owner has been contacted for the first time: he allows the data being disseminated to the GTS, the PTT format is compatible with the DRIBU code and he doesn't mind if they receive their data in physical values. The buoys now report onto the GTS.

6.1.6) Sensor order (3%)

For these buoys, the sensor order in the PTT message is not compatible with the DRIBU code.
Action proposed : The new Argos GTS processing chain should allow the owner of one buoy to use any order he wants for the sensors in the PTT message, i.e. the type of sensor used must be declared and introduced in the Argos system.

6.1.7) Go to the GTS via LUT (2.6%)

These 13 buoys are not transmitting data to the GTS via Argos but via the Edmonton Local User Terminal. 13 belong to the Polar Science Center (Univ. of WA), 4 belong to the Atmospheric Environmental Service of Canada.

6.1.8) Tests are conducted on the buoys (1.8%)

Tests are conducted on the buoys, therefore the accuracy and/or the representativity of the data cannot be guaranteed by the owner. Sometimes the buoys emit from the continent were they are actually tested before being deployed.

6.2) Request for new buoys reporting to the GTS

The Technical Coordinator has contacted the Principal Investigators of new Drifting Buoy Programs in order to ask them if they would like their data to be disseminated to the GTS. When the owner agreed, he studied in detail the various formats used for the PTT message in order to see if the Argos System were able to process the data for GTS purposes. When this was the case, he suggested the owner introduce a new processing type in the System. In some cases he got new WMO numbers contacting the National Focal Point. This action lead to an increase of about 40 drifting buoys reporting to the GTS, that otherwise would not have been disseminated.

6.3) Rationalization of GTS bulletin headers:

As requested by the DBCP during its previous session in Geneva, October 1989, the Technical Coordinator assisted CLS/Argos in the choice of rationalized GTS bulletin headers. A new list has been implemented on March 1st in the FRGPC for dissemination via the RTH Paris :

SSVX01 LFPW: North Atlantic
SSVX03 LFPW: Southern Hemisphere
SSVX05 LFPW: Northern Hemisphere, excluding North Atlantic
SSVX07 LFPW: Arctic
SSVX09 LFPW: Antarctic

The new list has been implemented on April 4th 1990 in the USGPC for dissemination via the National Weather Service Washington:

SSVX02 KWBC: Southern Hemisphere via NDBC QC
SSVX04 KARS: North Atlantic
SSVX06 KARS: Northern Hemisphere, no NDBC QC
SSVX08 KWBC: Northern Hemisphere via NDBC QC
SSVX10 KARS: Southern Hemisphere, no NDBC QC
SSVX12 KARS: Arctic
SSVX14 KARS: Antarctic
SSVX40 KARS: ATLAS buoys on equatorial Pacific.

6.4) New Argos GTS processing chain

A meeting has been held in Toulouse, May 28th-31st, in order to define the precise DBCP requirements and the specifications of a new Argos GTS processing chain. The document previously mailed by CLS to the chairman of the DBCP and the secretariats, indeed, was not close

enough to the DBCP needs. The Chairman of the DBCP therefore proposed CLS to organize such a meeting in Toulouse.
Attending the meeting: Yves Treglos (IOC secretariat), Paul Julian (NMC/head Quality Insurance Group), David Gilhousen (NDBC/Meteorologist, QC specialist), David Meldrum (SMBA/Oceanographer), Michel Taillade (CLS/President), Philippe Schwab (CLS/project manager), Alain Fontanaud (CLS/project manager), Pierre Yves Letraon (CLS/oceanography group) and Etienne Charpentier (Technical Coordinator of the DBCP).
The discussions have been very interesting and subjects like Quality Control responsibilities have also been studied in detail. The Operational Meteorological Agencies would have a major role to play in QC matters, while the Technical Coordinator would act as a focal point between them and the buoy owners. DBCP requirements and new specifications have been defined, so that various options are now available for discussion during this DBCP session (e.g. rewrite a complete independent GTS chain or modify the existing Argos system to implement the new chain; introduce a specific GTS data-base; add new processing types like Mathematic functions...). After the meeting, CLS figured out the price of these options. For more detail, see the meeting report.

6.5) Quality Control

See the annex regarding Quality Control on Drifting Buoy Data.

6.6) Synoptic data on GTS

Only a few buoys are now equipped with accurate real time clocks and are able to make observations at synoptic hours. The data are stored in a buffer before being sent to the satellite. The Argos system however is not able to handle such bufferized PTT messages for GTS dissemination of synoptic data. Considering that most of the time, the observation is made at the time the message is sent to the satellite, the only synoptic data being transmitted with the existing Argos System are therefore the ones for which a message has been collected between H-30 mn and H+30 mn of a synoptic hour.
In order to measure the efficiency of the existing Argos system to send such synoptic data to the GTS, the TC DBCP computed a map (see figure 6.6)) which gives the probability to compute a location with the Argos system (i.e. more than 4 messages collected, i.e. Satellite pass duration greater than 6 minutes for a repetition period of 90 seconds) between 0H-30 minutes and 0H+30 minutes UTC. To get the statistics for a given hour, shift the figures on the map of 15 degrees per hour to west.
These figures are based on an orbitography simulation of the satellites NOAA H and NOAA G for a 100 day period beginning on August 1st.
We can particularly see that while the Arctic and Antarctic areas are always 100% covered, buoys drifting in some particular areas ("holes") have no chance to be located at specific synoptic hours (the Argos system may however transmit data to the GTS in the case where no location has been possible (less than 4 messages) but at least two identical messages have been collected; in this case the previous location is used). The Atlantic, Pacific and Indian Ocean are better covered for 3, 9, 15 and 21 UTC than for 0, 6, 12 and 18 UTC.

6.7) A Status on Drifting Buoys reporting to the GTS, valid for August 1990 has been produced. The maps on figures 6.7.1 to 6.7.8 show the distribution of the drifting and moored buoys reporting to the GTS on August 8th 1990 and the distribution of the meteorological parameters measured (Air Temperature, Air Pressure, Air Pressure Tendency, Sea Surface Temperature and Wind). Note that while a substantial number of buoys report SST data onto the GTS, there is a real lack of measurements for Air Temperature, Air Pressure and Wind data, particularly in the Southern Hemisphere and in the Pacific Ocean.

7) Combined Meteo/Oceano Drifting Buoys

See the annex regarding Combined Meteorological/Oceanographical Drifting Buoys.

8) TC developments

8.1) The PC monitoring application presented during the DBCP V session, has been improved. The goal is to facilitate the TC DBCP monitoring activities. Using this application, the TC is particularly able to collect the GTS drifting buoy data and to control their quality: check the position, draw tracks, compare the data with climatological limits or nearby buoy data, draw time series...

8.2) Create a PC Data-Base and its tools containing up to date (one week or less) information concerning:

(i) the drifting buoy programs handled by the Argos System (program number, owner name, organization name...),
(ii) the buoys themselves (Argos number, Program number, Last Location...),
(iii) the owners of the platforms (Name, Address, Telephone, E.mail...),
(iv) the contacts that the TC has established with the Principal Investigators (name, date, explanation...),
(v) the ECMWF and OPC monitoring statistics (WMO number, Origin, parameter, bias, RMS, number of observations,...),
(vi) the WMO numbers in use for drifting and moored buoys.

8.3) Development of tools that produce graphs using ECMWF statistics and Argos files. See paragraph 9) for more detail.

8.4) In order to introduce the data of some platforms, using complicated transfer functions (raw data into physical values), on the GTS diffusion, the TC developed tools able to approximate mathematical formula with polynomial functions or calibration tables being used by the Argos System.

9) TC statistics

9.1) Compute on a monthly basis, using Argos files and data provided by the LUT operators, the graph showing the distribution of GTS and non-GTS drifting buoys by country. It is particularly useful to see the evolution of the total number of drifting buoys deployed by the various countries, and the percentage of these reporting to the GTS. The graph is included in the TC monthly report. See figure 9.1).

9.2) Compute on a monthly basis, the graph showing the distribution of the RMS (of Observation minus First Guess Field) of Air Pressure data. This graph, using 6 months of data, gives a good idea of the quality of the drifting buoy Air Pressure data. The graph is included in the TC monthly report. See figure 9.2).

9.3) Compute the graphs showing the distribution of life times of Air Pressure measurements, using the ECMWF monthly monitoring statistics. See figure 9.3).

9.4) Drifting Buoy GTS status for August 1990, see paragraph 6.7) and figures 6.7.1) to 6.7.8).

10) Miscellaneous

10.1) Check the Quarterly Report on Drifting Buoy and give approval before CLS sends it to WMO and IOC.

10.2) Assist CLS in preparing the Argos monthly status report to WMO.

10.2) Issue the WMO/Argos cross reference list on a monthly basis and send it to various Meteorological Centers. Send a floppy disk containing the list to the MEDS. It also includes the WMO numbers managed by the Oslo and Edmonton Local User Terminals (LUT) and indicates for each WMO number: The Argos number, the drifting buoy owner, and the dates the WMO numbers have been introduced and removed from the system (Argos or LUT). See figure 10.2) for a sample of the list.

10.3) Prepare the TC monthly report

10.4) Prepare the various TC missions

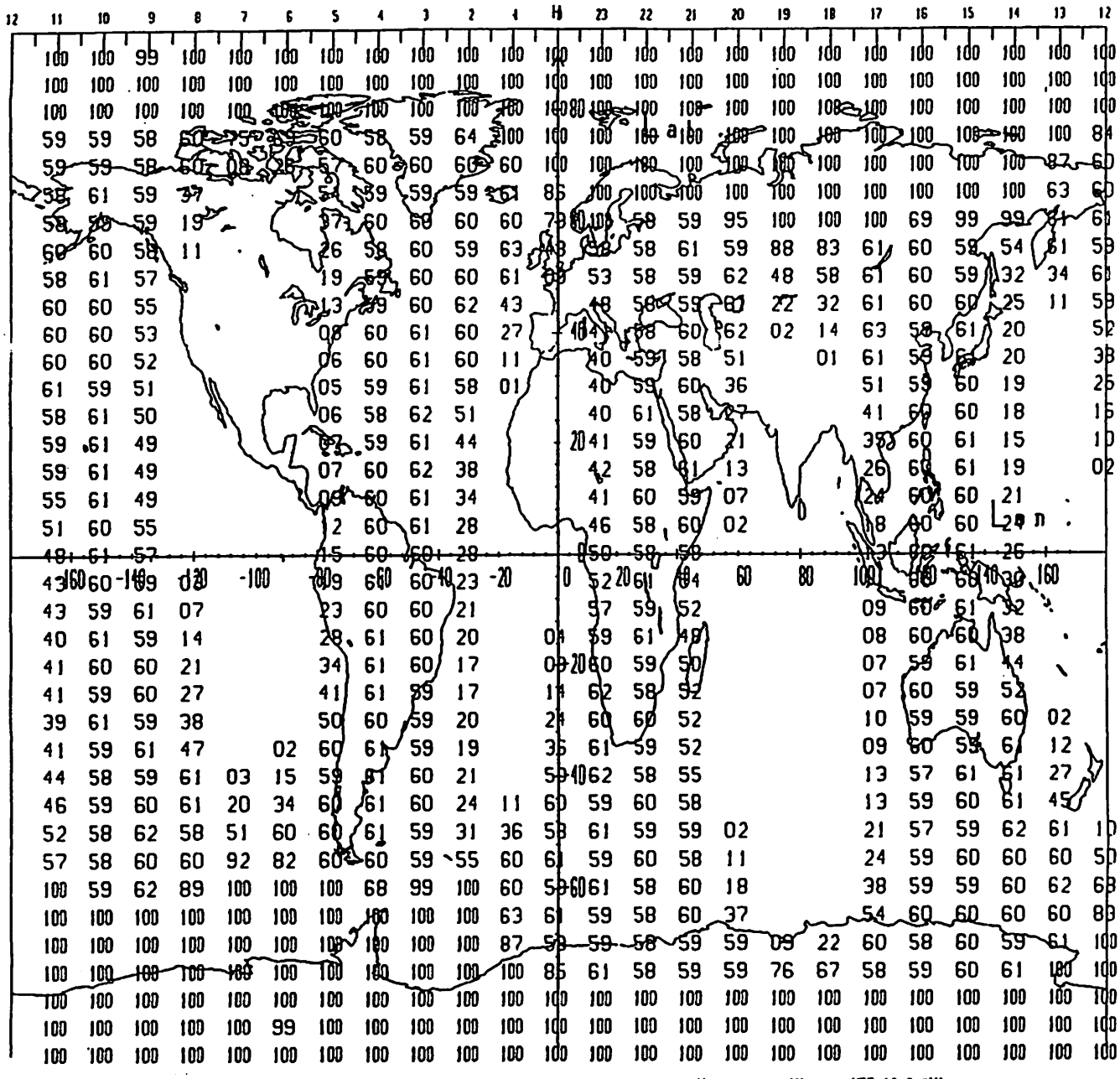
10.5) Prepare documents and the TC reports for the DBCP VI session:

- Report of the Technical Coordinator
- Report on drifting buoy data Quality Control
- Report on Combined Meteorological/Oceanographical Drifting Buoys.

Figure 6.1) Results on the survey for buoys not reporting on the GTS:

Organism	Country	Total	GTS	Poor Quality	No Met Data	Confid-entiality	Need Raw dta	Sensor order	Often recal	Test conduc	on GTS LUT	Not yet on GTS
NOAA/AOML	USA	134	111	23	0	0	0	0	0	0	0	0
MSA/Hyd Dep	Japan	43	4	0	0	39	0	0	0	0	0	0
US Navy	USA	39	7	2	0	30	0	0	0	0	0	0
Scripps	USA	38	0	0	0	38	0	0	0	0	0	0
NOAA/NDBC	USA	31	19	4	8	0	0	0	0	0	0	0
NOAA/PMEL	USA	25	0									
IFM/Kiel	Fed. Rep. Germ	18	0	0	0	18	0	0	0	0	0	0
NOAA/PMEL	USA	15	0	0	8	0	7	0	0	0	0	0
Woods Hole IO	USA	15	0	0	0	0	0	0	0	0	0	15
Univ Hannover	Fed. Rep. Germ	13	12	0	0	0	1	0	0	0	0	0
CMM	France	12	5	6	0	0	0	0	0	1	0	0
BCM	Australia	11	10	1	0	0	0	0	0	0	0	0
Woods Hole IO	USA	10	4	6	0	0	0	0	0	0	0	0
Exxon	USA	9	0	0	9	0	0	0	0	0	0	0
Univ. Washing	USA	9	0	0	0	0	0	0	0	0	9	0
Woods Hole IO	USA	8	0	0	8	0	0	0	0	0	0	0
Bat. Mem. Inst	USA	8	0	0	0	0	8	0	0	0	0	0
IFREMER	France	8	0	0	0	0	8	0	0	0	0	0
Hor. Mar. Inc.	USA	7	0	0	0	7	0	0	0	0	0	0
Fish Agency	Japan	7	0									
Met. Service	New Zealand	6	4	0	0	0	0	0	0	2	0	0
Univ Hamburg	Fed. Rep. Germ	6	0	0	6	0	0	0	0	0	0	0
Marine Lab.	Australia	6	0	0	0	0	0	6	0	0	0	0
Meteo. Inst.	Norway	6	0									
US Navy	USA	6	0	0	0	0	0	6	0	0	0	0
Scripps	USA	5	0	0	5	0	0	0	0	0	0	0
Weather Bur.	South Africa	5	5	0	0	0	0	0	0	0	0	0
Met. Office	United Kingdor	5	0	0	0	0	0	0	0	5	0	0
Bedford Ins. O	Canada	5	0	0	3	0	0	0	0	0	0	2
Atm. Env. Ser.	Canada	4	0	0	0	0	0	0	0	0	4	0
US Coast Guar	USA	4	3	1	0	0	0	0	0	0	0	0
Inst. Ocean. Sc	Canada	4	0									
U.S. Army	USA	4	0	0	0	4	0	0	0	0	0	0
Sverdrup Tech	USA	3	0	0	0	0	0	3	0	0	0	0
China Sea Bur.	China	3	0									
Alfr. Weg. Inst	Fed. Rep. Germ	3	0	3	0	0	0	0	0	0	0	0
Marine Bio. As	United Kingdor	3	0	0	0	3	0	0	0	0	0	0
Polar Res. Lab.	USA	3	0									
K.N.M.I.	Nederland	3	2	0	0	0	0	0	0	1	0	0
Polar Inst.	Norway	3	0									
Inst. Mari. Res	Norway	3	0	0	3	0	0	0	0	0	0	0
Naval School	USA	1	0	0	1	0	0	0	0	0	0	0
< two buoys		43	5									
Total		594	191									
% for Total		100	32.2									
Total available information		500	186	46	51	139	24	15	0	9	13	17
% Total available information		100	37.2	9.2	10.2	27.8	4.8	3	0	1.8	2.6	3.4

Figure 6.6) Probability to collect synoptic data with Argos:



Probability (%) to have a satellite pass which duration is greater than 6 minutes, between H-30 mn and HH30 mn UTC (* =0%).

Figure 6.7) Status on Operational GTS buoys for the 291 buoys reporting via Argos on August 8th:

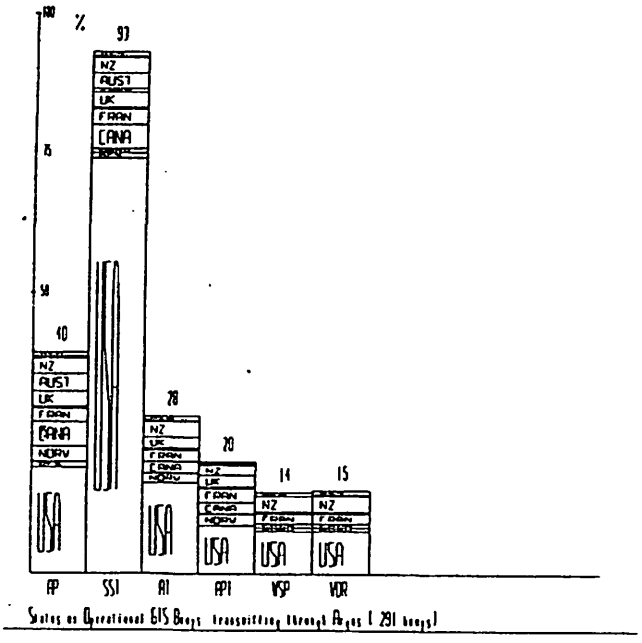


Figure 6.7.1) Distribution by parameter and country

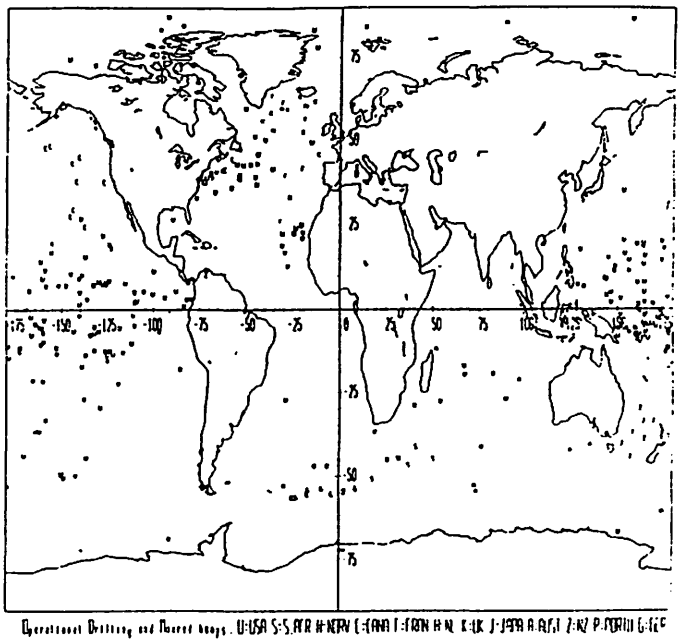


Figure 6.7.2) Positions by country

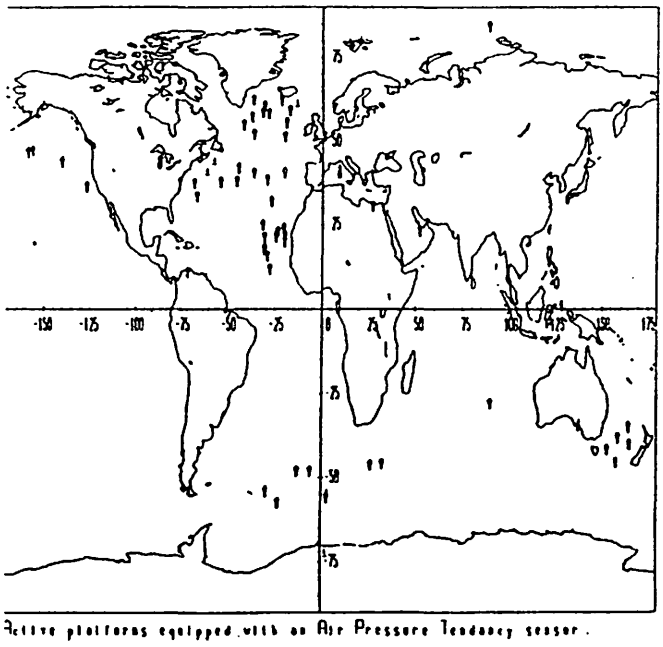


Figure 6.7.3) Positions for Air Pressure Temdency data

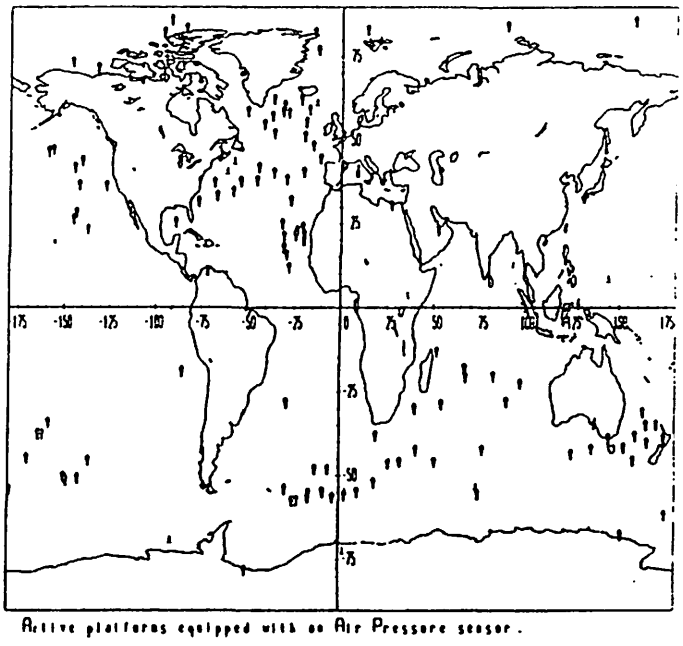


Figure 6.7.4) Positions for Air Pressure

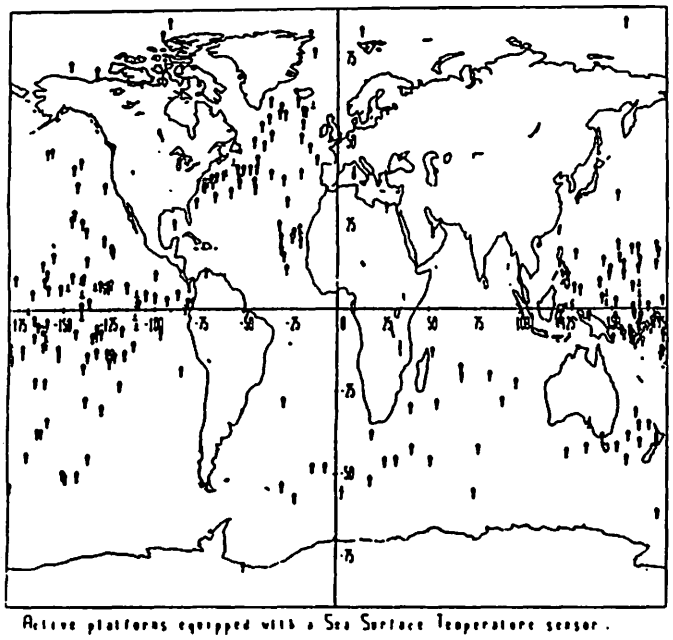


Figure 6.7.5) Positions for Sea Surface Temperature

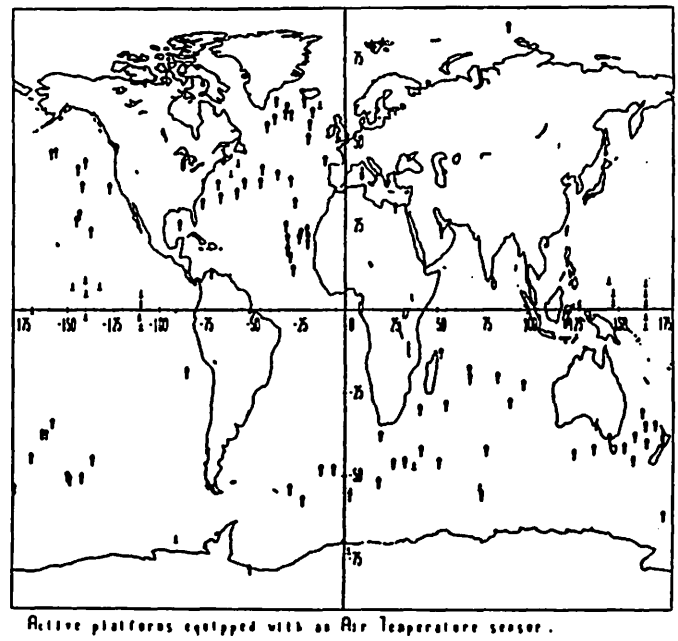


Figure 6.7.6) Positions for Air Tempe.

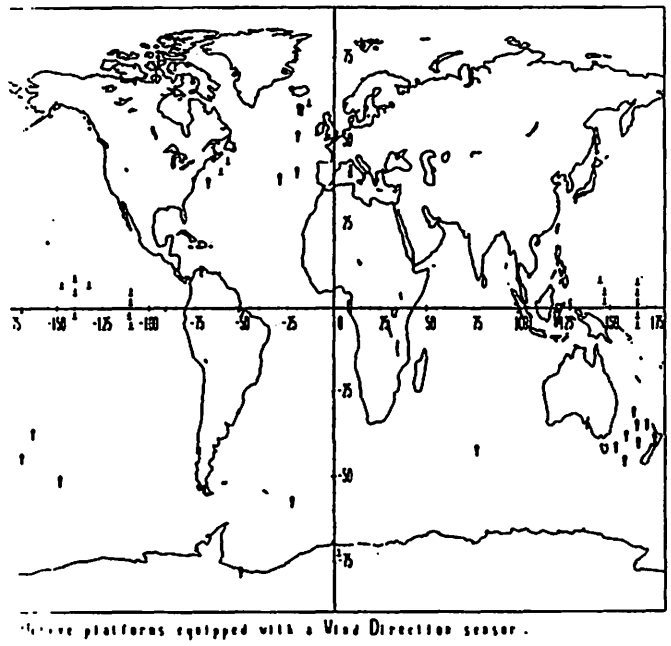


Figure 6.7.8) Positions for Wind Direction

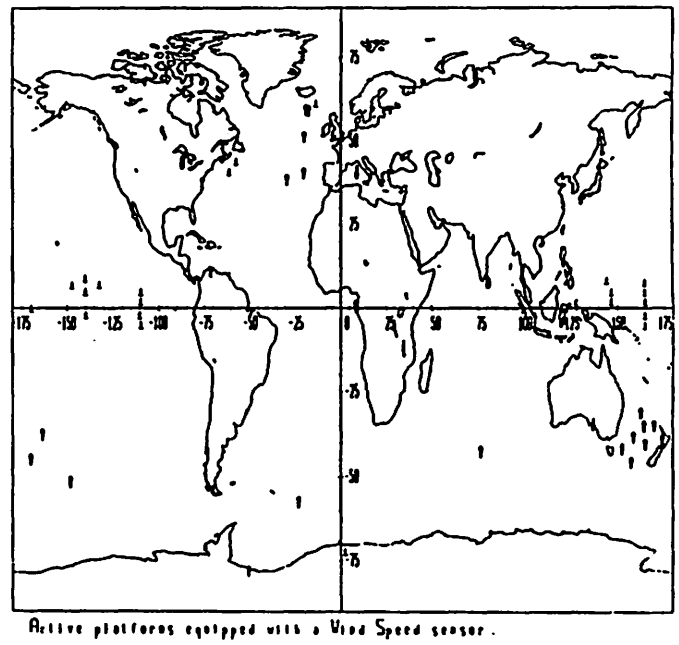
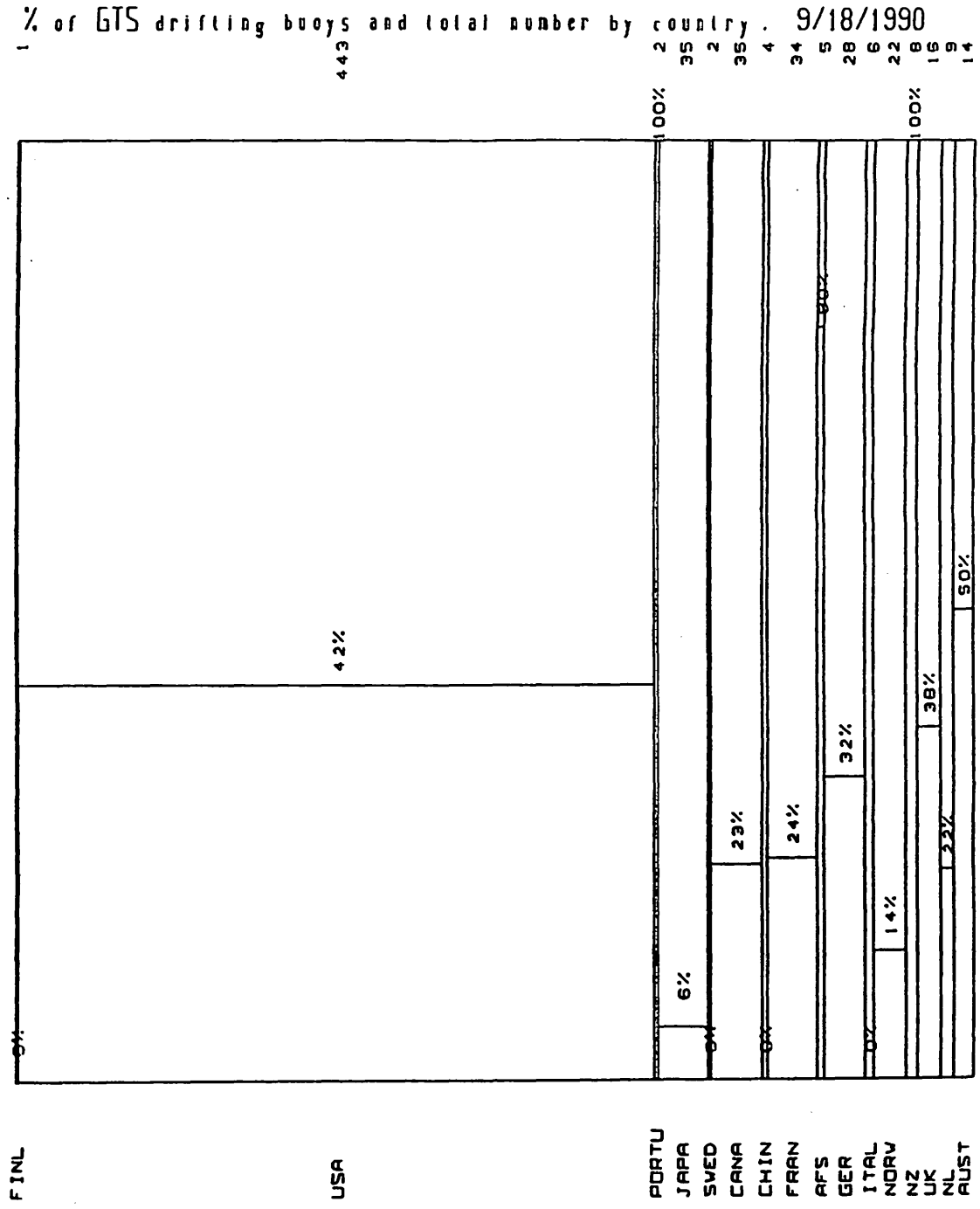


Figure 6.7.8) Positions forWind Speed

Figure 9.1) Distribution of the GTS and non-GTS platforms by country:



Total number of drifting buoys: 664
Total number of drifting buoys reporting to the GTS: 246 = 37%

Figure 9.2) Distribution of RMS (Obs. - First Guess Field) for Air Pressure data:

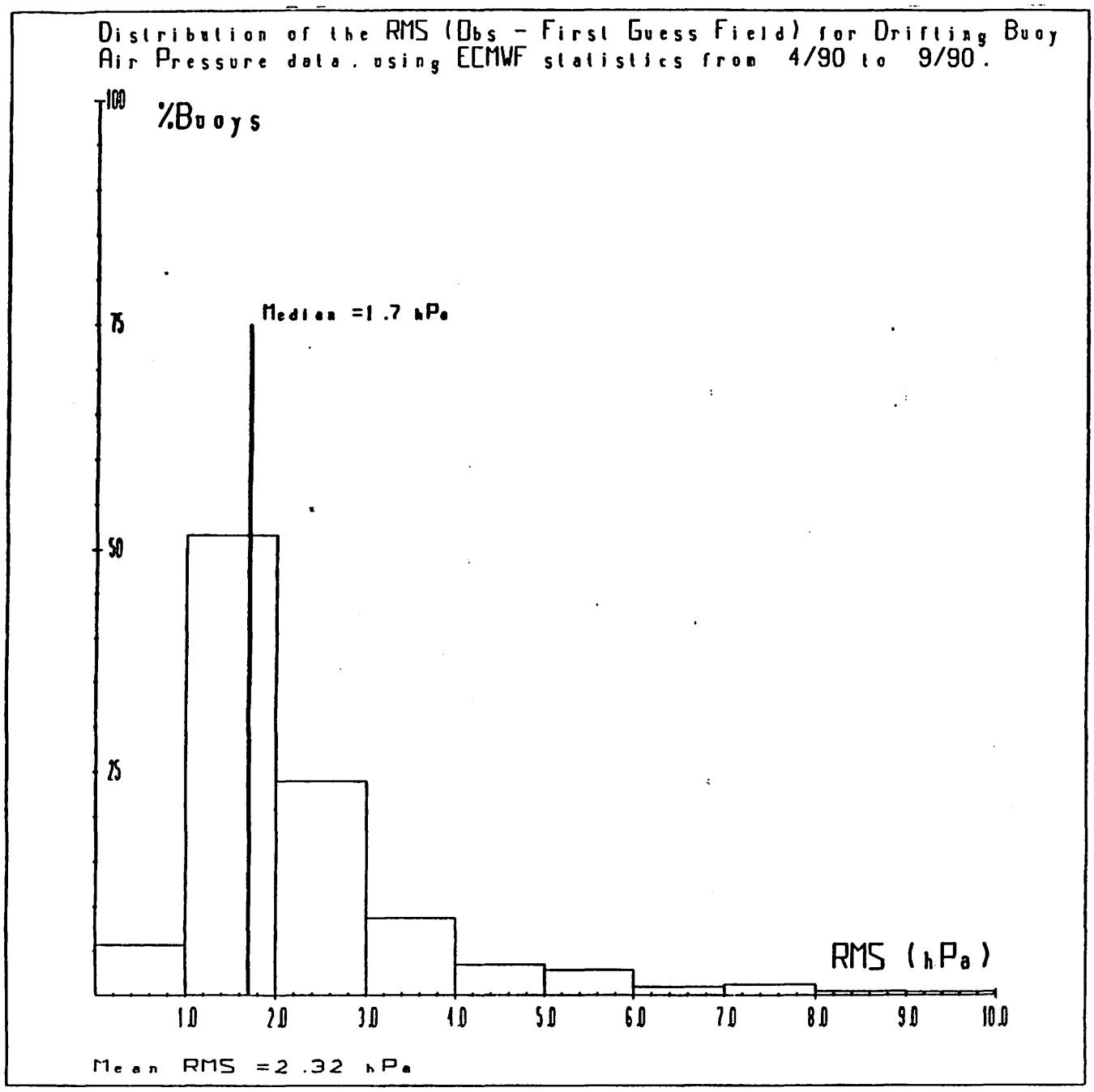


Figure 9.3) Distribution of the Life Time of the Air Pressure sensor:

% of Drifting buoys which have a life time greater than a given value. From ECMWF statistics. Buoys which stopped transmitting Air Pressure data before 8/1990.

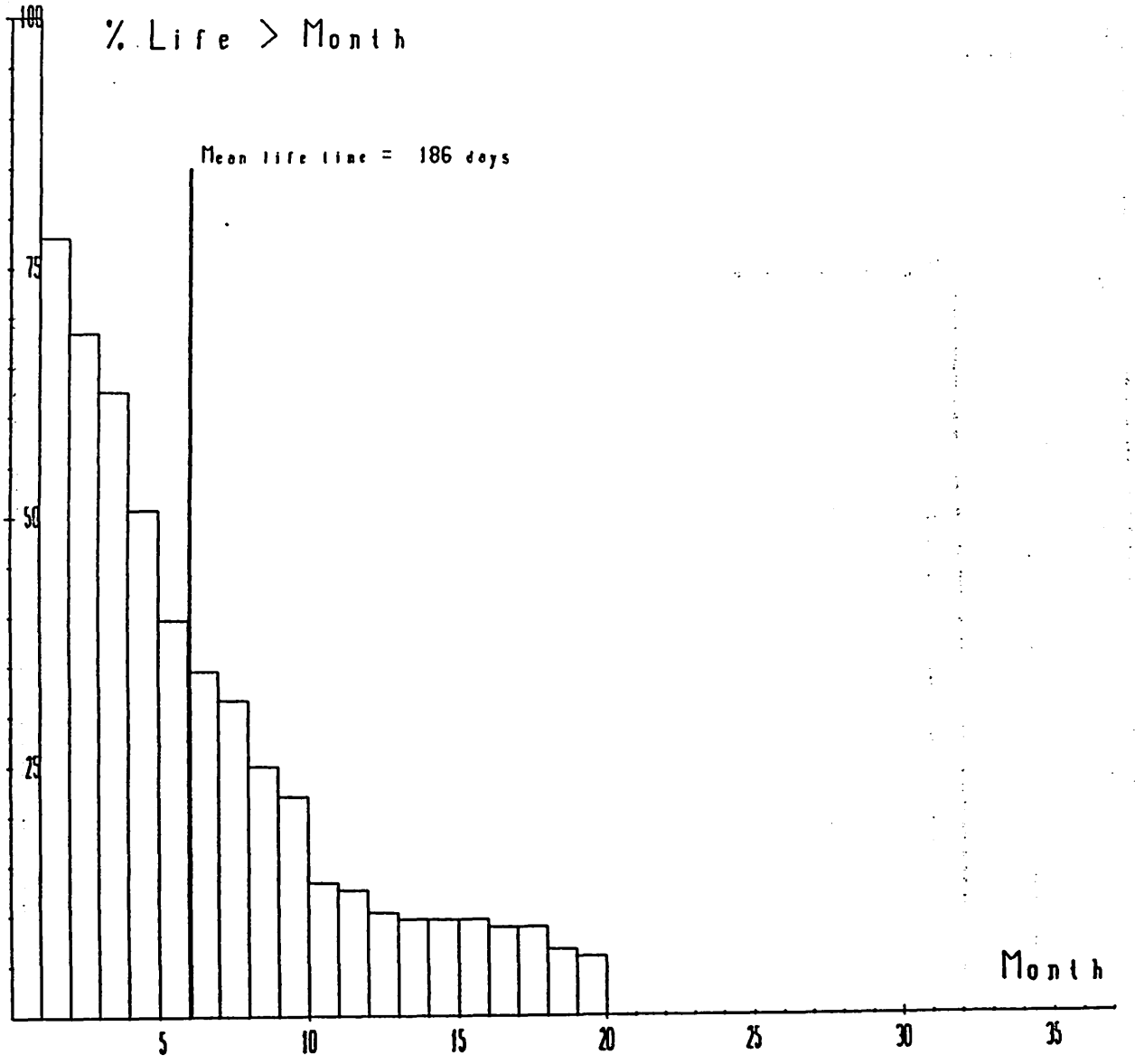


Figure 10.2) Sample of the cross reference list of WMO/Argos numbers (09/90):

Update of the list of WMO/Argos numbers for the last 6 months, 9/90

LUT : LAND = USGPC (Landover) OSLO = Oslo Local User Terminal
TOUL = FRGPC (Toulouse) EDMO = Edmonton Local User Terminal
ARGO = Argos center (global)

Type : DB = Drifting Buoy MB = Moored Buoy FS = Fixed Station SHIP = Ship

WMO	Argos	Organization	Type	Country	LUT	From	to
12501	11735	US_NAVY	DB	USA	LAND	5/02/90	9/16/90
12505	12637	US_NAVY	DB	USA	LAND	5/24/90	7/08/90
12846	11182	NOAA/AOML	DB	USA	LAND	11/15/89	6/13/90
12847	11191	NOAA/AOML	DB	USA	LAND	12/15/89	9/16/90
13501	12412	US_NAVY	DB	USA	LAND	6/18/90	9/16/90
13502	12413	US_NAVY	DB	USA	LAND	6/18/90	9/16/90
13503	12414	US_NAVY	DB	USA	LAND	6/18/90	9/16/90
13504	12415	US_NAVY	DB	USA	LAND	6/18/90	9/16/90
13505	12417	US_NAVY	DB	USA	LAND	6/18/90	9/16/90
13506	12420	US_NAVY	DB	USA	LAND	6/18/90	9/16/90
13507	12421	US_NAVY	DB	USA	LAND	6/19/90	9/16/90
13508	12422	US_NAVY	DB	USA	LAND	6/19/90	9/16/90
13509	12416	US_NAVY	DB	USA	LAND	6/19/90	9/16/90
13510	12418	US_NAVY	DB	USA	LAND	6/19/90	9/16/90
13511	12419	US_NAVY	DB	USA	LAND	6/21/90	9/16/90
13512	11714	US_NAVY	DB	USA	LAND	5/24/90	9/16/90
14803	8844	NOAA/NDBC	DB	USA	LAND	12/15/89	9/16/90
14804	8845	NOAA/NDBC	DB	USA	LAND	4/18/90	9/16/90
16021	9490	SAWB	FS	AFS	TOUL	1/15/89	9/16/90
16805	8823	NOAA/NDBC	DB	USA	LAND	1/15/89	9/16/90
17001	1591	NPI	FS	NORW	ARGO	1/11/90	9/16/90
17001	1591	NPI	FS	NORW	TOUL	1/11/90	7/12/90
17003	1758	NPI	FS	NORW	ARGO	1/15/89	9/16/90
17003	1758	NPI	FS	NORW	TOUL	1/15/89	7/12/90
17512	8259	SAWB	DB	AFS	TOUL	11/15/89	4/16/90
17512	9096	SAWB	DB	AFS	TOUL	4/17/90	9/16/90
17513	8264	SAWB	DB	AFS	TOUL	1/30/90	4/26/90
17513	9092	SAWB	DB	AFS	TOUL	4/27/90	6/05/90
17514	8263	SAWB	DB	AFS	TOUL	2/02/90	9/16/90
17515	8266	SAWB	DB	AFS	TOUL	2/02/90	9/16/90
17516	8267	SAWB	DB	AFS	TOUL	2/08/90	9/16/90
17517	8268	SAWB	DB	AFS	TOUL	2/08/90	9/16/90
17518	8261	SAWB	DB	AFS	TOUL	4/04/90	9/16/90
17519	8265	SAWB	DB	AFS	TOUL	4/10/90	9/16/90
17520	9097	SAWB	DB	AFS	TOUL	4/17/90	9/16/90
17801	8953	NOAA/NDBC	DB	USA	LAND	1/15/89	7/22/90
17802	8954	NOAA/NDBC	DB	USA	LAND	10/15/89	7/22/90
17803	5571	NOAA/NDBC	DB	USA	ARGO	10/15/89	9/16/90
17804	12300	NOAA/NDBC	DB	USA	LAND	4/03/90	9/16/90
17805	12304	NOAA/NDBC	DB	USA	LAND	4/03/90	9/16/90
17820	8846	NOAA/NDBC	DB	USA	LAND	1/15/89	9/16/90
17821	8847	NOAA/NDBC	DB	USA	LAND	1/15/89	9/16/90
17823	8950	NOAA/NDBC	DB	USA	LAND	1/15/89	7/22/90

DRIFTING BUOY CO-OPERATION PANEL ACCOUNT TO 31 DECEMBER 1989

	US$		US$
Contributions *			
Assessed	110,742		
Less: Unpaid	12,122		98,620
Obligations Incurred			
UCAR	86,000		
SMBA	4,900		
Administration direct	131		91,031
Balance of Fund		US $	7,589
Represented by.			
Cash at Bank			12,620
less: Unliquidated Obligations			5,031
		US $	7,589

* Contributions	Assessed	Paid	Due
	$	$	$
Australia	10,000	10,000	0
Canada	15,000	12,878	2,122
France	10,000		10,000
Greece	2,000	2,000	0
Ireland	411	411	0
United Kingdom	10,000	10,000	0
United States of America	50,000	50,000	0
UNESCO	13,331	13,331	0
	110,742	98,620	12,122

DRIFTING BUOY CO-OPERATION PANEL ACCOUNT TO 25 SEPTEMBER 1990

	US$	US$
Balance from 1989	7,589	
Received for prior years *	19,875	27,464
Contributions **		
Assessed	99,470	
Less: Unpaid	17,000	82,470
Contributions in Advance		778
Advance from GTS Chain Fund		5,720
Total Funds Available		116,432
Obligations Incurred		
UCAR	86,000	
SMBA	3,350	
Service Argos	25,500	
Experts	872	
Travel	705	
Administration direct	5	116,432
Balance of Fund at 25 September 1990	US $	0
Represented by.		
Cash at Bank		24,500
less: Unliquidated Obligations		24,500
	US $	0

* Contributions received for prior years

Canada		2,122
France		17,753
	US $	19,875

** Contributions		Assessed	Paid	Due	Advance
		$	$	$	$
Australia		10,000	10,000		
Canada		15,000		15,000	
France		10,000	10,743		743
Greece		2,000		2,000	
Iceland		2,000	2,000		
Ireland		470	505		35
United Kingdom		10,000	10,000		
United States of America		50,000	50,000		
	$	99,470	83,248	17,000	778

GTS CHAIN FUND

Account as at 25 September 1990

Contributions *	US $	25,000
Less Obligations		0
Balance of Fund	US $	25,000

Represented by:

Cash at Bank		19,280
Advanced to DBCP Fund		5,720
	US $	25,000

* Contributions		Assessed	Paid	Due
		$	$	$
Canada		15,000	15,000	
United Kingdom		10,000	10,000	
United States of America		20,000	0	20,000
	$	45,000	25,000	20,000

UCAR FINANCIAL REPORT

For Year 1 June 1989 - 31 May 1990

C030-WMO - DRIFTING BOUY TECHNICAL COORDINATOR

	89-90 Funding	89-90 Expense	Year End Balance	90-91 Funding	Effective 90-91 Budget
TC Salary	38,000	37,727	273	39,000	39,273
UCAR Salary	1,000	1,560	-560	1,250	690
Benefits	10,725	10,001	724	11,673	12,397
M & S	25	4	21	25	46
PS	730	594	136	813	949
Relocation	10,000	4,340	5,660	10,000	15,660
Travel	13,334	11,170	2,164	9,405	11,569
Indirect	12,186	11,859	327	13,834	14,161
Total	**86,000**	**77,254**	**8,746**	**86,000**	**94,746**

Notes:

TC Salary and UCAR administrative salaries are shown separately. The contract year ended mid-pay period, and the TC Salary has been interpolated through 31 May.

UCAR salaries exceed the budgeted figure due to various start-up expenses. Sixty per cent of UCAR salary expense occurred during the first third of the year. During the latter two-thirds of the year, average monthly cost of UCAR salary has been $76.

Benefits apply equally to the TC and UCAR salaries. This is budgeted slightly in excess of actual expense estimates, which produces the remaining surplus despite the minor deficit in Salaries themselves.

Materials & Supplies at $4 are not consequential.

Purchased Services have been running slightly beneath budget estimates, due primarily to absorption of some communications expenses by other UCAR programs.

Travel is separated into Relocation and Business Travel. The only expenditure we have had under Relocation was the $4,340 to remove the TC and his wife from France to the U.S. Business travel has been entirely travel by the TC as authorized by Peter Dexter. The total expenditure for the year includes $2,699 for the late May/early June trip to Toulouse. This trip crossed the year-end date, but ended 2 June; the entire expense has been included in the first year total. A summary of TC travel is attached;

note that costs as listed in the summary are approximations and vary from the actual sum reflected above.

Indirect Costs were applied to all expenditures in FY89 (ended 30 Sep 89) at the rates shown for FY89 in the budget, 10.41% Administrative Support, 2.45% G&A, and 3% fee. For expenditures during FY90, rates were 11.85%, 3.44% and 3%.

The end result at 31 May 90 was a positive balance in all categories except UCAR Salary and a total positive balance of $8,746.

Adding the balance in each category to the funding for the second year of UCAR support gives an Effective Budget for '90-'91, totaling $94,746.

More detail on any of these expenditures will be provided upon request.

Respectfully submitted,

Jon Rush
UCAR
Joint Climate Projects/Planning Office

Charpentier Travel

	Trip	Purpose	Begin	End	Approx. Cost
1.	Strasbourg-Geneva-Paris-London-Bracknell-Reading-Brest-Toulouse-Strasbourg	WMO familiarization tour	6/1/89	6/23/89	$2,227
2.	Strasbourg, France-Paris-IAD-Landover, MD	Relocation	6/26/89	7/15/89	$4,339
3.	DC-Toulouse, France-Geneva-Return	WMO Business	10/1/89	11/4/89	$4,582
4.	DC-New Orleans-Ret	Attend AGU Ocean Sciences Mtg.	2/11/90	2/16/90	$1,013
5.	Washington, DC - Paris/Toulouse, France-ret	WMO DBTC "Mission to Toulouse"	5/23/90	6/2/90	$2,699
					$14,860

MODIFICATION NO. 1
TO
SUPPORT AGREEMENT
BETWEEN
WORLD METEOROLOGICAL ORGANIZATION
AND
UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH

This Modification No. 1 entered into and effective on this _____ day of _____ 1990 between the University Corporation for Atmospheric Research (hereinafter referred to as "UCAR") and the World Meteorological Organization (hereinafter referred to a "WMO") WITNESSETH THAT:

Whereas, on July 17, 1989 UCAR and WMO entered into a Support Agreement for the Technical Coordinator to coordinate the drifting buoy programmes of the Member countries and other organizations; and

Whereas, UCAR and WMO now desire to modify said Support Agreement to extend the period of performance, provide a new budget for the extended performance period and make certain other changes therein;

NOW THEREFORE, in consideration of the premise and of the agreements hereinafter set forth UCAR and WMO hereby agree as follows:

a. The period of performance of the agreement is hereby extended on year from May 31, 1990 to May 31, 1991.

b. Exhibit A is hereby amended by adding the attached Exhibit A, dated February 13, 1990. Exhibit A shall apply to the period June 1, 1990 through May 31, 1991.

c. The first sentence of paragraph 4.01 is hereby deleted and the following is substituted in its place: "WMO's funding obligation hereunder for the period June 1, ~~1989~~ 1990 through May 31, ~~1990~~ 1991 shall not exceed actual contributions received from the panel Members up to the total estimated cost

of US$86,000. ~~and for the period June 1, 1990 through May 31, 1991 the total estimated cost of US$86,000.~~

d. The name "Jeff D. Reaves" which appears in paragraph 5.02 is hereby deleted and the name "Robert Greenwald" is substituted in its place.

With the exception of the above changes all provisions and requirements of the original Support Agreement shall remain unchanged.

IN WITNESS WHEREOF UCAR and WMO have executed this Modification No. 1 as of the date first above written.

Witness:

BY: Virginia Q. Fishman

TITLE: Contracts Secretary

UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH

BY: Robert Greenwald

Robert Greenwald
Director

TITLE: Contracts and Risk Management

Witness:

BY: A. J. Wilson

Director

TITLE: World Weather Watch

WORLD METEOROLOGICAL ORGANIZATION

BY:

Director

TITLE: Administration Department

EXHIBIT A

February 13, 1990

Joint Climate Projects/Planning Office
UCAR Account #C030
Drifting Buoy Cooperation Panel - Technical Coordinator
1 June 90 - 31 May 91
World Meteorological Organization

		Estimated Budget April 19, 1990
Salaries		
UCAR Administrative	1,250	
Technical Coordinator	39,000	
Subtotal		$40,250
Benefits		$11,673
Materials & Supplies		$25
Purchased Services		
Office Space	313	
Phones	100	
Email, Express Service, Etc.	400	
Subtotal		$813
Travel		
Relocation Expense	10,000	
Coordinator Travel		
International Airfare		
1 US-Australia RT	1,200	
Per Diem--18 days @ $136	2,448	
Miscellaneous	332	
Domestic Airfare--5 trips @ $500	2,500	
Lodging--20 nights @ $80	1,600	
Per Diem--25 @ $33	825	
Miscellaneous	500	
Subtotal		$19,405
TOTAL Direct Costs		$72,166
Indirect Costs		
Administrative Support @ 11.85%	8,552	
G & A @ 3.44%	2,777	
Fee @ 3%	2,505	
TOTAL Indirect Costs		$13,834
TOTAL Proposed Budget		$86,000

Indirect costs shown are FY 90 rates. FY 91 indirect cost rates are subject to negotiation and approval by the National Science Foundation. Such rates will be applied as approved. Relocation Travel is intended to cover both the return home of the incumbent and the relocation to Landover of his successor at the end of the 1990-91 contract.

CONTRACT

between

World Meteorological Organization (WMO)

and

Service Argos Inc.
1801 McCormick Drive, Suite 10
LANDOVER, MD. 20785
USA

The following has been agreed:

I. Service Argos Inc will provide to the Technical Coordinator of the WMO/IOC Drifting Buoy Cooperation Panel, for the period 1 June 1990 to 31 May 1991 inclusive, the following logistic support :

(a) An office and appropriate furniture;

(b) Necessary secretarial support;

(c) Free access to all telecommunications facilities currently available (telephone, telex, telegram, electronic mail etc..);

(d) Access to the computing facilities of Service Argos Inc, including free use of (i) a terminal giving access to the Argos processing centre; (ii) a micro-computer with standard software;

(e) Normal office supplies and facilities (including mail services and photocopies etc.).

II. WMO will pay to Service Argos Inc. for the services noted in I above the sum of US $ 13,500, such payment to be effected within 30 days of the finalization of this contract.

III. Except if specifically agreed otherwise, Service Argos Inc will bear all costs relating to the execution of the services noted in I above.

IV. Neither Service Argos Inc, nor any person employed by it in undertaking the agreed services, is to be considered as an agent or employee of WMO; nor can they claim any advantage, immunity, payment or recompense other than expressly provided for in the present contract; nor are they authorized to engage WMO in any additional expenses or obligations.

V. Service Argos Inc assumes full responsibility for whatever measures it deems necessary to take to insure itself against any loss or damage incurred during the execution of the agreed services.

For the World Meteorological Organization

Signature :

Title :

Date :

For Service Argos Inc

Signature :

Title :

Date :

ORGANISATION MÉTÉOROLOGIQUE MONDIALE

WORLD METEOROLOGICAL ORGANIZATION

Téléphone: National (022) 730 81 11
International + 41 22 730 81 11
Télégrammes: METEOMOND GENÈVE
Télex: 23 260 OMM CH
Facsimilé: 41 22 734 23 26

SECRÉTARIAT
GENÈVE - Suisse

41, Giuseppe-Motta
Case postale N° 2300
CH - 1211 Genève 2

No.: 15.458/A/CNS

Geneva, 7 March 1990

SPECIAL SERVICE AGREEMENT

MEMORANDUM OF AGREEMENT made this 7th day of March 1990 between the World Meteorological Organization and

Mr. David MELDRUM

(hereinafter referred to as the "subscriber"), whose address is Dunstaffnage Marine Laboratory, P.O. Box 3, OBAN PA34 4AD, Scotland.

WHEREAS the World Meteorological Organization desires to engage the services of the subscriber on the terms and conditions hereinafter set forth, and

WHEREAS the subscriber is ready and willing to accept this engagement of service with the World Meteorological Organization on the said terms and conditions,

NOW, THEREFORE, the parties hereto hereby agree as follows :

1. NATURE OF SERVICES

The subscriber shall perform the following services according to the schedule given below :

Review in depth the detailed specifications provided by CLS/Service Argos for the new Argos GTS processing chain with a view to:

a) Ensuring that these meet the specified requirements of the DBCP;

b) If necessary, proposing amendments, deletions or additions to these specifications;

c) If possible, assessing whether the implementation price being asked for this new system is a fair one.

2. DURATION OF AGREEMENT

This agreement shall commence on the 7th day of March 1990 and shall expire on the satisfactory completion of the services described above, but not later than the 8th day of March 1990.

./.

3. CONSIDERATION

As full consideration for the services performed by the subscriber under the terms of this agreement, the World Meteorological Organization shall pay the subscriber upon completion of the work to the satisfaction of the Organization the sum of US$ 600.- (six hundred dollars).

No national taxes will be reimbursed by the World Meteorological Organization.

4. STATUS OF THE SUBSCRIBER

The subscriber shall be considered as having the legal status of an independent contractor. The subscriber shall not be considered in any respect as being a staff member of the World Meteorological Organization.

5. RIGHTS AND OBLIGATIONS OF THE SUBSCRIBER

The rights and obligations of the subscriber are strictly limited to the terms and conditions of this agreement. Accordingly, the subscriber shall not be entitled to any benefit, payment, subsidy, compensation or entitlement, except as expressly provided in this agreement.

6. TITLE RIGHTS

The title rights, copyrights, and all other rights of whatsoever nature in any material produced under the provisions of this agreement shall be vested exclusively in the World Meteorological Organization.

7. UNPUBLISHED INFORMATION

The subscriber shall not communicate to any person or other entity any unpublished information made known to him by the World Meteorological Organization in the course of performing his obligations under the terms of this agreement except upon authorization by the World Meteorological Organization.

IN WITNESS WHEREOF, the parties hereto have executed this agreement.

WORLD METEOROLOGICAL ORGANIZATION

(G.O.P. Obasi)
Secretary-General

(Subscriber)

ORGANISATION MÉTÉOROLOGIQUE MONDIALE — WORLD METEOROLOGICAL ORGANIZATION

Téléphone: National (022) 730 81 11
International + 41 22 730 81 11
Télégrammes: METEOMOND GENÈVE
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Facsimilé: 41 22 734 23 26

SECRÉTARIAT
GENÈVE - Suisse

COPY

PLEASE SIGN AND RETURN THIS COPY TO PERSONNEL DIVISION

41, Giuseppe-Motta
Case postale N° 2300
CH - 1211 Genève 2

No.: 15.942/A/CNS

Geneva, 23 May 1990

SPECIAL SERVICE AGREEMENT

This agreement, made between the World Meteorological Organization and the ~~Scottish Marine Biological Association (SMBA)~~ Dunstaffnage Marine Laboratory (DML), whose address is : P.O. Box 3, Oban Argyll PA34 4AD, Scotland establishes the conditions under which the SMBA will make available to the World Meteorological Organization the services of a Consultant, Mr. David MELDRUM.

1. NATURE OF SERVICES

The services to be performed by the Consultant are given below :

To participate in, and chair if appropriate, a special working group of the Drifting Buoy Co-operation Panel. The group will work in Toulouse, in conjunction with CLS/Service Argos, to develop a set of options (including detailed specifications) for a new Argos GTS processing chain, in accordance with requirements expressed by the panel.

2. DURATION OF AGREEMENT

This agreement is effective from 27 May 1990 till 2 June 1990. Each of the parties may at any time cancel the present contract by providing three days' notice in writing. In case of cancellation, the ~~SMBA~~ DML will be compensated prorata for the work which has been effectively completed by the Consultant and which the World Meteorological Organization has judged to be satisfactory.

3. CONSIDERATION

The cost of the services provided by the ~~SMBA~~ DML under the terms of this agreement is US$ 2,750.- (two thousand seven hundred fifty dollars).

The World Meteorological Organization will pay the ~~SMBA~~ DML upon presentation of an invoice and upon completion of the work of the Consultant to the satisfaction of the World Meteorological Organization.

./.

4. STATUS OF THE SUBSCRIBER

The designated Consultant will not be considered, in any respect, as being a staff member of the World Meteorological Organization. During the term of this agreement the Consultant will continue to be a staff member of the SMBA which will continue to pay him his emoluments.

5. RIGHTS AND OBLIGATIONS OF THE SUBSCRIBER

The rights and obligations of the ~~SMBA~~ DML are strictly defined by the present agreement. Therefore, the ~~SMBA~~ DML and the Consultant, acting jointly or separately, will not be entitled to any benefit, payment, subsidy, compensation or entitlement except as expressly provided under the terms of this agreement.

6. TITLE RIGHTS

The title rights, copyrights, and all other rights of whatsoever nature in any material produced under the provisions of this agreement shall be vested exclusively in the World Meteorological Organization.

7. UNPUBLISHED INFORMATION

Any unpublished information made known to the Consultant by the World Meteorological Organization in the course of the performance of his duties shall not be communicated to any person or other entity except upon authorization by the World Meteorological Organization.

IN WITNESS WHEREOF, the parties hereto have executed this agreement.

WORLD METEOROLOGICAL ORGANIZATION

Dunstaffnage Marine Laboratory (NERC)
~~SCOTTISH MARINE BIOLOGICAL ASSOCIATION (SMBA)~~
(DML)

(G.O.P. Obasi)
Secretary-General

Date: 25 May 1990

(Director)

Date: 7 June 1990

DRAFT UCAR BUDGET

1 June 1991 to 31 May 1992

Estimated Budget
20 September 1990

		US $
Salaries		
UCAR adminstrative	1,250	
Technical co-ordinator	43,895	
Subtotal		45,145
Benefits		13,544
Materials & Supplies		25
Purchased Services		
Office space	313	
Phones	100	
Email, express service etc.	417	
Subtotal		830
Travel		
Co-ordinator travel		
Int. airfare - 1 US-Europe RT	1,000	
Per diem 12 days $145	1,740	
Miscellaneous	500	
Domestic airfare - 10 trips $500	5,000	
Lodging - 30 nights $90	2,700	
Per diem - 40 $33	1,320	
Miscellaneous	500	
Subtotal		12,760
TOTAL direct costs		72,304
Indirect costs		
Admin. support 20.85%	15.075	
Fee 3%	2,621	
TOTAL indirect costs		17,696
TOTAL proposed budget		90,000

Indirect costs shown are proposed FY 91 rates, subject to negotiation and approval by the National Science Foundation. Indirect cost rates for FY 92, undetermined at this time, will be applied as approved to expenditures under this budget in FY 92.

WWW 1449

SERVICE ARGOS INC. EXPENDITURES 1990

THE DRIFTING BUOY COOPERATION PANEL
1990

Summary of the Estimated Expenditures from the Logistic Support of the Technical Coordinator of the WMO/IOC Drifting Buoy Coorperative Panel(TCDBCP)

Monthly Expenses		
Office Space		230
Office supplies		17.5
Fax		14
Utilities		70
Building Insurance,Services &Taxes		80
Secretarial Support		75
Access & usage of Computer		500
Amortization of IBM PC		38
Sub Total		1024.5
Direct Expenses Paid by SAI		
Postage	368.94	
Telex	61.84	
Fax	68.85	
Software	446.49	
Omnet	621.1	
Printing	173.25	
Telephone	2621	
Estimated monthly direct expenses		$623.07
Monthly Average		$1,647.57

Service Argos,Inc. estimates that the yearly cost for the service provided to the TCDBCP will amount to $19,770.81

DRAFT TABLE OF CONTRIBUTIONS 1991/92

COUNTRY	1990/91 CONTRIBUTION	+5%	1991/92 CONTRIBUTION
	$US	$US	$US
Australia	10,000	500	10,500
Canada	15,000	750	15,750
France (FF 60,000)	10,743	-----	10,800
Greece	2,000	100	2,100
Iceland	2,000	100	2,100
Ireland (Ir 300)	505	-----	505
Netherlands	------	-----	1,500
United Kingdom	10,000	500	10,500
USA	50,000	2,500	52,500
TOTAL			$US 106,255

DRAFT TABLE OF EXPENDITURES 1991/92

	US $
Employment of technical co-ordinator (UCAR)	90,000
Logistic support for technical co-ordinator (Service Argos Inc.)	14,000
WMO administrative expenses	300
Sundry (contracts for specific tasks, contingencies)	8,150
TOTAL	112,450

The WOCE/TOGA Surface Velocity Program (SVP)
An Overview for 6th DBCP Meeting
Melbourne, Australia
16-19 October, 1990

Submitted by:
Drs. Jeffrey D. Paduan and Pearn P. Niiler
Global Drifter Center,
Scripps Institution of Oceanography

The overall scientific objectives of SVP are to provide mixed layer velocity and temperature observations on basin wide scales, from which maps of surface currents and their variances can be constructed on global basis. Beyond this basic description, SVP observations will be used to test global models of surface currents, to study advection of ocean surface properties, and to relate satellite measurements of wind stress and sea surface elevation to ocean dynamics. To achieve this goal requires the maintenance of arrays of Lagrangian drifters, with SST sensors, within an ocean basin for a four to five year period, at a spatial resolution of approximately 600km x 600km. These ARGOS-tracked mixed layer drifters will be of a calibrated design, so the accuracy of the velocity and temperature measurements are known.

A pilot program sponsored by TOGA has been carried out over the past two years within the tropical Pacific. This experiment, called the "Pan-Pacific Surface Current Study", has maintained drifter observations with the desired SVP resolution over the region from 15° S to 15° N in the tropical Pacific. Figure 1 shows the resulting trajectories for all drifters for which the drogue indicators indicate attachment. It is imperative that velocities be inferred only from drifters with drogues attached, because the flow characteristics relative to mean currents at the drogue level (15m) are then known to a well-determined level of accuracy. In SVP, the objective is to produce a sampling of surface trajectories of about three times the density displayed on Figure 1 which will require four to five years of array duration in each basin.

Fiscal realities and practical considerations of drifter construction in various countries dictate that SVP be implemented on a basin by basin basis, rather than attempt to deploy drifters in all ocean basins at the same time. Because the TOGA Pan-Pacific drifter sampling is being continued for the next three years, it has been decided that the Pacific Ocean will be filled with WOCE drifters starting in early 1991. U.S. WOCE SVP drifters are committed to expansion of the TOGA tropical drifter array to higher latitudes and sampling in remote ocean regions not supported by specific interests of other countries. The number of drifters funded by NSF presently, when taken together with the international commitments, are sufficient to implement the Pacific basin SVP. Funds are now being sought from NOAA for the Atlantic SVP implementation. The table below denotes the number of US WOCE drifters required to do the job (TBA = To Be Announced):

US WOCE SVP Drifter Requirements

Basin	Array Size	Total Required	Years for Deployment
Pacific Ocean	132	351	91-95
Atlantic Ocean	107	284	92-96
Southern Ocean	180	393	93-97
Indian Ocean	TBA	TBA	94-98

Deployments will be made from voluntary observing ships and research vessels of opportunity and will be managed by scientists at Scripps Institution of Oceanography's Global Drifter Center (GDC) and NOAA's Atlantic Oceanographic and Meteorological Laboratory's (AOML) Drifter Data Center (DDC). GDC also provides the quality control on manufacturing, the engineering evaluations of drifter performance, and assistance to the international community on drifter construction. DDC is a data assembly center, which acquires the data through SERVICE ARGOS, quality controls it, makes diagnostic products for the SVP participants and sends it to the Marine Environmental Data Service (MEDS) of Canada for distribution. As data from the Pacific accumulates at MEDS (by Fall 1991), proposals to the appropriate funding agencies can be written for its analyses and interpretation. SVP data is shared with other WOCE projects according to the WOCE data policy.

Although SVP is an integral part of WOCE, interests in it and support for it comes also from an even broader oceanographic community. Contributions are being made from projects in a number of countries which are not formally a part of WOCE. For example, in the US about 100 WOCE quality drifters per year will be released in the western Atlantic by EPA and MMS. In Korea, Australia, and Hawaii fisheries research institutions will contribute 20-30 drifters into the Pacific arrays. As long as instrument lifetimes in a non-WOCE project are several months, GDC will endeavor to install battery life for few years duration so drifters will become part of the Global SVP observing network during this extended life. The regions of responsibility for WOCE/TOGA participating countries in the Pacific and nominal array sizes are shown in Figure 2.

Through engineering studies and experience gained in the TOGA Pan-Pacific Surface Current Study in 1988 and in WOCE Heavy Weather Drifter Tests in 1989-90, the design for a WOCE/TOGA standard drifter has emerged. Plans are to add a barometer capability to this drifter trough WOCE support and salinity sensors through TOGA support. The primary engineering objectives were to design a drifter whose water following characteristics were understood and to build a drifter which would survive for at least 18 months in the open ocean. Drifters constructed using GDC guidelines are now being built and deployed by US, France, Taiwan, Korea, Japan, Brazil and Russia. Several countries are building WOCE/TOGA quality drifter hulls, which will be fitted with US transmitters for use in basin-wide deployments. The drifter design is explained shortly below.

The at-sea measurements of the water following calibrations of drifters has been done by attaching two VMCMs to the top and bottom of the drogue. Such slip data has been gathered

from holey-sock and Tristar drogues with various tethers and surface floats in the tropical, midlatitude, and northern Pacific. These specially-instrumented drifters have been released in many different wind and shear conditions since 1985,(e.g. see Niiler. et. al., 1987) and the slip of the drogue through the water has been related to wind and shear. A least square fit model for slip has been developed and it accounts for nearly 90% of the variance of the observed slip as a function of wind, shear and drag area ratio,R (R is the ratio of the drag area of the drogue to the drag area of the combined tether and surface float). The table below displays the best fit model coefficients. A value of R>40 is required to reduce the slip below 2 cm/sec in winds of 20 m/sec and has been adopted as a WOCE/TOGA standard.

"Best Fit" Model to Downwind Slip(U) as a Function of Wind(W), Velocity Difference(D), and Drag Area Ratio(R)

Model	Coeff. (95% C. L.)		Var. Explained
	a	b	
$U = a*W/R + b*D/R$	-3.50 ± 1.96	-9.81 ± 6.47	88%

The construction specifications of a mechanically reliable drifter have been achieved by deploying a number of candidate designs at sea and recovering a significant number for inspection. In October 1989, 16 drifters were released near OWS PAPA and 12 were recovered in May 1990 off the Washington coast. These WOCE Heavy Weather Drifter Test results have led to the following observations : i) a subsurface float on the tether significantly reduces the shock load on the top of the drogue; ii) flexible carroting below the surface float is required; iii) largest biofouling occurs on the surface float; iv) no systematic biases of drift were found between the holey-sock and Tristar drogues; v) drogues, polypropylene coated tethering cables and fiberglass surface floats showed no perceptible wear and tear after 200 days in heavy weather. Because of the relative ease of construction and shipping, the holey-sock type drifter, with spherical surface and subsurface floats has been adopted as the standard for SVP (see photograph). Detailed engineering drawings, and materials specifications of the recommended drifter will be sent to all SVP participants in September, 1990. Anyone wishing copies of these drawings may obtain them through GDC by writing to Dr. Pearn P. Niiler, Scripps Institution of Oceanography, Code A-030, UCSD, La Jolla, CA 92093.

The adaptation of barometric pressure sensors to the low-cost drifters has been funded as part of U.S. WOCE and is also being carried out at the GDC. Once successfully implemented, this enhancement will greatly increase the amount of real-time pressure data over remote parts of the ocean at a fraction of the costs for platforms in use today. A test array of 10 drifters with barometric pressure measurements is planned for deployment in 1992 in the eastern North Pacific.

In summary, SVP is one of the funded and operational global programs of WOCE, one which will complement other programs of directly measuring the world ocean circulation. The

data set obtained will be available to the broad scientific community and proposals to utilize the data can be sent to all WOCE participating agencies.

References:

Niiler, P.P., R.E. Davis, and H.J. White, 1987: Water-following characteristics of a mixed layer drifter. Deep-Sea Res., 34, 1867-1881.

Figure Captions:

Figure 1. Trajectories of drifters with drogues attached from the TOGA Pan-Pacific Drift study for the time period of July 1, 1988 through April 30, 1990.

Figure 2. Approximate array sizes for drifters in the Pacific portion of SVP arranged by region and by funding source (actual numbers of instruments required will be greater than the array size depending on the average instrument longevity).

Photo. Mariann Andreasson of the Scripps Global Drifter Center stands next to a holey-sock drifter built to SVP standards. In the foreground can be seen the surface float, which contains the ARGOS transmitter, and the subsurface float, which is used to isolate the drogue element from surface wave action.

TOGA/PAN-PACIFIC DROGUED DATA FROM JULY 1, 1988 THRU APRIL 30, 1990

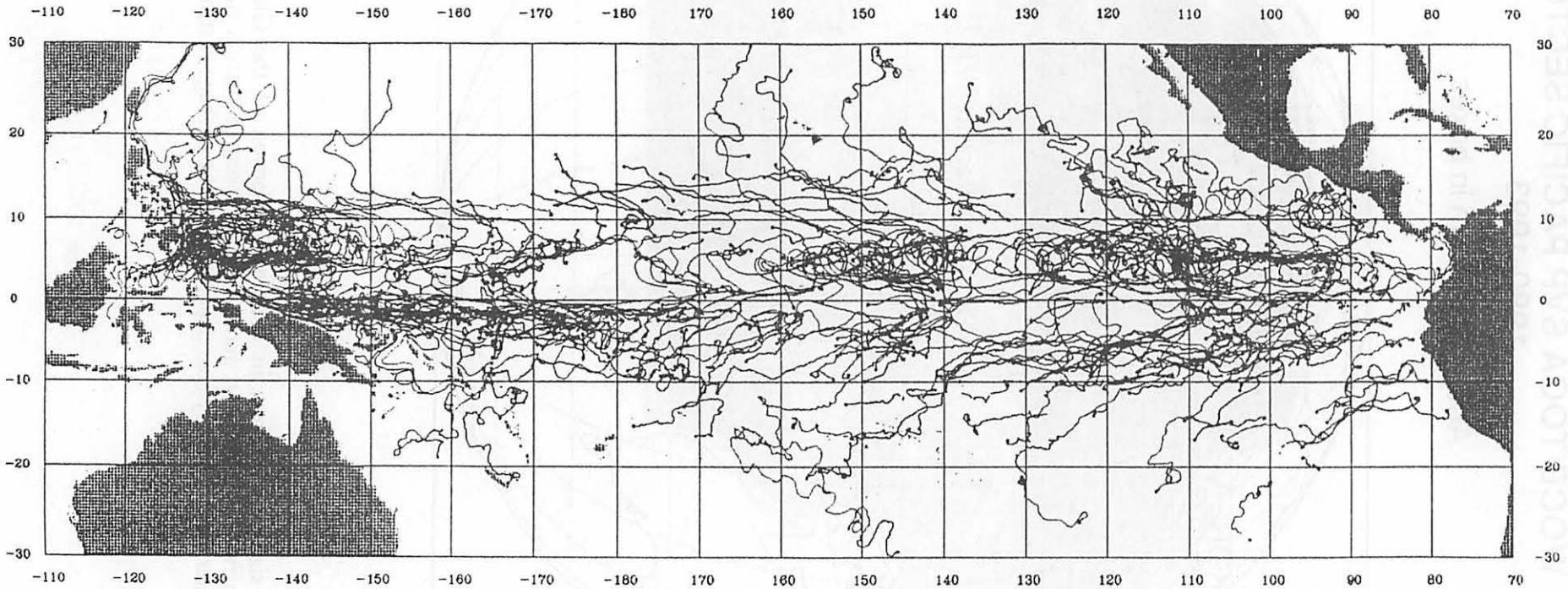
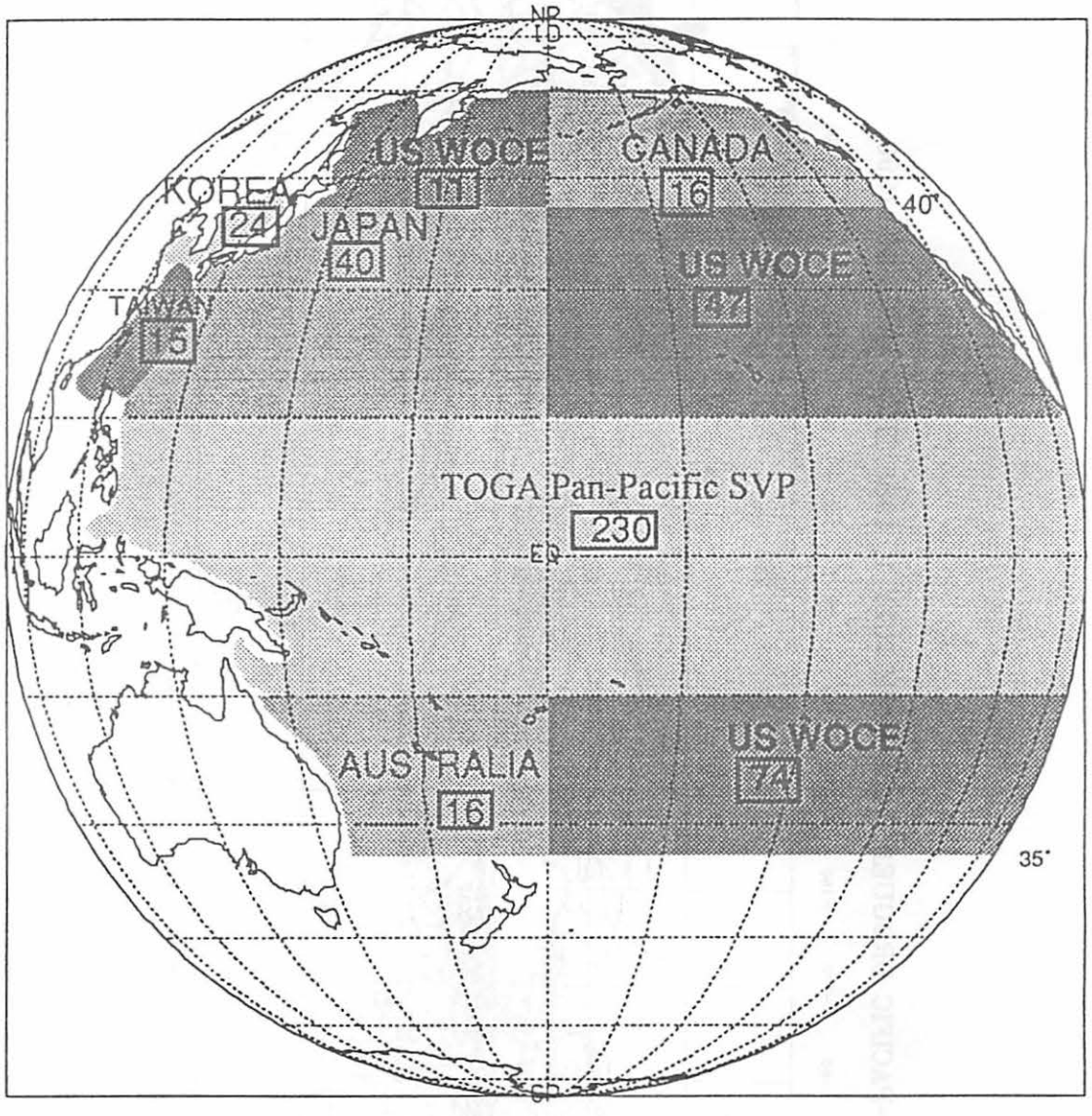


Figure 1.

WOCE/TOGA SVP PACIFIC SECTOR
1990-1993

Array size shown in boxes



Approximate array sizes for drifters in the Pacific portion of the Global Surface Velocity Programme (SVP) arranged by region and by funding source (actual numbers of instruments required will be greater than the array size depending on the average instrument longevity.)

Figure 2.

REQUIREMENTS, SPECIFICATIONS AND COST EVALUATIONS FOR A NEW ARGOS GTS PROCESSING CHAIN

INTRODUCTION

1. The Informal Expert Meeting on the New Argos GTS Processing Chain was held at the kind invitation of CLS/Service Argos at CLS headquarters, Toulouse, France, from 28 May to 1 June 1990. A list of participants is attached as Annex 5.

2. The Meeting began with presentations by CLS of the present Argos processing chain and proposals for modifications that might suit DBCP requests regarding the circulation of drifting-buoy data over the GTS. The following general discussion aimed at clarifying the capabilities and limitations of the present chain and at comparing CLS proposals to the Panel's requests.

GENERAL APPROACH

3. The Meeting then discussed the requirements for a new GTS processing chain, which differ if the buoy owner is part of the "operational" community or a scientist. One of the key issues being to get relevant "scientific" data onto the GTS, every effort should be undertaken to make this operation as "transparent" as possible to the scientists, unless they themselves wish to intervene, for any reason, in the process.

The Argos GTS Processing Chain should be designed to meet operational requirements without interfering with scientific ones.

4. This leads to the problem of the responsibility for the data quality, viz for inserting the data onto the GTS. The answer to this question can be found through a thorough analysis of the way the quality of the data is controlled. Modern four-dimensional data assimilation techniques allow the main meteorological operational centres around the world to be in the best position to make valid data quality control. So, provided there is no "garbage" inserted onto the GTS (which should be taken care of, as far as possible, by the Argos chain itself),

the main operational centres, through the feed-back they would provide to the Technical Co-ordinator, should be collectively "responsible" of the quality of the data circulating onto the GTS.

5. Of course, when a scientist is interested to have his data circulating onto the GTS, he takes part in this responsibility. But it should be stressed that the GTS is primarily dedicated to operational activities. (The question of responsibilities for data quality control is discussed in more detail in para. 7 below).

6. The experts defined three main items to be studied in depth in terms of requirements and attendant specifications for the Argos GTS processing chain: data quality control (QC); coding of the reports; sensor processing.

DATA QUALITY CONTROL

7. Two alternatives have to be considered (when the buoy owner is a scientist who allows his data to be circulated onto the GTS):

(i) Some sensors (e.g., air pressure sensors) may have been installed on buoys as a result of negotiations between the buoy owner and others (e.g., funding agencies or operational community), but may be of no use to the buoy owner himself. In this case, it is clear that the principle stated under para. 4 above fully applies.

(ii) Sensor outputs may be of interest to both the buoy owner and the operational community. In this case, the responsibility for quality control should be shared. The following is a theoretical attempt to show how such a sharing might work:

(a) the buoy owner may himself detect "bad sensors". He should then ask CLS (i.e., the Argos Users' Office) to take appropriate action, e.g., re-calibrate the sensor or remove it from GTS distribution, as the case may be. The Argos Users' Office would of course work in close co-operation with the Technical Co-ordinator;

(b) an operational centre may also detect "bad sensors" and suggest possible remedial action. It then should get in touch with the Technical Co-ordinator who will be the link between the operational agencies, the buoy owner and CLS, take action as appropriate and inform all interested accordingly (e.g., circulate a new sensor calibration).

8. The part of the QC exercise operated by the CLS chain itself has to be fully automated (including the sending of "warnings" to the Technical Co-ordinator) and organized in such a way that no possibly good data be removed from GTS distribution but flagged if considered doubtful. The following tests can be performed:

(i)	quality of location (through CLS existing procedures),	} for every platform
(ii)	"beached" platforms (showing virtually no movement),	
(iii)	gross error (absolute limits of variable),	} for every sensor/ variable to be coded and sent over the GTS
(iv)	user's limits (provided by the buoy owner),	
(v)	climatological limits (depend upon location and date),	
(vi)	time/continuity (too large variations in time),	
(vii)	sensor "blockage" (same value reported every time).	

Failing tests (iii) and/or (iv) only would restrict the data to be sent over the GTS. Other failings would generate a flag and a warning message to the Technical Co-ordinator.

CODING OF THE REPORTS

9. The experts were unanimous in considering that a large variety of code forms might be used to send drifting-buoy and equivalent (i.e.,

generated through Argos) data over the GTS (e.g., DRIBU, SHIP, SYNOP, BATHY, BUFR, ...). Managing code forms should therefore be very flexible. Now, the present situation regarding coding in the Argos "Meteo Public File", from which the information to be coded is extracted, is not fully satisfactory, in that:

(i) access to variables is made by using Argos identifiers,

(ii) WMO identifiers are not included,

(iii) background information on buoys is not included,

(iv) results of QC tests are not included,

(v) the information is stored according to sensor serial numbers, not to variables,

(vi) apart from a few "special services", only DRIBU can be used, etc.

10. These and other considerations plead for establishing a "GTS Data Base" that would contain, among others, the following features:

(i) any kind of information needed to code any relevant reports to be sent over the GTS;

(ii) access by WMO identifiers and/or date/time of observation;

(iii) optional access by Argos identifiers;

(iv) information stored by variable types in physical values (location, Argos and WMO identifiers and date/time should be treated as "variables");

(v) QC flags and/or results of QC tests included and updated in real time;

(vi) "compression indexes" by sensor (see para. 12 below);

(vii) information on the platform (provided by the buoy owner);

(viii) information on GTS bulletin headers;

(ix) access to the GTS data base shared in real time by the "Meteo Manager Office" (see para. 17 below) (in R/W modes), the coding modules (in R only mode), etc.;

(x) the GTS data-base management should minimize all delays between the observation and GTS dissemination times.

SENSOR PROCESSING

11. Under this general heading, several sub-items were identified: multiplexing and compression index problems; flexible data conversion; flexible sensor order; data processing on-board buoys; raw data simulation.

Multiplexing and Compression Index Problems

12. When the length of the message generated by the PTT exceeds the normal length of one single Argos message (i.e., 256 bits), several Argos messages may be used in sequence to forward the information. This method is named "multiplexing". For the time being, Argos considers multiplexing problems on a case by case basis, which means that a new software has to be developed (by the user or by CLS) for each new case to restore the original information. A new processing chain might be able to incorporate some standards (still to be defined) to that end. In addition, the multiplexing technique impinges upon the use of the "compression index" [The "compression index" is an indicator of the reliability of the message received from the buoy, based on the number of identical messages received during one satellite passing. For the time being, this number should be > 2 to allow the data to be sent over the GTS]. The setting up of a "compression index" by sensor, instead of by platform as is presently the case, would also prevent from having to develop a new software every time a new multiplexing technique is developed.

Flexible Data Conversion

13. Not only is there a need to convert raw data into physical values in as flexible a fashion as possible (mathematical functions, pieces of software, etc.) to accommodate various users' requirements, but such a flexibility is sometimes required to get physical values (for operational uses) to the accuracy the code forms used onto the GTS allow. CLS already studied this question and noted that, in addition to related software development, such a possibility might impinge upon the functioning of the Argos Users' Office. Assistance by the "Meteo Manager Office" (see para. 17 below) might be welcome.

Flexible Sensor Order

14. This question is directly linked to, and solved by, a proper GTS data base, the variables being identified by an indicator. In this connection, it was noted that it would be worth using BUFR descriptors.

Data Processing On-board Buoys

15. Such a possibility would not lead to any problem, unless in very specific cases (such as the use of ASCII characters, for example, which would have to be "translated" into GTS-compatible numerical values). This is a special case of "Flexible Data Conversion" (see para. 13 above).

Raw Data Simulation

16. This is the way for the user of testing the data conversion function. It should be achieved through the "Meteo Manager Office" (see para. 17 below) and/or through the setting up of new tools for the users to intervene directly on the processing chain.

"METEO MANAGER OFFICE"

17. This CLS wording covers the activities of the Technical Co-ordinator as the link between the operational community and CLS itself. CLS

is ready to develop operational tools to be used by the Technical Co-ordinator for consultation of/action on the processing chain. Indeed, the responsibility of running the Argos chain lies with CLS; any "outsider"'s intervention must not go beyond some precise limits (involving, for example, the overall functioning of the chain, confidentiality of some data, etc.). CLS needs therefore to (at least) control the tools used by the Technical Co-ordinator.

18. In this connection, it was made clear that the Technical Co-ordinator should be able to access any data that can be put onto the GTS and related information about the platform/programme/etc. unless the buoy owner explicitly forbids it.

CONCLUSIONS OF THE EXPERT MEETING

19. With that in mind, two different schemes were designed that take into account the above requirements and attendant specifications (see Annexes 1 and 2, respectively). Advantages and disadvantages of both solutions were listed as follows:

(i) **Solution 1**

Advantages:
- one "Collect." module only,
- development step by step possible,
- new "Demultiplexing" and "Collect" modules would benefit all users (not only GTS ones).
- the owner may be "responsible" of data sent over the GTS.

Disadvantage:
- the "Collect" module has little flexibility.

(ii) **Solution 2**

Advantages:
- clean (not a "patch-on-patch" approach),
- flexible for GTS (takes data from early in chain, allowing wide range of options),
- flexible for Argos (allows development of new services and new techniques),
- non-destructive (no risk to existing real-time operations and existing users),
- independent (separates GTS data stream and modifications needed by it from classic user data stream).

Disadvantages:
- possible loss of feedback from user's own assessment of data quality to GTS data stream (the owner "does not care"),
- tougher intellectual exercise to design new chain than to "patch" existing one.

20. Both solutions have some identical features:

- coding modules
- QC modules
- demultiplexing modules
- GTS data base management/structure
- role of the "Meteo Manager Office" (almost).

21. Features that differ from a solution to another are:

- compression/sensor modules
- collect. modules
- distribution to users.

22. In order that a progressive implementation (and related funding) be made possible, the Meeting established the following priority lists:

Priority	Solution 1	Solution 2
0	GTS Data Base	
1	Coding Modules	New Collect. Module (initially, only copy of the existing one)
2	QC Modules	Coding Modules
3	{ Compression/Sensor Module }	Raw Data Simulation
4	{ Distribution to Users }	QC Modules
5	Modif. Collect. Module	Compression/Sensor Module
6	Demultiplexing Module	
		5 } Fully new Collect. 6 } Module

23. CLS kindly agreed to provide rough financial estimates of the costs of development of each solution by mid-July 1990. CLS would also study the implications of implementing identical processing chains in its various processing centres (e.g., regarding needed computer power).

COST EVALUATIONS (submitted by CLS/Service Argos)

24. The following is a summary of adopted requirements and order of priority:

(i) Establishment of a GTS-only database. This would enrich the data concerning each weather buoy, enhance access to GTS data and thus provide better feedback on the operation of each buoy, permit specific upgrades (regarding, in particular, the compiling of statistics), and so on.

(ii) Establishment of a "Meteo Manager Office", providing access to the database, monitoring of buoy operation, correction of certain values, output of statistics, and so on.

(iii) Modification of the encoding module for weather data distributed over the GTS. In particular, (a) the existing module must be made to interface with the database and (b) new codes must be accommodated.

(iv) Implementation of a module to monitor the quality of data transmitted over the GTS, including:

- gross error check,
- climatological check,
- time continuity check,

- user limits check,
- beached platforms check,
- location quality check,
- etc.

(v) Sensor-by-sensor data compression. The Argos chain currently compresses identical, consecutive messages without discriminating between sensor values. The present proposal is to compare all sensor values, one by one, for all messages transmitted by the platform during a satellite pass, whether consecutive or not.

(vi) Provision of raw data. At present, the Argos chain cannot distribute both raw data for the user and physical data values output by sensor data processing for the GTS. This point was the subject of much discussion at the experts' meeting. We agreed that the following solutions were conceivable:

Solution 1: Modify the Argos distribution so that both raw data and physical values can be output.

Solution 2: Implement a second sensor data processing module to convert the data to be transmitted over the GTS into physical data.

(vii) Enhancement of sensor data processing to meet users' new requirements. The Argos chain currently provides five ways of converting binary data into physical values. If the need really exists, we propose to extend the scope of sensor data processing, letting users define, themselves, calibration curves including log, sine functions, etc. This would be done via the User Office.

(viii) Simulation of binary data at the sensor data input stage. Users would not have to switch on their platforms to fine-tune parameters for their calibration curves. To check that their curves were valid, they would simply supply a set of test data to the User Office.

(ix) Scope for processing messages of different lengths or types from the same platform. This would mean demultiplexing the data in accordance with certain criteria, but, unfortunately, these have not yet been defined. The Meeting did not go into this item in detail, and work remains to be done.

25. The above are the requirements for the new GTS processing chain. These have been translated into two possible software architectures (see Annexes 1 and 2). The advantages and disadvantages of the two architectures are summarized in the experts' meeting report. The most significant difference is that the second architecture includes a separate sensor data processing module, and that it provides a more flexible and independent GTS chain. Note, however, that the problems of computing power and storage space needed for the GTS chain were barely raised during the meeting. More study is clearly necessary, but it is already clear that the Australian Regional Processing Center (RPC) which should be a third gateway for Argos data onto the GTS, is not in a position to offer all the functions of the new GTS chain.

26. As requested, CLS has provided a financial assessment, broken down by stages, of software development for the new chain under each proposal. The prices given were carefully calculated, but cannot be considered firm or definite. They are simply an order of magnitude. Annexes 3 and 4 describe the different functions to be provided by the new GTS chain.

SOLUTION 1 - FINANCIAL ESTIMATE

Stage 1

• GTS databank	59500
• Simplified Meteo Manager Office	185500
• Interface with Argos chain	31500
• Modification of weather data encoding module	63000
• Modification of weather data distribution module	31500
• Upgrade of data transfer between Argos centers	56000
Total FF	427,000 (excl. of taxes)

Stage 2

• GTS data quality control	192500
• Impact on Argos User Office	49000
• Enhancement of Meteo Manager Office	143500
• Upgrade of data transfer between Argos centers	31500
Total FF	416,500 (excl. of taxes)

Stage 3

• Sensor data compression	87500
• Provision of binary data	56000
• Modification of Argos distribution system	52500
Total FF	196000 (excl. of taxes)

Stage 4

• Binary data simulator	143500
• Enhancement of sensor data processing	259000
Total FF	402500 (excl. of taxes)

Stage 5

• Message demultiplexing	154000
• Separation of GTS chain	119000
Total FF	273000 (excl. of taxes)

Comment:

During Stage 5 and for a supplementary cost of 119000 FF, we plan the possibility to separate the GTS chain from the regular Argos chain. The architecture would then be almost identical to that of Solution 2.

Total cost of implementing a GTS chain (solution 1):

Stage 1:	427000
Stage 2:	416000
Stage 3:	196000
Stage 4:	402500
Stage 5:	273000

Total: FF 1,715,000 (excl. of taxes)

SOLUTION 2 - FINANCIAL ESTIMATE

Stage 1

• GTS databank	59500
• Simplified Meteo Manager Office	217000
• Interface with Argos chain	42000
• Modification of weather encoding module	63000
• Modification of weather data distribution module	31500
• Upgrade of data transfer between Argos centers	66500
• Integration and modification of sensor data processing	52500
Total FF	532000 (excl. of taxes)

Stage 2

• GTS data quality control	192500
• Impact on Argos User Office	49000
• Enhancement of Meteo Manager Office	143500
• Upgrade of data transfer between Argos centers	31500
Total FF	416500 (excl. of taxes)

Stage 3

• Sensor data compression	87500
Total FF	87500 (excl. of taxes)

Stage 4

• Binary data simulator	143500
• Enhancement of sensor data processing	259000
Total FF	402500 (excl. of taxes)

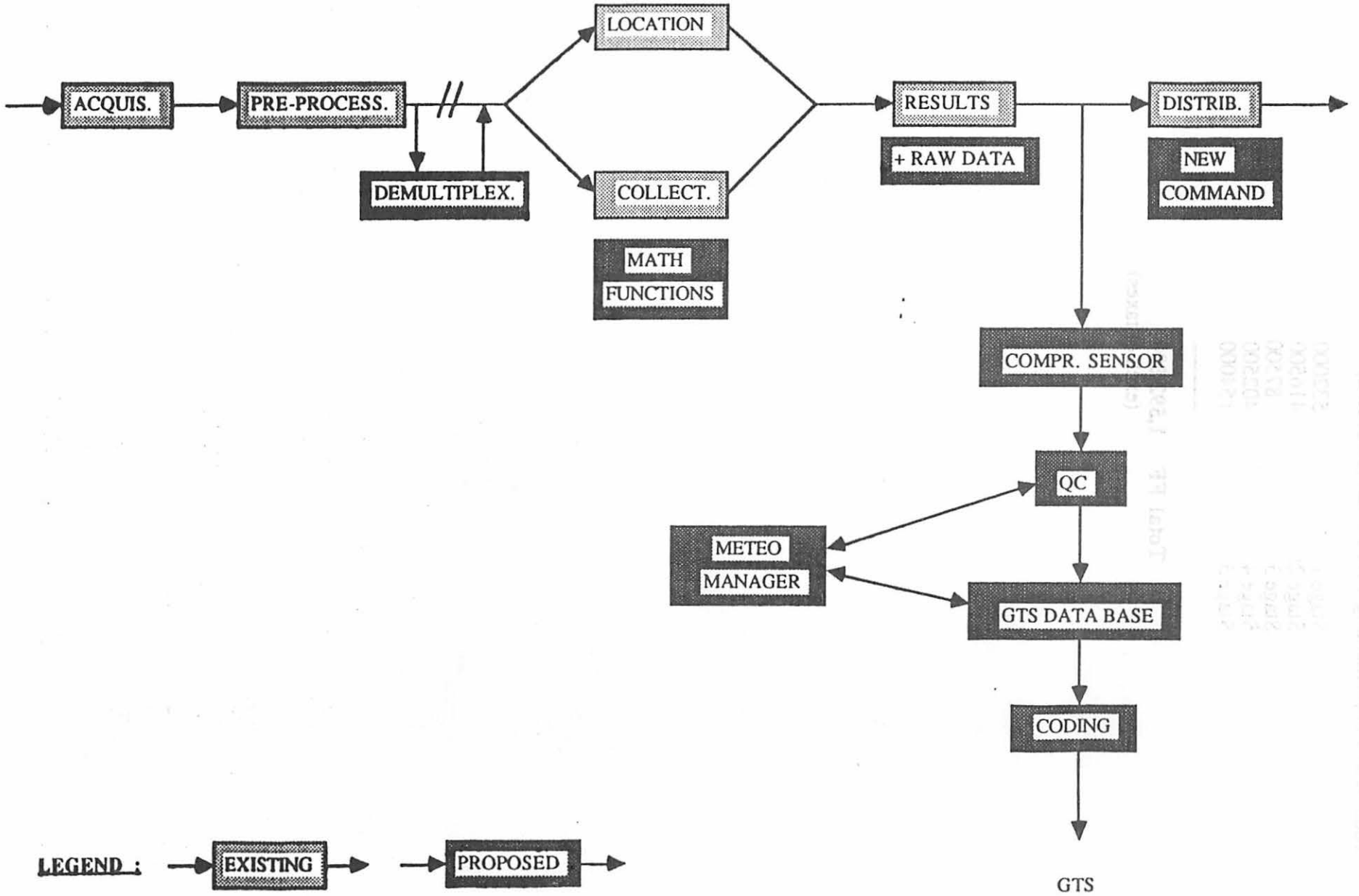
Stage 5

• Message demultiplexing	154000
Total FF	154000 (excl. of taxes)

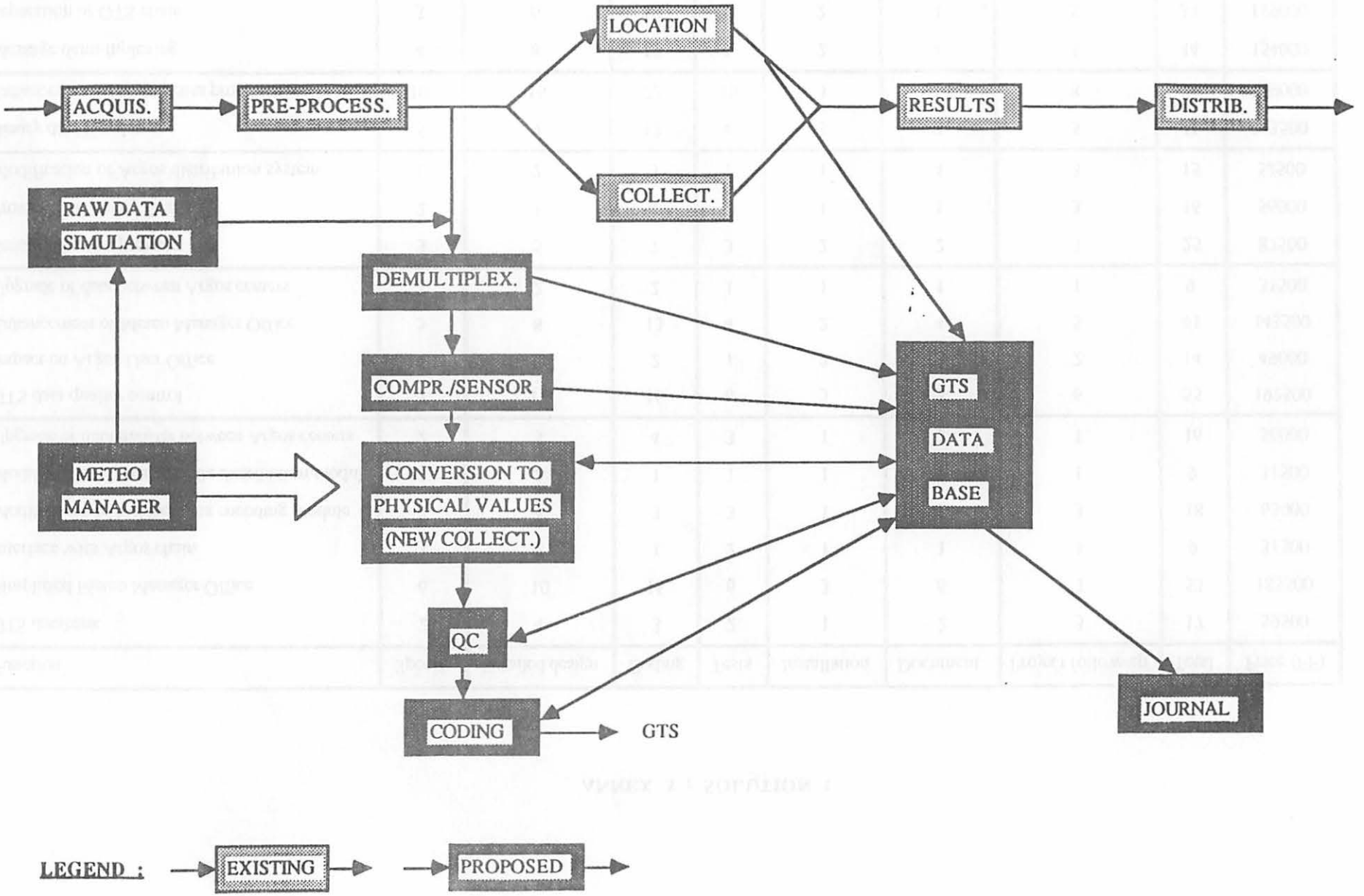
Total cost of implementing a GTS chain (solution 2):

Stage 1:	532000
Stage 2:	416500
Stage 3:	87500
Stage 4:	402500
Stage 5:	154000
Total FF	**1,592,500** (excl. of taxes)

ANNEX 1 : SOLUTION 1



ANNEX 2 : SOLUTION 2



ANNEX 3 : SOLUTION 1

Function	Specif.	Detailed design	Coding	Tests	Installation	Document.	Project follow-up	Total	Price (FF)
GTS databank	2	4	3	2	1	2	3	17	59500
Simplified Meteo Manager Office	6	10	15	6	3	6	7	53	185500
Interface with Argos chain	1	2	1	2	1	1	1	9	31500
Modification of weather data encoding module	2	4	3	3	1	2	3	18	63000
Modification of weather data distribution module	1	2	1	1	1	2	1	9	31500
Upgrade of data transfer between Argos centers	2	3	4	3	1	2	1	16	56000
GTS data quality control	7	12	16	8	3	3	6	55	192500
Impact on Argos User Office	1	3	2	1	2	3	2	14	49000
Enhancement of Meteo Manager Office	5	8	13	4	2	4	5	41	143500
Upgrade of data between Argos centers	1	2	2	1	1	1	1	9	31500
Sensor data compression	3	5	7	3	2	2	3	25	87500
Provision of binary data	2	3	4	2	1	1	3	16	56000
Modification of Argos distribution system	1	2	3	1	1	4	3	15	52500
Binary data simulator	5	9	12	4	3	3	5	41	143500
Enhancement of sensor data processing	10	16	22	10	3	5	8	74	259000
Message demultiplexing	4	8	15	6	2	4	5	44	154000
Separation of GTS chain	3	6	10	4	2	4	5	34	119000
TOTAL	56	99	133	61	30	49	62	490	1715000

ANNEX 4 : SOLUTION 2

Function	Specif.	Detailed design	Coding	Tests	Installation	Document.	Project follow-up	Total	Price (FF)
GTS databank	2	4	3	2	1	2	3	17	59500
Simplified Meteo Manager Office	9	12	19	6	3	6	7	62	217000
Interface with Argos chain	2	2	3	2	1	1	1	12	42000
Modification of weather encoding module	2	4	3	3	1	2	3	18	63000
Modification of weather distribution module	1	2	1	1	1	2	1	9	31500
Upgrade of data transfer between Argos centers	2	3	4	3	1	2	1	16	56000
Integration & modif. of sensor data processing	2	3	5	1	1	1	2	15	52500
GTS data quality control	7	12	16	8	3	3	6	55	192500
Impact on Argos User Office	1	3	2	1	2	3	2	14	49000
Enhancement of Meteo Manager Office	5	8	13	4	2	4	5	41	143500
Upgrade of data transfer between Argos centers	1	2	2	1	1	1	1	9	31500
Sensor data compression	3	5	7	3	2	2	3	25	87500
Binary data simulator	5	9	12	4	3	3	5	41	143500
Enhancement of sensor data processing	10	16	22	10	3	5	8	74	259000
Message demultiplexing	4	8	15	6	2	4	5	44	154000
TOTAL	55	94	127	55	27	41	53	452	1592500

ANNEX 5

LIST OF PARTICIPANTS

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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 and vice-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 requires 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. These arrangements will be reviewed annually.

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

DRIFTING BUOY CO-OPERATION PANEL WORKPLAN AND OBJECTIVES FOR THE FIFTH YEAR

PART A

Summary of the tasks

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

2. Maintain a catalogue of existing ongoing drifting buoy programmes.

3. Maintain a list of 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 Global Telecommunication System and determine the reason for their non-availability.

5. If deemed necessary, 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.

6. Arrange for the circulation of information on the panel's activities, current and planned drifting buoy programmes and related technical developments, including the results of the work undertaken by SCOR Working Group 88.

7. Arrange for the implementation of a new GTS processing system to be established in the Argos processing centres.

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

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

10. Prepare annual report of the Drifting Buoy Co-operation Panel

11. Assist the South-west Indian Ocean Tropical Cyclone Committee to implement a planned drifting buoy programme in the South-west Indian Ocean.

12. Assist in the planning and implementation of the drifting buoy component of the global ocean observing system to be included in the proposed system for global climate monitoring.

13. Keep up-to-date with the latest drifting buoy technical developments, in particular the new low-cost drifter being developed under WOCE.

dbcpwork

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 the 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)	Chaiman, WMO/IOC Secretariats and CLS/Service Argos	Wide circulation by WMO/IOC Secretariats and CLS/Service Argos	6, 7
7	Chairman and technical co-ordinator (1, 2, 3, 7)	WMO/IOC Secretariats and financing, Member countries	Panel and users	1, 2, 5
8	Chairman and sub-committee	WMO/IOC Secretariats	WMO/IOC Secretariats	8
9	Chairman/panel		Panel (at next session)	8
10	Chairman	Technical co-ordinator	Executive Councils of WMO and IOC	9
11	Chairman	Technical co-ordinator and WMO/IOC Secretariats	Panel	3, 4, 5, 7
12	Chairman	WMO/IOC Secretariats	Panel	1
13	Technical co-ordinator (1, 4, 5, 8)	Chairman and panel members	Panel	6, 7

* 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.