SHIP OBSERVATIONS TEAM (SOT)
FIRST SESSION

Goa, India, 25 February to 2 March 2002

FINAL REPORT

JCOMM Meeting Report No. 11

WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

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N O T E

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C O N T E N T S

GENERAL SUMMARY OF THE WORK OF THE SESSION

I. COMMON SESSION

Organization of the session

1.1 Opening of the session

1.1.1 The first session of the JCOMM Ship Observations Team (SOT) was opened by the chairman of the team, Mr Rick Bailey (Australia), at 0900 hours on Monday 25 February 2002 in the conference room of the National Institute of Oceanography (NIO), Goa, India.

1.1.2 The chairman of the Local Organizing Committee for the meeting, Dr G. Narayana Swamy, introduced himself and other members of his committee, and assured participants of their full support throughout the meeting. He then called on the Director of the NIO, Dr Ehrlich Desa, to address the meeting.

1.1.3 Dr Desa welcomed participants to the NIO and to Goa. He noted that the Institute was born out of the International Indian Ocean Expedition in 1966. Since that time, it had maintained a strong culture of interaction internationally with other institutes and organizations, on both a bilateral and multilateral basis. He then gave a brief introduction to the Institute, which included expertise in all the traditional oceanographic disciplines, and concentrated its work in four main areas: the coastal zone, engineering and technology, ocean processes and ocean research. A recent important focus had been on the establishment of patents, and future stress would be on interaction and collaboration with stakeholders. He concluded by again welcoming participants to the NIO and to Goa, and wishing everyone a very successful meeting.

1.1.4 The SOT chairman, Rick Bailey, on behalf of all participants, expressed his considerable appreciation to Dr Desa, Dr G. Narayana Swamy, and all the staff of NIO for the excellent and efficient organization of and support for the meeting. He recognized that the coming week was to a certain extent experimental, and would certainly be challenging. It was therefore important to keep it open and informal, and focussed on the ultimate goals and objectives. These included, in addition to the continued coordination and strengthening of the work of the individual panels, the development of a true synergy, and if possible integration, in much of their work. This was very important, to ensure the most effective and efficient use of volunteer ships as marine observation platforms, to allow the incorporation of new programmes and their requirements, and ultimately to contribute to achieving the goals of JCOMM itself. These goals were very much focussed on full integration in ocean observations, data management and services. The chairman concluded by once more welcoming participants, noting that the meeting provided an excellent opportunity for everyone to become more closely acquainted with new programmes and new people. He reiterated his belief in the significance of the meeting and in its ultimate success.

1.1.5 On behalf of the Secretary-General of WMO, Professor G.O.P. Obasi, and the Executive Secretary IOC, Dr P. Bernal, the Secretariat representative also welcomed participants to the first session of the SOT. In doing so, he expressed the very sincere appreciation of both Organizations to the Government of India, to the NIO and its Director Dr Desa, and especially to the local organizer, Dr G. Narayana Swamy and his staff, for the excellent facilities provided as well as for the tremendous organizational effort already put into preparations for the meeting. The Secretariat representative then supported the remarks of the chairman concerning the objectives and importance of the meeting. He assured participants of the full support of the Secretariat, both during the meeting and throughout the implementation of the SOT work programme, and he concluded by wishing all participants a very successful meeting and an enjoyable stay in Goa.

1.1.7 The list of participants in the meeting is in *Annex I.*

1.2 Adoption of the agenda

1.2.1 The SOT adopted its agenda for the session on the basis of the provisional agenda. This agenda is given in *Annex II*.

1.3 Working arrangements

1.3.1 The meeting agreed its hours of work and other practical arrangements for the session. The documentation was introduced by the Secretariat.

2. Reports

2.1 Report on JCOMM

2.1.1 The meeting recalled that the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) was formally established in 1999 by Thirteenth Congress and the Twentieth Session of the IOC Assembly, through a merger of the Commission for Marine Meteorology (CMM) and the Joint IOC/WMO Committee for IGOSS. JCOMM is the reporting and coordinating mechanism for all operational marine activities in both WMO and IOC. As such, it is charged with the international coordination, regulation and management of an integrated, operational, oceanographic observing, data management and services system which will eventually become the ocean equivalent of the World Weather Watch.

2.1.2. The first session of JCOMM took place in Akureyri, Iceland, from 19 to 29 June 2001. The session was attended by 113 participants from 42 Members/Member States and 11 international organizations. A summary report of the main results of the session of relevance to the SOT is given in *Annex III*.

2.1.3 The meeting was informed that the JCOMM Management Committee had held its first session in Geneva just prior to the current SOT meeting. Among the many issues addressed, those of interest to the SOT included:

(i) A thorough review of the Programme Area work plans and implementation strategies;

(ii) The appointment of Dr Hiroshi Kawamura as satellite rapporteur and Dr Tony Knap as rapporteur on non-physical variables and JCOMM;

(iii) The identification of integration and overarching issues for JCOMM, and the development of an outline overall strategy;

(iv) The development of plans for coordinated the Brussels 150th anniversary and CLIMAR-II conferences in 2003.

2.1.4 The meeting noted all these developments with considerable interest, and agreed that they provided an excellent framework and overall objectives for its own work, both during the coming week and in the future.

2.2 SOT

2.2.1 The chairman of the SOT, Rick Bailey, outlined to the meeting his vision of the team, as well as its objectives and goals as a component of an integrated operational ocean observing system under JCOMM. The SOT work area consists of a collection of very successful and enduring data collection programmes, involving voluntary observing ships (VOS), Automated Shipboard Aerological Programme (ASAP) ships and ships-of-opportunity (SOO), which have supported a number of research and operational applications over many years. Indeed, marine meteorological and oceanographic observations have been collected by these vessels for well over

a hundred years, and in many instances provide the longest climatological records for such these variables. The challenge for the SOT was therefore to maintain, coordinate and wherever possible integrate these programmes to support a developing range of well defined operational and research applications. Under the JCOMM structure, scientific guidance will continue to be provided by the GCOS/GOOS/WCRP Ocean Observations Panel for Climate (OOPC), along with the CLIVAR Ocean Observations Panel (CLIVAR OOP), for climate issues, and bodies such as Commission for Basic Systems (CBS) for operational meteorology. The SOT will need to have strong input into specification of the scientific goals, providing scientific and logistical advice.

2.2.2 The chairman noted that the first meeting of the SOT would provide an excellent opportunity for the team to begin addressing a number of important issues. Specifically SOT-I will help to:

- Provide a status and develop an understanding amongst the participants of the various programmes utilising merchant vessels and ships-of-opportunity.
- Develop mechanisms for coordinating and integrating these programmes.
- Discuss common implementation issues, such the present "volatility" in ship routing operations, coordination of ship greeting and recruitment, etc.
- Exchange information on instrumentation and data applications.
- Consider implications of contributing to operational programmes, such as the need for standardisation of data collection, data processing and data management.
- Consider the needs and specifications for instrument and procedure evaluations.
- Develop performance measures.
- Discuss and document resource issues.
- Identify general issues requiring consideration and support from JCOMM.

2.2.3 He then outlined the reporting and working arrangements for the SOT:

- The SOT reports to and is represented by the SOT Chair on the JCOMM Observations Programme Group. The first meeting of this group is on 24-27 April 2002 in La Jolla, USA.

- The Chair, SOT is a member of and represents the SOT on the CLIVAR COOP. The next meeting of this panel is scheduled for the first half of 2002.

- The SOT will have representation at the next OOPC meeting, which is scheduled for June 2002 in Kiel, Germany.

- The SOT will have initially three, targeted panels overseeing the technical implementation of the three main programme areas, i.e. the Ship-of-Opportunity Programme (SOOP), the Voluntary Observing Ships (VOS) programme, and the Automated Shipboard Aerological Programme (ASAP). Each panel will have its own terms of reference.

- Coordination support for the SOOP is provided by the JCOMM *in situ* Observing Platform Support (JCOMMOPS) Centre in Toulouse.

- Task Groups should be established to address cross-cutting issues for SOT as appropriate (such as programme promotion, satellite communications, ship recruitment, etc)

- Pilot projects will need to be considered for the design and evaluation of new observation programmes, such as the pCO_2 and sea surface salinity monitoring programmes.

2.2.4 The meeting expressed its appreciation to the chairman for his report, which is reproduced in full in *Annex IV*. It agreed with the overall vision and both short and long-term objectives for the SOT. These objectives will be addressed throughout the meeting.

2.3 SOOPIP

2.3.1 The acting chairman of the SOOP Implementation Panel, Rick Bailey, recalled that the coordinated international Ship-of-Opportunity Programme had been in operation for the last 15-20 years. During this time ships-of-opportunity had proven to be the most cost-effective platforms for obtaining *in situ* observations of the upper ocean, enabling repeat global and ocean basin coverage. Ships-of-opportunity include volunteer merchant ships, fishing fleets, research vessels and naval vessels. From 1985 to 1995 ad hoc biannual meetings of SOOP national managers were held under the auspices of the Joint IOC/WMO Integrated Global Ocean Services System (IGOSS). At these meetings information was exchanged on instrument technology and performance, data coverage, real-time data transmission capabilities and user requirements. The scientific objectives and design of the global network were also driven at this time by the implementation in 1985 of the Tropical Ocean Global Atmosphere (TOGA) Research Programme. From 1995, following the end of TOGA, an operational Ship-of-Opportunity Programme (SOOP) was formally established under IGOSS, with the objective of transforming the existing research-funded XBT activities to a long-term, operational status and coordination.

2.3.2 With the establishment of JCOMM, SOOPIP now reports to the Ship Observations Team within the JCOMM Observations Programme Area. Scientific direction is to still be provided by the OOPC and the CLIVAR Upper Ocean Panel (UOP), which has now been transformed into the CLIVAR OOP. Many of the members of these panels are also on SOOPIP. National contributors to SOOP at present include Australia, Canada, France, Germany, India, Japan, United Kingdom and the U.S.A., as well as several Mediterranean countries. Russia and China are aiming to develop formal programmes within their countries. With support from member states and the Data Buoy Coordination Panel (DBCP), the Technical Coordinator for DBCP will continue to provide part-time technical coordination for SOOP under the direction of the Chair of the SOOPIP.

2.3.3 In the light of a number of recent developments in ocean observations (profiling floats, satellite altimeters, equatorial mooring systems, etc), it was realized that it was timely to reconsider the upper ocean sampling network, particularly the SOOP XBT contribution. In response to these developments, the OOPC, SOOPIP and the CLIVAR UOP decided to convene a study and a workshop to review the upper ocean thermal network. The findings of the review were presented to and endorsed by the international scientific community at the Conference on Ocean Observations for Climate in St. Raphael, France. The review recommended that the program should gradually withdraw from areal/broadcast sampling as Argo is implemented. At the same time SOOP should ramp up its effort in line (transect) sampling. The line sampling would include intermediate resolution, frequently repeated lines and high-density, quarterly repeated lines. This change in approach enhances complementarity with existing elements, particularly TAO, profiling floats and altimetry. These recommendations concern the climate observational network, and are not intended to surpass individual sampling requirements for alternative national priorities and objectives.

2.3.4 Within the context of this overall programme goal, the panel has been addressing other major issues relating to or associated with upper ocean thermal measurements, including:

(i) Multi-disciplinary sampling;

(ii) Data management and programme monitoring;

(iii) Sampling and resources;

(iv) Instrument evaluations and calibration.

2.3.5 The acting SOOPIP chairman then outlined a number of issues relevant to the SOT and to JCOMM in general:

- As an operational system, mechanisms and procedures must be found to ensure data collected by operators conform to agreed upon basic standards, formats, levels of data quality, etc.

- SOOP still relies heavily on the contributions of research agencies, which simply cannot commit to long-term support of an operational programme.

- Extra bandwidth must be found in the real-time data distribution system to enable the data transmission of the full- resolution XBT data.

- An Evaluation and Accreditation Committee must be formed and adequately resourced to test all instrumentation and procedures used by this programme (and probably other JCOMM programmes).

- Continued support recommended for the SOOP Technical Coordinator position.

- Data management and data collection must continue to be driven by user requirements and best scientific practice.

- Close coordination with the VOS, VOSClim, and ASAP activities is strongly recommended to promote the more effective implementation of observations from commercial shipping in support of joint scientific objectives and to maintain the harmony and support of the owners of volunteer observing ships.

In addition, decreasing resources in support of the programme are a matter of extreme concern for both JCOMM/GOOS and CLIVAR.

2.3.6 The meeting expressed its appreciation to the acting SOOPIP chairman for his comprehensive and valuable report, which is reproduced in full in *Annex V*. Specific issues raised are discussed in detail under the relevant agenda items, in particular in the section concerned specifically with SOOP matters.

2.4 ASAPP

2.4.1 The vice-chairman of the ASAP panel, Jean-Louis Gaumet (France), noted with regret that the panel chairman, Klaus Hedegaard, was no longer involved directly with a national ASAP programme, and had therefore had to resign as chairman in early 2002. The vice-chairman then noted with satisfaction that the intersessional period since ASAPP-XII (Reading, September 2000) had shown a significant increase in ASAP soundings compared with the previous year. This increase had occurred in several individual participating countries, and also reflected the implementation of the WRAP and E-ASAP projects, which to date involved 3 new lines on the North Atlantic, the Mediterranean and worldwide. Both these projects also represented international cooperative efforts, which pointed the way forward for future expansion of the overall ASAP programme.

2.4.2 Other significant developments during the year included the shift in data transmission by France and Germany from the use of METEOSAT to Inmarsat, and the decision by France to transfer shipboard ASAP operation from meteorological personnel to ship crew members, primarily for cost savings.

2.4.3 The meeting expressed its appreciation to the ASAPP vice-chairman for his interesting report, which is reproduced in *Annex VI*. Specific issues raised are dealt with in detail under agenda items in the section concerning specifically ASAP matters.

2.5 VOSP

2.5.1 On behalf of the chairman of the VOS Panel, Mr George Kassimidis (Greece), who unfortunately was unable to participate in the meeting because of illness, the Secretariat representative presented a brief report on the principal activities undertaken in support of the VOS programme during the past four years. These included:

(i) Development and implementation of the VOS Climate (VOSClim) Project;

(ii) Publication and distribution of the VOS Framework Document and a VOS Brochure;

(iii) Three regional PMO training workshops: in Valparaiso, Chile in 1998 for Latin America; in Melbourne, Australia, in 1999 for Asia and the Pacific; and in Cape Town, South Africa, for Africa;

(iv) Further development of the WMO Ship Catalogue, including new metadata fields, a reconstructed database, and web availability.

2.5.2 The meeting noted these activities with interest and appreciation. It recognized that all of them would be discussed in more detail under specific agenda items later in the session.

3. Reports on associated programmes and requirements for ship-based observational data

3.1 Marine services

3.1.1 The meeting noted that the newly appointed JCOMM satellite rapporteur within the Observations Programme Area Coordination Group was Dr Hiroshi Kawamura (Japan). Both Dr Kawamura and the SOOP coordinator, Mr Etienne Charpentier, participated as JCOMM representatives in the fourth session of the CBS Expert Team on Observational Data Requirements and the Redesign of the Global Observing System (GOS) (Geneva, 28 January to 1 February 2002). Within the context of this meeting, they had prepared a first draft of a Statement of Guidance relating to the marine component of the GOS and JCOMM requirements for marine observational data. As noted by Dr Kawamura and Mr Charpentier, this draft now needed extensive review, both within JCOMM (the Services and Observations CGs) and outside (GOOS Coastal Ocean Observations Panel (GOOS/COOP) and Global Ocean Data Assimilation Experiment (GODAE)).

3.1.2 The meeting expressed its appreciation to Dr Kawamura and Mr Charpentier for the work which they had accomplished on behalf of JCOMM. It reviewed the draft, and endorsed the suggestions made recently by the JCOMM Management Committee regarding its finalization:

(i) Care should be taken that this statement should not conflict with the Oceans Theme document of the Integrated Global Ocean Strategy (IGOS) Partners;

(ii) The preparation of the statement should be used as a mechanism to identify and specify possible deficiencies in the CBS data base as it related to JCOMM, as well as possible inadequacies and incompatibilities in the Oceans Theme document;

The draft was to be reviewed and revised through the JCOMM Services and Observations Coordination Groups, in a similar way to the process adopted with the Seasonal to Interannual Forecasting Statement, through AOPC/OOPC. (**Action**: JCOMM PA Coordination Groups)

3.2 Climate

3.2.1 The Chairman of the SOT, Rick Bailey, on behalf of the Chairman OOPC, Dr. Neville Smith, provided an update on OOPC activities since JCOMM-1, and highlights of those areas where the

OOPC had identified key issues arising for JCOMM. The key issues had not changed significantly. Top priorities still included the implementation of GODAE and Argo; the refocusing of SOOP activities onto selected lines; the development of the surface reference network (SURFA); and the continuity, quality and expansion of the network of tropical moorings. Efforts were now underway to create a network of time series stations, 23 being funded, and 29 being on the drawing board. Key regional developments were underway in the Indian Ocean, where a regional GOOS was being developed with the help of the Perth Office of IOC. A planning meeting for Indian Ocean GOOS was expected in the first week of November. A similar development would be required for the South Atlantic, with the likely assistance of the new IOC Office in Rio de Janeiro. In terms of new technologies, pilot projects to collect ocean pCO2 from ships of opportunity were being established. Dr Smith emphasised the need for a thorough overhauling of the data management infrastructure and practices to meet the requirements of OOPC for faster and timely access to integrated, multidisciplinary data. It was suggested that one of the first priorities of the JCOMM Data Management Programme Area should be to develop a JCOMM data management plan, in coordination with IODE.

3.2.2 Dr Peter Taylor (U.K.) then specifically addressed the requirements on VOS data for climate studies. To an increasing degree, high quality VOS observations are required for verification of model predictions, for verification of satellite observations and for climate research. He noted that the OceanObs99 Conference had, in the consensus statement, emphasised the need for high quality VOS observations to augment the network of flux reference sites.

3.2.3 The present VOS system has primarily been designed for weather forecasting purposes. Thus, while it has been much used for climate research, for example through the Marine Climatological Summaries Scheme (MCSS), the data quality is not ideal. The observation methods used on the VOS depend on the recruiting country, the instrumentation used is very basic, and the available metadata have been, until recently, very limited. Modern merchant ships are very large and are not the ideal site for making accurate weather observations.

3.2.4 Given these considerations, the primary need for climate studies is to quantify the error characteristics of the data, i.e. to quantify the random and systematic errors and the correlations between error terms. To achieve this, full metadata on the observation methods are required. The VOSClim Project is designed to provide those metadata, to allow better quality control of observations, and hence assemble a high quality VOS data set. Further developments that are needed for climate studies include the provision of improved instrument systems, such as the new AWS, which are beginning to be implemented, and the inclusion of other variables such as pCO_2.

3.2.5 The meeting strongly supported the continuing implementation of VOSClim and of improved instrumentation systems. It recommended that, where changes are made to the instrument fit on a country's VOS fleet, studies should be undertaken to ensure homogeneity of the climate records. Use of the VOS to monitor a wider range of climate variables should be coordinated with support for the implementation of high quality meteorological measurements. (**Action**: VOSClim project and VOS operators)

3.3 Argo

3.3.1 Etienne Charpentier reported on the status of the Argo programme. He recalled that Argo was a CLIVAR COOP and OOPC GODAE pilot project, which planned to establish an operational array of some 3000 sub-surface profiling floats by 2005. Argo is managed by the Argo Science Team (AST). Countries having plans to deploy Argo floats include Australia, Canada, China, Denmark, France, Germany, India, Japan, New Zealand, the Republic of Korea, the United Kingdom, Spain, the USA plus the European Union through its Gyroscope project. Exchange of Argo data is free and unrestricted. Data are distributed in real-time within 24 hours after data collection (TESAC format). In the period FY99 to FY01, about 1000 floats had already been funded and about 700 per year are proposed over the next following 3 years. In February 2002, about 330 floats were operational and reporting on the GTS, mainly from the Equatorial and North Atlantic

Ocean and from the Pacific Ocean, although a few floats were already reporting from the Indian Ocean.

3.3.2 Data management is being planned through the Argo Data Management Team, which held its last meeting in Brest, October 2001. The team particularly made decisions regarding the exchange of Argo data in real time in NetCDF format, and designed an Argo NetCDF template. It also agreed upon standard automatic real time QC procedures. Two Global Argo Data Acquisition Centres (US GODAE server in Monterey, and French Coriolis Centre in Brest) exchange the data among themselves and are responsible for the distribution of the data to the users. The US National Oceanographic Data Center (NODC) runs the Argo Global Data Repository to assure long-term archival of Argo data.

3.3.3 Argo defined a float retrieval scheme: a sticker written in four UN languages informs those potentially recovering floats of the purpose of the instruments and suggests to contact the Argo Information Centre for instructions on how to properly dispose of it.

3.3.4 The question of floats entering Exclusive Economic Zones (EEZs) was discussed. It was recalled that the IOC resolution XX-6 requires that the concerned coastal states must be informed, through appropriate channels, of all deployments of floats which might drift into waters under their jurisdiction, indicating the exact location of such deployments. To meet these requirements, IOC and WMO established the Argo Information Centre (AIC) in February 2001. The AIC is run by the Argo Coordinator, Mr. Mathieu Belbéoch. Whenever a float operator deploys a float, he/she informs the AIC immediately who in turn provides details (position, deployment date, WMO number, name of the operator) regarding the deployment(s) to all designated National Focal Points. At the same time, operational status products are available through the AIC web site to show a day to day status of the programme, through dynamic maps and a list of floats.

3.3.5 The AIC also provides additional support to the programme, including: (i) assistance to reach agreement to deploy floats within specific EEZs, (ii) programme promotion and provision of information on the programme and its objectives, (iii) assistance with regard to programme implementation, (iv) information exchange tools such as mailing list and internet technical forum, etc.

3.3.6 The AIC is part of JCOMMOPS and all related support products made available for Argo, the DBCP, and SOOP are being developed in an integrated way. For example, a single database is being used for the coordination required by the three programmes. This database is directly connected to the JCOMMOPS and AIC web sites to provide dynamic tools (http://argo.jcommops.org/).

3.3.7 The meeting noted this information with interest, and expressed its appreciation to Mr Charpentier and to the Argo coordinator, Mr Belbéoch, for the report. It recognized that the Argo programme is complementary to SOOP, while other aspects of the work of the SOT would also support Argo in various ways.

4. New types of observations from VOS

Ocean CO_2

4.1 The meeting was informed that one of the important issues for the Ocean CO_2 Advisory Panel of IOC/Scientific Committee on Ocean Research (SCOR) (chaired by Prof. Doug Wallace of Institute fur Meereskunde (IFM), Kiel) is to establish a global ocean carbon observation system, through promoting international cooperation in observations. For diagnostic and prognostic global carbon cycle models: 1. ocean surface CO_2 flux observations; 2. repeated hydrographic section measurements of CO_2; and 3. continuation of observations at time series stations, are essential. For wide and frequent coverage of the world ocean to observe CO_2 fluxes, the use of ships-of-opportunity is essential. The panel had recently summarized the activities of Ship-of-Opportunity observations (ongoing and proposed), including CO_2 measurements.

4.2 The initial CO_2 network consists of 5 programs in the Atlantic, 9 in the Pacific, 1 operating across the Atlantic and Pacific, and 5 programs in the Southern and Indian Oceans. These measure a wide range of ocean and atmospheric variables, including SST, SSS, pCO_2, fluorescence, pigments, nutrients, total CO_2, alkalinity, and atmospheric CO_2 greenhouse gases, air temperature, humidity, solar radiation, wind velocity and wind direction. The vessels used are approximately 50% research or re-supply vessels, and 50% industry vessels. Countries sponsoring programs include Norway, Germany, UK, Spain, US, Japan, Australia, Canada, and France. This information is on the Panel web-site (http://www.ioc.unesco.org/iocweb/co2panel). The Panel will serve as a means of integrating this community with the larger network of scientists using VOS. An eventual joint activity with JCOMM will hopefully lead to enhanced coordination, synergies and eventually integration in an approach to VOS-based observations of all types.

4.3 Dr. Yukihiro Nojiri (National Institute for Environmental Studies (NIES), Japan), who was participating in the SOT meeting on behalf of the panel, introduced the panel activities related to VOS and the recent successful observation program by NIES. An ocean pCO_2 observation program started in 1995 using a North Pacific cargo ship between the US/Canada west coast and Japan. Because of a change of ship route and the addition of other VOS, it will soon be expanded to two routes, one for Japan-Australia and the other for Japan-US (west coast). On-board atmospheric and oceanic CO_2 systems are operated by a seaman employed through the research budget, ensuring nearly complete data recovery. The program is operational and long-term continuation is expected.

4.4 The ocean CO_2 observation community is now discussing the expansion of the VOS pCO_2 measurement network. Recently, a project for Atlantic VOS pCO_2 measurements (CAVASSO) was funded by the European Union (EU). One of the four lines in CAVASSO has been started through IFM/NIES collaboration. For better coverage of the Pacific, the US and Canada are planning pCO_2 measurements from the US west coast to Australia/New Zealand using VOS lines. France is already operating TSG measurements on a VOS from Panama to New Caledonia. The addition of a pCO_2 system is planned for coverage of the South Pacific. Basically, oceanic pCO_2 systems use seawater lines in the ship engine room. Thus the system is compatible for thermosalinograph (TSG) observations. The panel considered that collaboration between JCOMM/SOT and the ocean CO_2 community would be helpful for a wider observational coverage and will contribute to the establishment of global ocean carbon observation.

4.5 The meeting noted this information with considerable interest. It agreed completely with the proposal for expanding collaboration between the SOT and the CO_2 Panel, in the obvious interests of both communities. Since the extent and modalities of such collaboration were not yet well defined, it requested the chairs of the SOT and of both VOSP and SOOPIP, together with the Secretariat, to maintain close contacts with the CO_2 Panel, with a view to preparing a more concrete proposal for consideration by SOT-II. (**Action**: Chairs SOT, SOOPIP, VOSP and the Secretariat)

5. National reports

5.1 The Team was presented with national reports from Argentina, Australia, Bulgaria, Canada, France, Germany, India, Israel, Japan, Kenya, Malaysia, Poland, Russian Federation, Singapore, United Kingdom and USA. Those reports will be published separately in electronic form as a JCOMM Technical Report. (**Action**: Secretariat and participants) Some of the comments and/or issues addressed in those reports were as follows (the issues are dealt with under further agenda items):

(i) Many countries, for various reasons, experienced a serious decrease in the numbers of ships recruited (mainly within the VOS scheme). But the global number of meteorological reports exchanged over the Global Telecommunication System (GTS) remains roughly constant, if not increasing, for a variety of reasons, including

more efficient satellite communications and higher data rates from automated systems;

(ii) Most reports insisted on the usefulness, not to say the necessity, to pursue the development of fully automated systems for data acquisition, encoding and transmission;

(iii) The reluctance of some INMARSAT Land Earth Stations (LESs) to accept the code 41 as an indication of payment of the transmission cost by the local Meteorological Office was raised on the basis of some concrete examples;

(iv) Some countries experienced economic as well as efficiency benefit in running the ASAP programme through the ship crews rather than with technicians embarked on purpose;

(v) Cooperation with Navies was generally considered as an important issue, though perceived differently in different countries;

(vi) The definitive need for international coordination among the network of Port Meteorological Officers (PMOs) was frequently highlighted;

(vii) Regional cooperation and capacity building were also highlighted in many presentations.

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II. Scientific and Technical Workshop

II.1 The meeting expressed its appreciation for the scientific and technical workshop, which had taken place during the second day of the session. Papers presented at the workshop covered topics such as new ship-based observing programmes (in particular ocean carbon measurements), observational equipment and communications facilities, evaluations and scientific and operational applications. The meeting requested the Secretariats to publish the full proceedings of the workshop as a JCOMM Technical Report. It also agreed that a similar workshop should be organized in conjunction with the second session of the SOT. (**Action**: Secretariat)

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Support infrastructure

6.1 Ship recruitment and servicing

6.1.1 The meeting reviewed the present PMO activities and network. It agreed that Port Meteorological Officers (PMOs) fulfil a highly important role in the liaison between National Meteorological Services (NMSs) and the shipping community. The meeting recalled that JCOMM-I stressed that national support to PMOs were essential for the successful operation of all ship-based observing programmes.

6.1.2 The duties of PMOs are described in the Guide to Marine Meteorological Services (WMO-No.471). Instructions for the Guidance of Port Meteorological Officers have also been published. Principles and procedures of meteorological training of PMOs are described in Volume I, Part IV of the Manual on Marine Meteorological Services (WMO-No.558).

6.1.3 The meeting re-affirmed that the international PMO network is critical to the maintenance and future enhancement of the VOS, and also of the other components of the SOT. Substantial efforts have been made in recent years to support and strengthen this network, and to improve contacts and liaison among PMOs in different countries. The meeting noted that a major

international seminar and workshop took place in London in September 1993. As a follow-up to this event, a series of regional PMO workshops is being implemented, involving both formal class work and "hands-on" practical training. The first of these took place in Valparaiso, Chile, in September 1997 (in Spanish, for Latin America); the second in Melbourne, Australia, in November 1999 (in English, for Asia and the Pacific); the third in Cape Town, South Africa, in November 2000 (in English, for Africa).

6.1.4 To facilitate communication among PMOs, a list of "useful PMO contacts worldwide" has been established and is it is accessible through the WMO marine programme web page. The meeting noted that it is important to keep the list updated and agreed that all the relevant countries should be further encouraged to submit national updates to the Secretariat. (**Action**: Secretariat and ship operators)

6.1.5 The meeting recognized that already most if not all ASAP and SOOP vessels also make and transmit standard VOS meteorological/oceanographic reports, while in a number of countries efforts were being made to better coordinate these programmes with VOS activities, and in particular to make more extensive and efficient use of the major human and technical resource which the PMO network constitutes. ASAP and SOOP are more technically complex activities than standard VOS observations, requiring different input from land-based personnel and more extensive support from ship crews. Nevertheless, there were potential advantages for the managers of all three programmes in enhancing coordination, particularly in the use of PMOs as a common mechanism for ship greeting, equipment and consumables management, and the training of shipboard personnel. In addition, the psychological and practical advantage of having only one "metocean" person visiting a ship while in port should not be underestimated.

6.1.6 The meeting recognized that the WMO guidance material dedicated to PMOs at present concentrated on their support for the traditional VOS. It agreed that this material should be upgraded to include extensive guidance relating to both SOOP and ASAP operations, if the PMOs were also to act in support of these programmes. The Secretariat was therefore requested to arrange for such a revision, in consultation with the chairs of SOOPIP and ASAPP. This revised guidance material should eventually be included in the appropriate WMO publications. (**Action**: Secretariat, chairs of SOOPIP and ASAPP)

6.1.7 Based on a wide-ranging discussion relating to the PMOs and their work, the following additional recommendations were made by the meeting:

(i) Recognizing the pressures to downgrade PMO functions in many countries, primarily for economic reasons, efforts should be made to impress upon national agencies the essential nature of specialized PMO functions and work. (**Action**: Secretariat and operators)

(ii) Bearing in mind the multiple observing functions of voluntary ships, as illustrated by the SOT, an investigation should be made of the possibilities for developing an integrated information stream to be made available to shipping (companies and crews) regarding the value and applications of ship-based observations. (**Action**: SOT chair and Secretariat)

(iii) Work should continue through organizations such as IMO and ICS to emphasise the value and applications of ship-based observations of all types. (**Action**: Secretariat)

Deployment opportunities and other logistics

6.1.8 The SOOP Coordinator presented information on deployment opportunities for drifting buoys, profiling floats, servicing of moored buoys, and XBTs which are being made available via the JCOMMOPS web site (http://www.jcommops.org/depl_opport/depl_opport.html). Such information is useful for DBCP (buoys), VOS (met. observations from ships), SOOP (ocean observations from ships), and Argo (profiling floats) operators in charge of programme planning

and operations, and especially new ones. It allows them to quickly identify logistic opportunities, make appropriate contact nationally or in foreign countries, and eventually take advantage of the opportunities offered. The information provided is expected to permit time-savings for those in charge of programme planning and implementation.

6.1.9 Information being made available presently includes: (i) JCOMM list of National Focal Points for logistic facilities (DBCP, SOOP, Argo), (ii) list of XBT lines presently operated under the SOOP programme, as these can also potentially be used for drifter and float deployments, (iii) research ship schedules, (iv) information on air deployments opportunities, (v) opportunities sorted out by ocean basin,(vi) opportunities provided by specific countries. For the latter, a contact point is indicated and details are given regarding the type of opportunity offered (i.e. type of ship, potential area, time period, regularity, availability of crew, whether technicians can embark, whether the ship can stop, whether air deployment opportunities are being provided, etc.). Information is being entered in the JCOMMOPS database. It is planned to offer query tools, so that users of the information can easily sort out the kind of information they are looking for.

6.1.10 The meeting agreed that this kind of support by JCOMMOPS was very valuable and could facilitate implementation of ship based observing programmes as well as providing support to the DBCP and Argo programmes. However, the meeting agreed that full potential of such support could only be achieved if Member states regularly provided the SOOP Coordinator with relevant information. It therefore urged them to regularly provide JCOMMOPS with up to date information. (**Action**: Secretariat, ship operators and SOOP coordinator)

International recognition of ship participation

6.1.11 The meeting noted with interest a proposal from George Kassimidis, chairman of the VOS panel, for a possible international award scheme for VOS, to complement the existing national awards, as a means of further encouraging ship recruitment. In a wide-ranging discussion on this general topic, the following points were noted:

(i) There was merit in and scope for some type of international recognition scheme for the VOS, as well as for enhanced information distribution to both ships and ship-owners, to enhance involvement in the VOS;

(ii) An international newsletter for VOS would be useful, or if this proved impractical because of the resources required, enhanced use might be made among the VOS of existing information material such as national publications and documents such as the GOOS and GCOS newsletters;

(iii) The recently agreed VOSClim Certificate of Participation might be adapted as a similar international certificate of participation for all VOS;

(iv) Similarly, the VOSClim Newsletter might also be expanded for use with all VOS;

(v) A central pool or bulletin board of existing publications related to VOS, perhaps maintained through JCOMMOPS, would be very useful to all ship operators;

(vi) Information on ship-based environmental observation programmes published in the general maritime press could also serve to enhance understanding of these programmes;

(vii) An international approach to both ship builders and ship classifiers was required, to ensure the inclusion during manufacture of the basic infrastructure needed now for many types of observation;

(viii) The WMO, IOC and JCOMM logos could be included on national certificates and awards.

6.1.12 The panel agreed that all these ideas had merit. It therefore decided to establish a small intersessional **Task Team on VOS Recruitment and Programme Promotion** to address all the relevant issues as detailed above, and prepare some specific proposals. The team comprises Steve Cook (convenor, USA), Rick Bailey, Dave Evans (Australia), Francois Gerard (France), Gordon Mackie (U.K.), Geoff Morrison (International Seakeepers) and Sarah North (U.K.). It should work by email, and make the proposals available within six months for consideration by the chairs of the SOT and the three panels. If there was general agreement, then a decision could be made on those aspects for immediate action, and those which should be referred to SOT-II for further consideration. (**Action**: Task Team, chairs and Secretariat) (see *Annex XX*)

6.2 Telecommunication facilities and procedures

INMARSAT

6.2.1 The meeting was informed by Andy Fuller, the representative of IMSO, about two new satellite communication terminals announced by Inmarsat for introduction during 2002. These were:

(i) **Inmarsat Fleet F77.** This terminal offers advanced maritime safety features and will also deliver a wide range of commercial communication services including: voice, fax and data services at speeds up to 64 kbit/s, mobile ISDN and mobile packet data service (MPDS). With MPDS, users will be charged for the amount of data sent or received, rather than for the time they are connected.

(ii) **Inmarsat mini-C.** This low-power evolution of Inmarsat C will support all standard Inmarsat C services with a significantly reduced level of power consumption. The equipment is smaller and lighter than existing Inmarsat C terminals and will be easier to install. It is likely also to be significantly cheaper than current Inmarsat C terminals. Inmarsat mini-C offers two-way messaging and e-mail, position reporting and polling plus ship-to-ship communications. It also supports short access code message addressing (e.g. code 41 messages).

6.2.2 The meeting noted these developments with interest. It recognized that the Fleet F77 terminal would have potential advantages in the medium term, because of the high data rates available, while the mini-C was of immediate interest, in particular for moored buoy and similar applications.

6.2.3 The meeting recalled that the use of the code 41 short code dialing procedure with Inmarsat C greatly facilitated the transmission of meteorological and oceanographic reports from ship to shore, at no cost to the ships themselves. These costs were then borne by the National Meteorological Services having agreements with the LES in their countries to this effect. Unfortunately, this arrangement leads to a relatively small number of countries bearing the full burden for the cost of such data transmissions via Inmarsat C. Because the LES operate commercially, this situation may become exacerbated if two or more of the LES are owned by the same company, in which case all the reports for all these LES will be channeled through, and paid for, by a single NMS.

6.2.4 The meeting recognized that this situation needed to be addressed, with the idea of some form of global cost sharing scheme being suggested, among other possible solutions. In order to fully assess the extent of the problem, and to also have an idea of all potential solutions, the meeting established a small intersessional **Task Team on Satellite Communications System Costs**, to prepare a report on the issue for consideration by SOT-II. The team is chaired by Volker Wagner (Germany), and includes Sarah North, Frits Koek (Netherlands), Francois Gerard and a representative of Inmarsat. (**Action**: Task Team) (see *Annex XX*)

Argos

6.2.5 Christian Ortega of CLS/Service Argos provided a written report to the meeting regarding Argos system applications and enhancements. It was recalled that the Argos data collection and location system was a French/USA venture established in 1978 and dedicated to environmental applications. Argos is flown on NOAA polar orbiting satellites (low earth heliosynchronous orbit). Half of the Argos system capacity is actually being used for ocean and climate related applications. A dedicated GTS sub-system permits data processing, automatic quality control checks, and formatting according to WMO regulations for GTS distribution of relevant data (buoys, floats, ships, XBTs). Other Argos applications include animal tracking, oil spill tracking, hydrology, fish stock management, and hazardous cargo monitoring.

6.2.6 Several ship based observing systems are using Argos for data telecommunication. These include for example systems developed by France (e.g. Minos VOS system) and XBT systems used by Australia and France.

6.2.7 The present Argos 2 generation (two Argos 2 operational satellites at the moment) already permits higher telecommunication data rate (3 times better than Argos 1). Argos is planning substantial enhancements, which will permit: (i) increased data telecommunication rates (Argos 3 will permit 4800 bps by 2005), (ii) downlink capabilities (planned for late 2002 through cooperation with Japan and use of the ADEOS-II satellite), and (iii) better system access through a new user interface (open interface to directly modify platform status, and new interface to access the results). At the same time, in recent years Argos took steps to increase its real-time coverage through installation of a worldwide network of regional receiving stations (28 S-band stations in January 2002). Details can be found on the Argos web sites at http://www.cls.fr/ and http://www.argosinc.com.

6.2.8 The meeting noted this information with interest. It recognized in particular that new developments such as the downlink capability and higher bandwidth had very positive implications for ship operators. It urged operators already using, or with a potential interest in Argos, to participate in the annual Joint Tariff Agreement meetings, both to input to the tariff negotiations and also to pass requirements to CLS/Service Argos. (**Action**: Ship operators)

EUMETSAT and the IDCS

6.2.9 The meeting recalled that a detailed description of the International Data Collection System (IDCS), operated on the geostationary meteorological satellites, including EUMETSAT, had been presented to the scientific and technical workshop by Sean Burns (EUMETSAT). The meeting expressed its appreciation to Mr Burns for this presentation, at the same time noting that, in the context of the SOT, the IDCS was used primarily by ASAP operators. No additional requirements for the use of the IDCS on board ships could presently be identified.

New telecommunications facilities

6.2.10 The meeting noted with interest and appreciation a review document by the DBCP vice-chairman, Mr David Meldrum (U.K.), containing a summary of those commercial satellite communication systems which might ultimately be of use to marine data collection. Although most systems under review offered attractive facilities, such as two-way communications, reliable high data throughput rates and near real-time coverage, the meeting was concerned that in many cases the future of the systems was uncertain. This concern was compounded by the lack of influence that the SOT considered it would have with the satellite operators. The meeting therefore recommended that ship operators should be cautious before committing to a new communication system. At the same time, the meeting also recognized that there was some potential leverage to be gained with system operators, with regard in particular to the cost of system usage, by dealing with several competing systems, perhaps through retailers/service providers. Further, ship operators were advised to consider the potential cost advantages to be gained through the use of forward and bulk purchasing of satellite use time from system operators. (**Action**: Ship operators)

6.2.11 The meeting, in recognizing its duty to remain abreast of developments in communications technology, thanked Mr Meldrum for his report, which is published as an Annex to the final report of DBCP-XVII, and also in the DBCP Annual Report for 2001. It requested that future updates of this review should also be made available to SOT members and ship operators in general. (**Action**: David Meldrum and Secretariat)

6.3 JCOMM in situ Observing Platform Support Centre

6.3.1 Etienne Charpentier reported on JCOMMOPS and its establishment. He recalled that the concept for a JCOMM *in situ* Observing Platform Support Centre (JCOMMOPS) was first introduced and discussed at the second transition planning meeting for JCOMM, Paris, June 2000. Since the DBCP, and SOOP, were initially providing the resources to run JCOMMOPS through the DBCP and SOOP International Coordination facilities, it was then also discussed and approved by the DBCP and SOOP. Finally, at its first session, Akureyri, Iceland, 19-29 June 2001, the Commission strongly endorsed the concept of JCOMMOPS and adopted a recommendation for its adoption as a formal JCOMM centre. JCOMMOPS, which is run by the DBCP and SOOP Coordinator, also includes the Argo Information Centre and the Argo Coordinator, Mr. Mathieu Belbéoch.

6.3.2 JCOMMOPS basically provides support and coordination at the international level for implementation and operational aspects of observational programmes run by the DBCP, SOOP, and Argo (i.e. XBTs, drifting buoys, moored buoys in the high seas, and sub-surface profiling floats). This is a two-person centre based in Toulouse, France. It is one of the areas where JCOMM integration is being achieved.

6.3.3 Support from JCOMMOPS is provided through a number of means. These include: (i) provision of status information regarding observational programmes (e.g. status maps, lists of operational platforms), (ii) provision of information on data requirements (e.g. GOOS, GCOS, WWW), (iii) assistance with the development of cooperative arrangements for buoys and sub-surface float deployments, and for the servicing of moored buoys in the high seas, (iv) assistance as appropriate in relaying quality information from data users back to data producers, (v) assistance as appropriate in the standardization of data formats, (vi) provision of information regarding satellite data telecommunication systems (e.g. survey by David Meldrum, vice-chairman, DBCP), (vii) assistance in promoting GTS distribution of the data, (viii) monitoring, and (ix) links to appropriate products and services developed and made available elsewhere.

6.3.4 To provide those services, a common integrated DBCP, SOOP, and Argo relational database was designed, built, and connected to a dynamic web based system which also includes a Geographical Information System (GIS). The database is in the process of being loaded with relevant data. It particularly already includes a copy of a subset of GTS data provided by Météo France to JCOMMOPS on a monthly basis (i.e. SHIP, TEMP-SHIP, BUOY, BATHY, TESAC, TRACKOB).

6.3.5 From the activities of JCOMMOPS the following goals are eventually expected to be achieved: (i) facilitate the decision making process by programme managers, (ii) facilitate programme implementation at the international level, (iii) facilitate operational and monitoring aspects, and (iv) better visibility provided to private companies and quality evaluation.

6.3.6 As far as ship based observing systems are concerned, the meeting noted that substantial support is already being provided by JCOMMOPS, mainly for the SOOP programme, but also for the VOS programme to a lesser extent. This included, for example: (i) information on ship logistical opportunities, (ii) lists of contact points, (iii) information on instruments being used and performance evaluation by programme participants and manufacturers, (iv) information on network design (e.g. conclusions from the upper ocean thermal review), (v) the SOOP Operations Guide which provides details on how to run a SOO programme, (vi) information on the GTS (including list of GTS bulletin headers), (v) information on data telecommunication systems, (vi) lists of ships and

ship lines, (vii) status and monitoring reports (e.g. by Marine Environmental Data Service (MEDS)), (viii) list of publications, of meetings, etc.

6.3.7 The meeting noted, however, that the support provided to the VOS and ASAP programmes was minimal at the moment, due to the lack of resources to develop and manage such support. It recognized at the same time the potential value of JCOMMOPS providing similar support to those two programmes as it already provided to the DBCP and SOOP. It also agreed that JCOMMOPS had a potentially very valuable role to play in the JCOMM integration process, in providing a single source of integrated information on the status of the overall system. JCOMMOPS could also act as a single portal to a range of distributed information and data centres related to SOT, such as the VOSClim DAC and the WMO ship catalogue.

6.3.8 At the same time, the meeting recognized that a detailed development plan for SOT coordination activities was required, before consideration could be given to estimating and identifying the resources needed for JCOMMOPS development. This plan should include a specification of requirements (in particular for VOS and ASAP under JCOMMOPS, together with the integration aspects), plus an implementation plan to achieve full operational status. The meeting therefore established a small **Task Team on JCOMMOPS**, comprising the chairs of the SOOP, VOS and ASAP Panels and the JCOMMOPS Coordinator, chaired by the SOT chair, to develop this plan. The plan should be available within six months, for circulation to SOT members for review, prior to its consideration by the Observations Coordination Group, and eventually by the JCOMM Management Committee at its second session in early 2003. (**Action**: Task Team and Secretariat) (see *Annex XX*)

7. Operational programme requirements

7.1 The meeting recalled that JCOMM-I, in discussing the question of instrument evaluation, calibration and possible accreditation, agreed: "*that there was a developing requirement to establish properly resourced procedures for evaluating and possibly accrediting instrumentation and procedures used operationally by JCOMM observing system components, including SOOP. It recognized that such procedures would be neither simple nor inexpensive to establish, but nevertheless agreed that this should be considered as a priority issue for JCOMM.----- In a similar vein, the Commission recognized a need to work towards implementation of mechanisms to ensure that data collected by observing system operators conformed to agreed upon basic standards, formats, and levels of data quality.*"

7.2 In addition, the Commission: "*noted that, under the auspices of the Commission for Instruments and Methods of Observation (CIMO), several instrument inter-comparisons of meteorological instrumentation had already successfully been carried out with similar objectives and that comprehensive experience had thus been obtained in this field of common concern. In this context, the Commission noted especially the relevant guidelines for organizing and performing such tests, as contained in the Guide to Meteorological Instruments and Methods of Observations (CIMO-Guide), WMO-No. 8 (sixth edition, 1996). The Commission recognized that CIMO might therefore be consulted for the provision of support in organizing required evaluation tests".*

7.3 As requested by JCOMM-I, and with a view to providing advice to the OCG, the meeting reviewed background information, provided by CIMO, on the Regional Instrument Centres (RICs), including their general terms of reference and location, and an evaluation of their status, based on the results of a questionnaire distributed in 1998 and subsequently updated. The meeting also took into account the WMO procedures and guidelines relating to formal instrument inter-comparisons, developed by CIMO.

7.4 The meeting recognized very clearly the importance of this issue. It agreed that it crosscut all the panels and that, while not necessarily solvable immediately, nevertheless should be urgently

addressed. The meeting noted that there were at least three different pathways possible for undertaking such evaluations:

(i) Through the different panels and other platform-specific groups, as happened now on an ad hoc basis;

(ii) Through the establishment of a formal JCOMM instrument evaluation, intercomparison and testing programme;

(iii) Through existing CIMO mechanisms, with JCOMM providing the required technical expertise.

7.5 The meeting recognized that all three approaches would require, to a greater or lesser extent, significant resources to be effective. At the same time, a number of other relevant points were raised:

(i) The major problem for ship meteorological instrumentation related to instrument exposure, so that standards for instrument siting also needed to be addressed;

(ii) Manufacturers paid their own costs for participating in most CIMO intercomparisons, such as those for radiosondes, and the same situation might also apply for oceanographic intercomparisons;

(iii) Much intercomparison work was already undertaken at the national level and/or within research programmes, but the results of this work were not generally available, or easily accessible, internationally. There was therefore a need for a central information source for such results, perhaps maintained through JCOMMOPS;

(iv) In general, an overall plan was required for monitoring and publicising existing instrument testing and calibration work.

7.6 To address these issues, and prepare specific proposals for consideration by the Observations Coordination Group and SOT-II, the meeting agreed to establish an intersessional **Task Team on Instrument Testing and Intercalibration**, comprising experts from each of the three panels, to be convened by the SOT chairman. The experts suggested were Steve Cook (SOOPIP), Dave Evans (VOS), and Ulrich Leiterer and Horst Dier (ASAP). (**Action**: Task Team) (see *Annex XX*)

7.7 The meeting recognized that operational programmes require that the user can be assured of certain levels of documented data quality, and that the data are easily accessible and in standard formats. This had implications for data standardization between and across the separate panel activities. It was recognized that in many cases there were successful quality monitoring and data standard assurance procedures in operation in each programme, such as the marine surface data monitoring undertaken by the Met Office (U.K.) on behalf of CBS, and the ASAP monitoring by ECMWF and Météo France. However, there was a need to ensure that appropriate documentation on these was made easily available and accessible across the JCOMM programme areas. Another issue related to data quality assurance for complementary observations, and how to integrate monitoring and assessment generally under JCOMM. The meeting agreed that such issues should be first addressed at through the Observations and Data Management Coordination Groups, and it therefore requested the SOT chairman and the Secretariat to bring them to the attention of these groups. (**Action**: Chairman and Secretariat)

8. Discussion of issues for the SOT panels to consider

8.1 The meeting agreed that the following general, potentially crosscutting issues should be addressed by the individual panels, with a view to eventually formulating specific actions to be undertaken at the level of the SOT itself:

- ship recruitment
- national focal points
- instrument evaluations
- integration of sampling requirements
- data management and data standards
- metadata
- telecommunications requirements, including bandwidth
- performance indicators
- the rationalization of observing networks.

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Panel Sessions

III. VOSP-II

1. Programme Review

1.1 Monitoring report

1.1.1 The meeting noted with appreciation that RSMC Bracknell had, at the request of the CBS, assumed responsibility in 1987 as lead centre for real-time monitoring of the quality of surface marine data. Specific variables monitored were surface air pressure, surface wind speed and direction and sea surface temperature, and the monitoring encompassed observations from ships, moored and drifting buoys and others in situ marine platforms. The monthly monitoring reports for ship observations, once compared and rationalized with similar monitoring results from ECMWF, JMA and NWS/NOAA, were distributed directly by RSMC Bracknell to a number of National Meteorological Services. The full six-monthly report, for all platforms, is provided to the Secretariat. The statistics relating to suspect VOS operated by specific Members are extracted, and distributed by the Secretariat to PMO focal points for the Members concerned, under a covering letter requesting that remedial action be taken to correct the problems. The meeting agreed that this monitoring and its follow-up by PMOs, has significantly enhanced the quality of data available in real-time on the GTS.

1.1.2 The meeting agreed that the four variables should continue to be monitored. At the same time, it considered that the monthly report would be of enhanced value to VOS operators and data users if it was written in a more user-friendly language. It therefore requested the Secretariat to raise this matter with RSMC Bracknell for their consideration. (**Action**: Secretariat, RSMC Bracknell).

1.2 Review of SGVOS-I action items

1.2.1 The meeting reviewed the action items identified at SGVOS-I. It recognized that a number of action items to be taken by Members were on-going (see item 5.2).

1.2.2 The meeting noted that one of the most important developments based on the action items was the establishment of the VOS Climate Project. It further noted that some of the action items, such as a survey regarding computational algorithms for automated and semi-automated systems, were forwarded to the VOSClim project and were being carried out within the process for development of this project.

2. Review of the VOSClim project

2.1 Ms Sarah North, Project Leader of the VOSClim project, presented the meeting with the development and present status of the project. The VOS Climate (VOSClim) project was initiated at its first project meeting (VOSClim-I) held in Southampton, United Kingdom, in November 1999. The second (VOSClim-II) and third (VOSClim-III) project meetings were held in Asheville, USA, November 2000 and in Southampton, U.K., January 2002, respectively. Following on from the VSOP-NA recommendations, the objective of the VOS subset envisaged by the project is to provide a source of high-quality marine meteorological data and associated metadata, suitable for a number of applications, including global climate monitoring, research and prediction.

2.2 The meeting was informed that a target of 200 ships to participate in the project has been established and that a number of countries, including Australia, Canada, France, Germany, India, Japan, Poland, United Kingdom and USA, have already started the recruitment. Participating ships are requested to report a number of additional observational elements, which are essential to the success of the project. However, because of the CBS goal of converting all the alphanumeric codes to table driven codes (i.e. CREX, BUFR, and GRIB), it was decided that the existing (unmodified) ship code should be retained for real time reports and that the additional observation information should be provided in delayed mode only, in the modified IMMT-2 code format. The additional information will therefore be recorded in ships hard copy or electronic logbooks for future collection, processing, archival and delivery to users.

2.3 Participating ships are also requested to provide additional metadata, in accordance with the revised contents of the WMO ship catalogue (WMO-No.47). For the purpose of collection of these metadata, a dedicated recruitment/inspection form was developed for the project (*Annex VII*). The meeting recognized that this form is suitable for general use by the VOS. It therefore requested the Secretariat to make the form and instruction available to all VOS operators. The form and instruction should also be included in all WMO guidance material for PMO. VOS operators are encouraged to use the form to collect the metadata to be submitted to the WMO ship catalogue. (**Action**: Secretariat and VOS operators) The meeting noted that it would be possible to expand the contents of this form in the future to include metadata for all ship-based ocean observations, so that the form could be used not only by VOS, but also SOOP and/or ASAP vessels. The meeting agreed that SOT should continue reviewing the metadata needed for VOS, SOOP and ASAP vessels with a view to a possible extension of the survey form in future to all SOT vessels. (**Action**: SOT, especially SOOPIP and ASAPP)

2.4 The meeting noted with appreciation that a Real Time Monitoring Centre (RTMC, located at the Met Office, U.K.) and a Data Assembly Centre (DAC, located at NCDC/NOAA, USA) were established for the data management for the project. It was also pleased to note that varoius information, such as the project brochure, the list of ships participating in the project, and eventually a project newsletter, were available on the project web site (http://www.ncdc.noaa.gov/VOSClim-html) maintained by the DAC. For the purpose of project promotion, a logo for the project and certificate for the participating ships have been prepared. The project brochure had been published in three languages and distributed to participants. A project newsletter has also been designed and the first issue is planned to be published in September 2002.

2.5 The meeting fully recognized the importance of the project and expressed its appreciation to Capt. Gordon Mackie and Ms Sarah North, former and current Project Leaders, Dr Peter Taylor and Dr Elizabeth Kent (U.K.), scientific advisors to the project, and all the participating countries for their efforts in its support. The meeting noted that this project was planned to be continuous and was expected to become an operational programme.

2.6 During the discussion of the observational elements to be reported by ships, the meeting realized that original wind speed and direction were often reported, without height correction applied. At the same time, wind reduced to 10 meters should be reported according to WMO technical guidance, and was thus also reported, e.g. with the TURBOWIN software. The meeting

expressed concern that whether a particular vessel reports the original observation or reduced wind value cannot be detected in the current format. It recognized that the original purpose for reporting the reduced (10m) wind speed was no longer essential for operational meteorology. At the same time, it was agreed that it was much more valuable scientifically (e.g. for climate studies) if the original wind data were reported.

2.7 The meeting therefore requested that a recommendation to this effect should be submitted for consideration at JCOMM-II, through the Observations Coordination Group and the Management Committee. It noted that data input software packages such as TURBOWIN automatically report the reduced wind, and thus a considerable transition period would be needed. Also information on whether the reported value is the original wind or the reduced value will be indispensable, especially during the transition period. The VOS Panel chair and the VOSClim leader were requested to develop a procedure for obtaining this information in the short term. (**Action**: Secretariat, VOSP chair, SOT chair, VOSClim Project Leader).

3. Data Management

3.1 Review of MCSS including codes and formats

3.1.1 Dr Miroslaw Mietus (Poland), chairman of the JCOMM Expert Team on Marine Climatology, presented a review of the history and developments of the Marine Climatological Summaries Scheme (MCSS) since its inception.

3.1.2 The meeting agreed that the data collected under the MCSS have proven invaluable over the years. In addition to operational meteorology and services for marine users, the data are used in global climate studies and in calibrating algorithms determining sea surface temperatures and other variables from satellites. Detailed activities within the current MCSS were also reported. The meeting noted that there was increasing interest in global marine climatological data due to global warming and intensification of investigations concerning the role of the ocean in global processes. Intensification of efforts to digitize marine meteorological observations made before 1960 is highly recommended by the marine climatological research community, while the accompanying metadata also represent an important issue.

3.1.3 Dr Volker Wagner presented a report on the work of the Global Collecting Centres (Germany and U.K.) for the MCSS during the 8 years since their implementation in 1994. Data from Contributing Members (CMs) were submitted for every month during all years, and were dispatched, after quality control, to the Responsible Members (RMs) quarterly. The 2001 data contribution showed a marked decrease as the data from two of the big contributors were missing. Six Members from 41 potential CMs sent their data every year, 17 never contributed to the scheme, which represents around 18% of the total VOS fleet (according to WMO 47, 1999). The meeting strongly urged all VOS operators to submit their delayed mode data to the GCCs according to the agreed procedures. (**Action**: VOS operators)

3.1.4 The meeting stressed that the accuracy of data is of primary importance for the MCSS and scientific research. It is important that marine climatological data are quality controlled before they are exchanged. To ensure the quality of the marine climatological database, Contributing Members should apply MQCS before dispatching data to GCCs. The meeting was informed that GCCs have developed a software package for application of minimum quality control criteria, and that the package would made available to Contributing Members in early 2002. The meeting agreed that the use of such a software package would be invaluable to ensure the quality of the data submitted by CMs. It therefore requested the GCCs, through the Secretariat, to inform the CMs when the software package was available and to distribute it upon request (**Action**: GCCs, Secretariat). VOS operators were strongly encouraged to use this software.

3.2 Metadata

3.2.1 The meeting agreed that the WMO ship catalogue, *List of Selected, Supplementary and Auxiliary Ships* (WMO-No.47) was an invaluable and unique source of metadata on the ships participating in the VOS Scheme. The ship catalogue had been published annually in paper form from 1955 to 1998. A quarterly update was also published electronically and made available on the WMO web site.

3.2.2 The meeting noted that, based on the recommendation by the VOS Special Observing Project North Atlantic (VSOP-NA), it had been decided that the list should be modified to include additional information such as anemometer exposure, ship size and type. The IMO number was also introduced in the revised contents as a unique ship identifier. The meeting noted with appreciation that major efforts had been made by the CMM Subgroup on Marine Climatology to develop the revised contents and format of WMO-No.47.

3.2.3 The meeting reviewed the new contents of the catalogue. It noted that VOSClim-III (Southampton, January 2002) agreed that vessel types and type of meteorological reporting ship, as well as abbreviations used, should be further reviewed. Dr Elizabeth Kent (UK) had agreed that she would circulate a revised list of vessel types, based on the Lloyds register data, to focal points for their review. The list would then be finalized for consideration at the next session of the JCOMM Expert Team on Marine Climatology (ET/MC) and for eventual revision of the Guide and Manual on Marine Meteorological Services.

3.2.4 The meeting was informed that a new electronic database of the ship catalogue, in accordance with the revised format, had been developed in the WMO Secretariat and that the updating process for this database had been completed. The database, with on-line access and downloading functions, will be made available on the WMO website very shortly. Because of this database development process, WMO-No.47 had not been updated, either in paper form or in electronic form, in the past few years. The meeting agreed that the latest updated version was essential, both for effective ship recruitment and for data applications. It therefore requested the Secretariat to make the updated database available as soon as possible. (**Action**: Secretariat)

3.2.5 The meeting was also informed that the new database included not only the latest update but also historical metadata. At present, metadata since 1990 are included in the database. It recognized that it would be of great use if all the historical records were made available through the database. It noted that digitized records of WMO-No.47 since the 1970s were available at the Southampton Oceanography Centre (SOC, U.K.) and the National Climatic Data Center (NCDC, USA). It was highly desirable that these data should be eventually included in the WMO database. (**Action**: SOC, NCDC, Secretariat)

3.2.6 The meeting recalled that VOS operators were requested to submit national updates to No.47 on a quarterly basis. However, only a limited number of countries have been regularly submitting these updates to the Secretariat. All VOS operators were strongly encouraged to ensure submission of national updates with the correct information and correct format. The Secretariat will shortly send a formal letter to all the VOS operating Members requesting regular submission of national updates to the catalogue, with additional information and in the new format. The meeting noted that it would be helpful to ensuring a correct response if the letter would be copied to PMO focal points and SOT members. (**Action**: Secretariat, all VOS operators)

4. Organizational Matters

4.1 The terms of reference of the VOSP are reviewed, along with those of the other component panels, when addressing the overall terms of reference of the SOT under agenda item 13.

5. Future Work Programme and Implementation Issues

5.1 SOT coordination and integration issues

5.1.1 The meeting noted the following status of the general SOT coordination and integration issues, specifically with regard to the VOS:

(i) Steps taken to enhance and coordinate ship recruitment generally, including VOS, are recorded under agenda item I-6.1 above;

(ii) The Secretariat is to take action to update and maintain an enhanced list of national focal points for all components of the SOT;

(iii) Initial VOS instrument evaluations had been undertaken under the VSOP-NA project, and were now a central feature of VOSClim;

(iv) Integrated sampling included, for example, high quality meteorological data coordinated with high-density XBT lines. This remained an issue to be addressed;

(v) Data management, data standards and metadata were all well developed for the VOS, and were continually being evaluated and upgraded;

(vi) In general, telecommunications system bandwidth was not a major issue for VOS observations.

5.2 Action items

5.2.1 The meeting reiterated that the development of the VOSClim project would be one of the most important items within the VOS Scheme. Other implementation **action items** to be taken by VOS operators would include:

(i) Try to arrange interaction with shipping companies at the national level, with a view to ensuring that automated and recommended sensors and communications facilities for meteorological and oceanographic purposes are installed on all new ships during construction.

(ii) Arrange for tracking of the use of TURBO and similar software among national VOS.

(iii) Make every effort to ensure that national services prepare, and QC, delayed mode observational data sets and submit these to the GCCs according to the WMO regulations.

(iv) Where possible, arrange for national ship lists to be accessible, for reading and download, on national web sites.

(v) Ensure submission of national updates to No. 47 on a quarterly basis, with the correct information and in the correct format.

(vi) Enhance automation of all aspects of shipboard procedures, from observation through to message transmission, using already available software and hardware wherever feasible.

5.3 Publications

5.3.1 The meeting recalled that a number of publications relating to the VOS had been issued in the past intersessional period, including the VOS and VOSClim brochures and the VOS

Framework Document. No additional requirements for VOS publications were identified at the present time. However, the Secretariat was requested to ensure that the VOS brochure was made available on the WMO web site, in pdf format, for download and use at the national level. (**Action**: Secretariat)

IV. SOOPIP-IV

1. Programme Review

1.1 Report by SOOP Coordinator

1.1.1 The SOOP Coordinator, Mr. Etienne Charpentier, reported on his activities in support of the Panel since the last SOOPIP session, La Jolla, March 2000. He recalled that he was based in Toulouse, employed by IOC, and shared his time working for both the DBCP and SOOP. About one third of his time is dedicated to SOOP. However, some time was also spent on Argo (about 10%) and JCOMM (about 10%). Work spent on JCOMM was directly related to DBCP and SOOP activities. The Coordinator for example represented JCOMM in the CBS Expert Team on Observational Data Requirements and Redesign of the GOS. Specific information regarding SOOP observations was provided to the ET in this regard (e.g. estimates of instrument performances as compared to the requirements). Work spent on Argo was related to the establishment of the Argo Information Centre and recruitment of the Argo Coordinator who now also works in Toulouse with the SOOP Coordinator at JCOMMOPS. Time was spent on establishing and developing JCOMMOPS, for the benefit of the DBCP, SOOP, and Argo programmes (see agenda item 6.3 for details on JCOMMOPS).

1.1.2 The SOOP Coordinator attended meetings for the Panel, including JCOMMTRAN-2 (Paris, June 2000), CBS Expert Team on Data Representation and Codes (Toulouse, April 2001), CBS Expert Team on Migration to Table Driven Codes (Geneva, May 2001), JCOMM-I (Akureyri, June 2001), and GTSPP meeting (Brest, November 2001). He also visited NOAA in Washington DC in November 2000 to discuss US SEAS matters. He also attended other meetings for the DBCP and Argo.

1.1.3 The Coordinator produced several SOOP monitoring reports, including the SOOP monthly BATHY report, which had been substantially reformatted to include more detail (see 1.2 below). He also produced the SOOP semestrial surveys based upon data and metadata provided by the operators as decided at the third SOOPIP meeting. Other monitoring reports such as the MEDS QC report and MEDS JJXX/JJYY/JJVV and KKXX/KKYY reports were checked and people contacted when needed to fix identified problems.

1.1.4 Information on instrumentation was provided through the SOOP web site. It included details on XBTs, XCTDs, TSGs, pCO2, ADCP, and CTD. The TSG user guide produced by the Institut de recherch pour développement (IRD) was also placed on the web site. An electronic version of the IRD CD-ROM "Three decades of *in situ* Sea Surface Salinity Measurements in the Tropical Pacific Ocean" was made available via the IRD web site. References to key instrument related publications (evaluation, fall rate, algorithms, inter-comparisons) are given on the SOOP web site as well as information provided by the manufacturers.

1.1.5 Discussion regarding the unique tag issue was initiated although no agreement was reached during the intersessional period. A specific scheme is being used by SEAS, but there is no provision in the BATHY code form to encode unique tags. This will be feasible once the BUFR code is used.

1.1.6 The SOOPIP mailing list was renamed (soopip@jcommops.org) as well as the SOOP Internet technical forum (http://forum.jcommops.org). The SOOP web site was substantially re-designed in liaison with the SOOPIP chairman. The new web site includes a programme overview, details on SOOP instrumentation, data management (e.g. how to access the data), the conclusions

from the upper ocean thermal review, a comprehensive list of SOOP related publications, and the SOOP Operations Guide, which still needs to be completed.

1.1.7 The SOOPIP operations database was finally designed and developed in conjunction with the JCOMMOPS database. It particularly includes information regularly provided by the SOOP operators (i.e. semestrial data and metadata, monthly counts, GTS sub-set) plus information on SOOP lines and operated ships. The database is linked to the SOOP web site and permits to make dynamic products available (e.g. status maps, list of operational ships).

1.1.8 The SOOP Coordinator participated in the CBS ET on data representation and codes, where new specific BUFR descriptors were proposed to encode XBT data in BUFR according to users needs once that capability has been developed. Assistance was provided regarding specific problems related to GTS distribution of SOOP data. This included assistance to CLS, Service Argos for correcting the so-called 12H duplicate problem and fake profile inadvertent GTS distribution problem. In conjunction with DBCP work, the Coordinator wrote technical specification for encoding Argos observational data, including XBT, float, and buoy data in BUFR. Developments are underway for operational implementation in early 2003.

1.1.9 As required by the DBCP, the Coordinator is drafting a proposal on how to integrate the existing DBCP QC guidelines into JCOMM to include also XBT and sub-surface profiling float data. The goal is to facilitate and speed up the relay mechanism for providing quality information from data users (and QC centres) back to data producers in order to rapidly correct identified problems.

1.1.10 The meeting noted this information with interest, and expressed its considerable appreciation to the Coordinator for his efforts on behalf of the SOOP Panel. Specific actions arising from the report are addressed under the following agenda items.

1.1.11 The question was asked whether the JCOMMOPS database included historical data. The Coordinator informed the Panel that the SOOP database which is now being maintained at JCOMMOPS did not include those data because, (i) SOOPP started to collect metadata associated with information on every drop in the context of the SOOP semestrial resources survey exercise only in 2000, and (ii) the purpose of the database was basically for programme implementation and operations. A future goal, however, would be to ensure that the present monitoring metadata is included in the timely submission of the delayed mode data, to reduce the requirement for and number of reports.

1.1.12 The question was asked regarding what kind of information was provided on the SOOP web site regarding pCO_2 measurements. The meeting was informed that only general information was provided. However, there are links to the pCO_2 panel web site where more detailed information is available.

1.1.13 The Chairman stressed that the SOOP internet technical forum was a very valuable tool, and urged the participants to actually use it and upload useful information they have onto it in order for all programme participants and potential users to take advantage of their own experience (e.g. instrument evaluation). (**Action**: Ship operators)

1.1.14 The question was asked regarding what new services could be provided by the Coordinator in the future. The Coordinator replied that limited resources (1/3 of the Coordinator's time is spent on SOOP) did not permitted to provide substantially more services to the programme in addition to those already provided. However, new web based dynamic tools were under development at JCOMMOPS (e.g. status maps, list of ships etc) and will be provided during the next intersessional period. Also as decided by the Panel, the SOOP semestrial survey exercise and analysis by the Coordinator will be substantially improved with addition of indicators of how well sampling is realized for each line (see agenda tem 1.2 below).

1.2 Monitoring report

1.2.1 The SOOP Coordinator reported on SOOP monitoring activities, which are being routinely undertaken by the Panel for programme operations purposes. These include the following monitoring reports which are checked by programme participants and the Coordinator:

(i) The SOOP monthly BATHY report, which is produced by the Coordinator based upon statistical GTS input from Australia, France, Japan, and USA. In addition to the information already provided (i.e. GTS counts and duplicates per month for each ship and for data received in Australia, France, Japan, and USA) the SOOP monthly BATHY report was substantially reformatted to include more information such as the operator's name, GTS bulletin header, average delay, and Argos ID numbers and counts for these reporting via Argos. The report is useful to identify specific problems regarding GTS distribution of SOOP data, understand the cause of these problems, and make appropriate contacts in order to solve them.

(ii) The SOOP monthly GTS statistics are produced by specific GTS routing centres and provide statistics on the number of reports received from various sources as well as the number of reports inserted on the GTS by them.

(iii) The SOOP semestrial resources survey is produced by the SOOP Coordinator for the periods January to June and January to December of each year. It is based upon data and metadata provided by the SOOP participants in a format agreed upon at SOOPIP-III. Data and metadata submitted include information on every drop (e.g. observations date, location, ship name, line number, probe batch date, profile depth, etc.). The survey results are used to identify SOOP contributions and to prepare XBT sampling coverage diagrams for the Atlantic, Indian, and Pacific oceans. This helps to keep the programme focused on meeting the expressed requirements whenever possible (e.g. the upper ocean thermal review). Implementation plans are being updated accordingly.

(iv) MEDS is producing several monthly monitoring reports, including: (i) a QC report providing information on specific problems according to QC procedures operated by MEDS, (ii) MEDS data quality statistics (e.g. number of stations per cruise, number of stations which failed QC specific tests), (iii) MEDS JJXX/JJYY/JJVV and KKXX/KKYY reports to monitor BATHY and TESAC code changes implementation respectively, and (iv) MEDS line reports, which tentatively automatically allocate line numbers to received GTS reports (note that users are invited to use these line allocation numbers results with caution, as the results are not entirely reliable).

1.2.2 In addition to the above monitoring reports produced, the SOOP Coordinator also provides specific services and support to the programme. Specific status products are also being provided via the JCOMMOPS web site (see JCOMMOPS agenda item for details).

1.2.3 The meeting expressed its appreciation to the Coordinator and to GTSPP for these reports. It reviewed the latest versions of the monitoring reports, and agreed that these should be continued. (**Action**: SOOP Coordinator and GTSPP)

1.2.4 The Coordinator stressed that it was essential for the programme to have a routine, accurate, and up to date global view over the programme operations. For example, to realize this, the SOOP operators ought to provide him with the list of ships they operate (or with the information on changes in ship recruitment) at least on a monthly basis. This for example permits to quickly identify ship operators each time a problem is detected. The meeting agreed and urged all operators to routinely provide the Coordinator with required information. (**Action:** Operators**)**

1.2.5 The meeting agreed that it was also essential to monitor how well the sampling was realized for each type of line. The present semestrial monitoring exercise was based primarily on

transect counts and was not ideal. The meeting agreed that sampling indicators (e.g. regularity of sampling, completeness of line sampling along the whole transect, adequate spacing between drops according to the type of line, adequate number of transects) should be defined and computed by the Coordinator for each line based upon the data/metadata provided by the SOOP participants on a semestrial basis **(Action:** Operators and Coordinator**)**. At the same time the meeting agreed that it was also essential for this exercise to be accurate, reliable, and useful, that the transect information provided by the operators in their semestrial submission to the Coordinator should be accurate and that this was not always the case. The meeting therefore urged the participants to systematically and carefully check that information in the data they provide to the Coordinator. **(Action:** Operators**)**

1.2.6 The meeting agreed that the GTS monitoring tools were working well and were very valuable to identify problems and correct them.

1.2.7 The question was asked why USA and France did not provide the counts of duplicates in their input to the BATHY monthly report, as this was very valuable information. The Coordinator replied that as far as France was concerned, the information was not recorded in the database, and the information was lost (new duplicated record replacing the new one). Steve Cook will investigate the issue as far as the US is concerned. **(Action:** Steve Cook**)**

1.3 User reports (e.g. NCEP, BMRC, FNMOC, etc)

1.3.1 The panel recognized it did not get enough feedback from its main user, the climate community. It was only able to put on record three general comments from the users:

(i) A coverage more global than the one presently achieved would be required;
(ii) The duplicate reports continue to pose problems;
(iii) A better vertical resolution for the data would be welcome.

1.4 SOOPIP-III Action items review

1.4.1 The meeting reviewed the action items from the last SOOPIP session. Details are given in *Annex VIII*.

2. Implementation

2.1 The panel recognized it was too early to have full information on the implementation of the XBT programme during 2001 at the present time. It nevertheless undertook a review of the achievements during that year, ocean basin by ocean basin. A summary of that review, which consists in checking how each individual ship line had actually been sampled as compared to the way it should had been, is provided in *Annex IX.*

2.2 An estimate of the actual number of probe deployments (some 23,000) compared to the required number (35,000). That comparison demonstrated that it had not proved possible to fully implement the agreed sampling strategy during 2001.

2.3 To refine that assessment, the panel recognized it should have at its disposal a more precise tool. It took the view that the monitoring tools developed by the technical coordinator should be used to that effect, in building up dedicated performance indicators that could be applied to each individual shipping line. The basic idea would be to be able to determine, for each line, if the sampling had been made according to the specifications in terms of (i) timing/periodicity and (ii) spacing. Specific techniques might be developed to that end and eventually provide for a series of indicators which, combined with each other, should show if the sampling strategy had been met. The panel requested the technical coordinator to make proposals regarding such possible performance indicators within a few weeks. (**Action**: SOOP Coordinator) The operators would then, under the guidance of the chair, decide how to proceed and get as exact a picture of the situation as possible. (**Action**: Operators, chair)

2.4 It was made clear that the information provided by the operators to the SOOP coordinator in their semestrial reports should be exact if the result of the assessment was to be reliable. In particular, the number of transects achieved on each line, as well as the number of probes deployed, should be carefully checked. (**Action**: Operators) The way the ships' crews were actually proceeding to probe deployments (especially regarding the periodicity of the deployments), which obviously impinged upon the coherence of the samplings during each transect, was also to be checked, and possible shortcomings corrected through proper training. (**Action**: Operators) In this context, the panel debated if, on the same line and approximately at the same time, two "badly sampled" transects could result in one good transect. It came to the conclusion that this would be very unlikely.

2.5 The panel welcomed the offer of Mr Ali Mafimbo, from Kenya, to provide the technical coordinator with information regarding shipping lines potentially available for recruitment in his region. (**Action**: Ali Mafimbo)

Surface salinity network

2.6 The panel recalled that the project of establishing a surface salinity network had been adopted by IODE as well as by JCOMM. Work was presently underway to prepare a comprehensive project plan, which was due for September 2002. That plan should not only concern data management aspects of the project, but also provide for liaison with its implementation through essentially thermo-salinograph systems operated by countries such as Canada, France, Japan and USA.

2.7 It was made clear that any information would be useful in the field of salinity measurements, given the scarcity of existing data. With the appearance of satellite systems capable of sensing SSS, in situ measurements would be essential for calibration purposes. Those data were also important to improve monitoring models results.

2.8 In this context, the panel welcomed the offer of the SeaKeepers to contribute data to the project. (**Action**: SeaKeepers)

Sea surface currents

2.9 The panel recognized that sea surface current measurements were, for the time being, only relevant to national objectives. It therefore decided to keep track of possible developments in that field and to report on the topic at further panel's sessions, as necessary (**Action**: operators).

pCO_2 network

2.10 That project was undertaken under the auspices of the SCOR CO_2 panel and benefited from the assistance of the Seakeepers. The panel considered it had mainly to maintain liaison with the SCOR panel and to review possible integration issues, should the project become operational.

2.11 In this context, the panel discussed the way a pilot project might become operational. The agreed answer was that there was a need to define on-going requirements for the outcome of such a project, which should be done through relevant science panel(s). The final decision would remain with JCOMM itself. In any case, the panel expressed the view that there was a need to become more involved in the development of pilot projects of possible relevance to its activities. (**Action**: SOOPIP Chair)

2.12 In the same vein, the panel questioned the way it would receive requirements from the GOOS Coastal Ocean Observations Panel (GOOS/COOP). It was informed that a rapporteur on non-physical data (Dr Tony Knapp) had been appointed by the Management Committee at its first session.

Integration issues

2.13 The panel noted that oceanographic studies often require estimates of the air-sea heat and moisture fluxes at the position and time of an oceanographic sample (e.g. XBT or pCO_2 measurement). Such flux estimates require a higher accuracy than standard VOS meteorological observations and in addition must include radiation measurements. It therefore recommended that improved meteorological systems (such as the US IMET system) be installed on-board ships ensuring high density XBT routes, as well as on ships equipped with pCO_2 measurement capability, or similar oceanographic sampling. (**Action**: Ship operators)

2.14 The panel noted that greeting and servicing ships-of-opportunity were requiring higher than usual technical capabilities from PMOs. The latter should be either adequately trained or advised by specialists. It recognized that this issue should be looked at (see also paragraph I/6.1.6 above). (**Action**: Ship operators)

2.15 Finally on this topic, the panel recognized there were strong requirements for capacity building, more especially in data-sparse areas, where there was a need for local support to its activities. It therefore recommended that this question be closely followed by all concerned. (**Action**: Operators, JCOMM Capacity Building Programme Area Coordination Group)

3. Instrumentation and procedure evaluations

3.1 The panel reviewed the instrumentation and procedure presentations from the Science and Technical Workshop relevant to SOOP. It noted the extensive, ongoing instrument evaluation work in Australia by CSIRO/BMRC JAFOOS presented by Rick Bailey. This work demonstrated the continuing accuracy of the T-7/DB/T-4 fall rate equation correction through subsequent and regular sampling evaluations with research vessels using CTDs. Work undertaken in conjunction with NIO, however, points to possible problems using the fall rate correction in high latitudes, due to possible viscosity effects slowing the XBT. These require further investigation.

3.2 TSK, Japan, demonstrated test results for the latest version of the XCTD. Greater depth capacity was incorporated (1835m at 3 knots). Problems were addressed involving surface spikes and surface bubbles contaminating conductivity measurements.

3.3 Tadashi Ando, Japan, tabled two scientific papers concerning problems found with XBT recorders manufactured in Japan. The Z-60-16-II recorder had a measured start-up transient of around 10m, with a temperature error of around 0.1^0C at the nominally accepted depth of 3.7m for measurement of SST, taking into account previously measured recorder start-up transients. Unacceptable bowing errors in the mixed layer were also observed for the Z-60-16-II and Z-60-16-III recorders.

3.4 Requirements for future instrument and procedures evaluations were discussed. To formalize this area of work, it was considered most effective if these evaluations came under the umbrella of the WMO CIMO (as with other ships observations under the VOSP and ASAP), utilizing their expertise in this area and perhaps the WMO Regional Instrument Centres. It was recognized that the expertise from the SOOPIP in this area would have to be contributed to the WMO activities.

3.5 The following specific actions were identified arising from these discussions:

(i) **Action**: Further XBT/CTD comparisons are required in high latitudes. SOOPIP members are to advise of opportunities and implement wherever possible. Data are to be provided to NIO for analysis.

(ii) **Action**: SOOPIP members to identify general opportunities and undertake XBT/CTD comparisons in the intersessional period. Results to be reported to the SOOPIP Chair and Technical Coordinator.

(iii) **Action**: Rick Bailey and Erkki Jarvinen to prepare guide to XBT/CTD evaluations to be placed on the web site.

(iv) **Action**: Operators urged to make better use of the SOOP technical forum established by JCOMMOPS for the exchange of information on instrument and procedures issues.

(v) **Action**: Operators urged to take caution if considering using the Z-60-16-II and Z-60-16-III XBT recorders due to problems observed with measurements in the surface layers.

(vi) **Action**: Manufacturers were again urged to provide regularly updated information on changes to production, new products, etc.

4. Data Management

4.1 Bob Keeley reported on the SOOP data management. GTSPP forms the data management infrastructure of the SOOP. As this was a first co-meeting of ASAP, VOS and SOOPIP, he reviewed some history about the GTSPP and described the data flow. He ended his presentation with a brief summary of the immediate plans of the GTSPP.

4.2 His presentation highlighted a few items:

(i) He noted that GTSPP produces an automated line sampling report. He requested some discussion of what opinion the Panel had of this report and whether it should be discontinued, continued as is, or improved.

(ii) He also noted that there were similarities between some of the reports done by JCOMMOPS and by GTSPP. He requested that the suite of reports should be reviewed to be sure that there was no substantial duplication of effort.

(iii) He noted that GTSPP was still striving to come up with a unique way to identify data from real-time to final archiving.

(iv) He called attention to the capability that SEAS was close to having for sending full resolution XBT data ashore. He noted that GTSPP recommended no change in operations for the moment, but SOOPIP may also wish to comment.

4.3 Discussions following the presentation of the report included the presentation of a scheme developed by Australia for assigning a unique tag. This scheme will also be presented to the next GTSPP meeting in Hobart, March 2002.

4.4 The meeting arrived at these conclusions.

(i) The Upper Ocean Thermal review noted that as capability was developed, the preference was for all XBT data to come ashore in real-time and full resolution. SOOPIP requested GTSPP to review the impact of this at its upcoming meeting in Australia and devise a scheme to handle this data stream. (**Action**: GTSPP)

(ii) There presently exists a document that describes data QC procedures to be carried out on board ship before data are submitted to the GTS. In the case where full resolution data was coming ashore, the meeting asked GTSPP to review this to be sure it was still applicable. (**Action**: GTSPP with SOOPIP chair)

(iii) SOOPIP requested that GTSPP consider the Australian scheme for unique data tags, to weigh it against proposals expected at the GTSPP meeting, to choose a

solution and to implement this as soon as practical. (**Action**: GTSPP)

(iv) Rick Bailey, Etienne Charpentier and Bob Keeley were requested to review the monitoring products generated by JCOMMOPS and GTSPP to determine if there was any significant overlap. (**Action**: As specified)

5. Organizational Matters

5.1 TOR of SOOPIP and Membership

5.1.1 The terms of reference of the SOOPIP are reviewed, along with those of the other component panels, when addressing the overall terms of reference of the SOT under agenda item 13.

5.2 SOOP Coordinator

5.2.1 The panel recognized the importance of the coordinator position to the ongoing success of the programme, and expressed its considerable appreciation to Etienne Charpentier for his work in support of the panel, its members and activities. It therefore agreed to continue to maintain and support the position, under the general conditions established and maintained by the DBCP.

5.3 Trust Fund

5.3.1 The Secretariat representative presented the financial statements and budget for the employment of the coordinator, funded through voluntary contributions by DBCP and SOOPIP member institutions. The trust fund is maintained by WMO and the coordinator is employed by IOC and located at CLS, Service Argos in Toulouse. SOOPIP contributions so far total $US 20 000 per year, which are used to fund a portion of the coordinator salary and travel expenses, as agreed previously by both the DBCP and SOOPIP. He stressed that contributions from SOOPIP Members should at least equal those proposed in *Annex X*. New contributions beyond those proposed would be welcome, and would permit a greater range of activities to be undertaken in support of SOOPIP. The panel accepted the WMO and IOC statements of account for the trust fund for 2000/2001, agreed the SOOPIP components of the expenditure and income estimates for 2002, and endorsed the SOOPIP contributions for 2002. (**Action**: Secretariat)

5.4 Election of the chairman

5.4.1 The panel was informed that its acting (and former) chairman, Mr Rick Bailey, was unable to continue in this role. The panel expressed its considerable appreciation to Mr Bailey for the substantial work and very wise guidance he had provided in support of the panel since its inception in 1995. The panel elected Mr Steve Cook (USA) as its chairman, subject to the endorsement of the election by the JCOMM Management Committee.

6. Future Work Programme

6.1 Action items

6.1.1 See *Annex XXI.*

6.2 Publications required

6.2.1 The panel noted that the TSG guide was published on the web. The status of the SOOP home page, of the Best Practices Guide and of SOOP Implementation Plans should be reviewed by the chair and the SOOP coordinator. (**Action**: Chair and technical coordinator). Regarding the IOC Manuals and Guides series No. 3, the panel recalled that it had been criticized by the OOPC with regard to technical accuracy. The panel requested the Management Committee to seek

written comments from OOPC in this respect, in order to be able to determine what action should be taken regarding this guide. (**Action**: Management Committee)

V. ASAPP-XII

1. Programme review

1.1 Report of EUMETSAT

1.1.1 The EUMETSAT representative, Sean Burns, reported on the status of its monitoring activity and of the geostationary meteorological satellites in general, including in particular a report on the status of Meteosat Second Generation (MSG). This report will be reproduced as usual in the 2001 ASAP Annual Report. The panel expressed its appreciation to EUMETSAT for this report and for its continuing support for ASAP, and for marine data collection in general.

1.1.2 The meeting recognized that the International Data Collection System (IDCS), operated through the geostationary meteorological satellites, was, in the context of the SOT, used primarily for the transmission of ASAP data to shore. The meeting reviewed the status and operational use of channels allocated for data transmission via meteorological satellites. It noted a continuing problem with the transmissions from both French and German ships via Meteosat. This was compounded by the overlapping coverage of Meteosat and GOES, which resulted in some duplication of reports. The meeting noted with appreciation a plan to undertake an end-to-end system monitoring, using a single German ASAP ship, to be conducted during the coming months, in an attempt to clearly identify the source of the problem and hopefully to correct it. In this context, and based on the monitoring results presented at ASAPP-XII, EUMETSAT had already provided an alternative channel allocation to one of the German ships.

1.1.3 With regard to the imminent commencement of operations by MSG, the meeting requested that a long assessment should be undertaken as soon as possible of its new capabilities relevant to ASAP transmissions. This was important, in view of the ultimate desirability of using the IDCS in preference to a commercial communications system, because of the cost savings involved. (**Action**: EUMETSAT and operators)

1.2 Report of ECMWF

1.2.1 The ECMWF representative reported on their monitoring activities for ASAP. The panel was pleased to note that ASAP data quality continued to be comparable with or superior to that of land stations with respect to model fields. The panel expressed its appreciation to ECMWF for this report, which will be reproduced in full in the 2001 Annual Report.

1.3 Report of ASAP monitoring centre

1.3.1 The vice-chairman of the panel reported on the status and operation of and some results from the ASAP monitoring centre, which had been established by Météo France as agreed at ACC-VII. The panel expressed its appreciation to Meteo France for this comprehensive and very valuable report. The report of the ASAP Monitoring Centre will be reproduced in the 2001 Annual Report.

1.4 Report on the EUMETNET ASAP project

1.4.1 The panel noted with interest a summary report on the EUMETNET ASAP (E-ASAP) project, presented by Francois Gerard on behalf of the project leader, Klaus Hedegaard. The main achievement in the past year has been the operational implementation of two additional units, one in the Mediterranean and the other in the North Atlantic. A full report on the status of the project will be included in the 2001 ASAP Annual Report.

1.5 Worldwide Recurring ASAP Project (WRAP)

1.5.1 The panel recalled that, at its 12th session (Reading, September 2000), among the new initiatives being progressed were plans for a Worldwide Recurring ASAP Project (WRAP). A potential sounding track and ships were identified for this new global ASAP project and the USA delegate kindly offered to provide, on loan, a complete launcher and sounder system. Given its importance for operational meteorology and global climate studies it was agreed that this project should be given high priority. It was however recognized that a number of major issues required consideration, particularly concerning the identification of a participating ship, the installation of the sounder system, crew training and funding of consumables. The panel had therefore agreed to appoint a consultant, Capt. Gordon Mackie, to address these and prepare a detailed project plan.

1.5.2 The study undertaken by Capt. Mackie succeeded in identifying and confirming a project ship (the mv Palliser Bay), and in confirming support from the USA (sounder and launcher), Australia (consumables and other support) and the U.K. (logistics), as well as potential future support from EUMETNET. On this basis, the ASAPP chairman agreed to proceed with project implementation, with Capt. Mackie as Project Leader. The ship was subsequently fitted with the equipment and consumables, and began the first WRAP voyage in April 2001. Of the 20 launches executed during the first WRAP passage 16 were successful. Palliser Bay is due to complete her fourth WRAP voyage on 1 March 2002 and the quality and quantity of the upper air soundings from the ship have continued to improve since voyage 1. Unfortunately, the round-the-world trading of Palliser Bay and her sister ships is coming to an end and the WRAP equipment will have to be removed in May 2002. However, another company which has vessels on the route Europe/South Africa/around Australia/South Africa and back to Europe, including a UK call at Felixstowe, has been identified and has agreed to host the WRAP on one of their yet-to-be-nominated vessels. The fitting of this ship will most probably take place in June 2002.

1.5.3 The panel noted with satisfaction that the Australian Bureau of Meteorology had undertaken an impact study of the Palliser Bay WRAP data, which indicated very strongly that these data have made a positive impact on Southern Hemisphere meteorological analyses (see *Annex XI*). The panel agreed that the WRAP project was a testament to the spirit of international co-operation between the various national meteorological services involved and the extreme helpfulness and enthusiasm of the Master and staff on board Palliser Bay. It expressed its appreciation to Capt. Mackie and all others involved in this very successful project. In view of this success, and of the obvious value of the data, the panel agreed that the project should continue, hopefully on a long-term basis. (**Action**: WRAP participants) Considering that much work would be required to ensure the transfer of the equipment to the new ship and the implementation of its operations, the panel agreed that Capt. Mackie should be re-appointed as Project Leader for a further year. (**Action:** Secretariat and Gordon Mackie) In addition, the panel noted with interest the sounding log used on the WRAP vessel, which had been developed in the U.K. in support of WRAP(*Annex XII*). It recognized that such a log was of potential value to all ASAP operators, and encouraged them to make use of it as appropriate. (**Action**: ASAP operators)

1.5.4 Bearing in mind the value of enhanced integration in ship operations, the panel noted and endorsed the possibility of the new WRAP ship being recruited to operate a required high-density SOOP line from Australia to South Africa. (**Action**: Gordon Mackie, SOOPIP chair and SOT chair)

1.5.5 The panel recalled that, from information presented under agenda item 4 and to SOOPIP, there were ships, operated by Contship Ltd., which were engaged in round-the-world trading (via the USA east coast, Panama, New Caledonia, Australia, Suez and Europe), and which already cooperated in ocean monitoring. These ships were potential participants in additional, operationally valuable, WRAP routes. The panel therefore requested Capt. Mackie to undertake an initial feasibility study of this possibility, covering ship recruitment and the availability of sounders, launchers and consumables. The results of this study should be reported to the panel chairman, hopefully within six months, for consideration for further action. (**Action**: Gordon Mackie and chairman)

2. Coordination of implementation

2.1 The panel noted from both the national and WRAP reports that there was a continuing problem with GPS wind measurements, including in strong winds. Operators and Vaisala were urged to continue investigating this problem, with a view to eventually proposing solutions. (**Action**: Operators and Vaisala)

2.2 The panel noted with interest ongoing work in the USA to develop a new deck launcher, which would be portable, weather resistant, simple, usable in up to 40 knot winds, and of modest price. Some results were expected in the next year, and the panel requested to be updated at the next session. (**Action**: USA)

2.3 The panel requested operators to investigate the possibilities for obtaining data during the sonde descent, following balloon burst, and to report on any results to the next session. (**Action**: Operators)

2.4 The panel reviewed the status of information on ASAP included in relevant WMO catalogues and operational publications, and ASAP information dissemination in other ways such as the WWW Operational Newsletter. In this context, it noted that the list of operational ASAP ships and national contact points for ASAP operations had been updated during 2001, but that it was desirable to carry out this exercise on a regular basis. The Secretariat was therefore requested once again to circulate the existing list to operators for updating, with the new list to be disseminated in a forthcoming Operational Newsletter and in the 2002 Annual Report. (**Action**: Secretariat and operators)

2.5 The panel reviewed both the capital cost and the operating cost of ASAP units. It agreed that the document originally developed on this topic remained valid. The ASAP cost document will be reproduced in the 2001 Annual Report. (**Action**: Secretariat.)

3. Organizational Matters

3.1 TOR of ASAPP and Membership

3.1.1 The terms of reference of the ASAPP are reviewed, along with those of the other component panels, when addressing the overall terms of reference of the SOT under agenda item 13.

3.2 ASAP Trust Fund

3.2.1 The meeting reviewed and approved a finalized statement of account for the ASAP Trust Fund for the biennium 2000/2001. This statement is given in *Annex XIII*. It recognized that substantial expenditures would continue to be required during 2002, in particular to support the further development WRAP, including the continued engagement of Capt. Gordon Mackie as consultant to support the project. It therefore agreed a draft budget for 2002, including a table of contributions, which is given in *Annex XIV*. The panel noted and approved the fact that, with the approval of the panel chairman, the Secretariat had already invoiced contributors, including for WRAP, and that a number of these contributions had been received by late February 2002. (**Action**: Secretariat.)

3.3 Election of officers

3.3.1 The meeting elected Mr Jean-Louis Gaumet as panel chairman and Mr David Evans as vice-chairman, to hold office until the end of the next panel session. In doing so, it noted with regret that Mr Klaus Hedegaard had had to resign as chairman of the panel, and thanked him for his extremely valuable work in support of ASAP over many years.

4 Future work programme

4.1 Action items

4.1.1 The meeting reiterated that the top priority in programme implementation for the panel over the next year and more would be the continuation and enhancement of WRAP. Other implementation **action items**, in addition to those noted in preceding paragraphs, would include:

(i) Continuation and enhancement of the ASAP monitoring by Météo France. (**Action**: Météo France.)

(ii) Liaison with monitoring and NWP centres regarding ASAP impacts and quality. (**Action**: Operators.)

(iii) Confirming support from EUMETNET for WRAP for years after 2002. (**Action**: chairman and EUCOS Programme Manager.)

4.2 Publications required including ASAP annual report

4.2.1 The panel reviewed and endorsed existing procedures for the preparation of the annual report, as well as the overall structure for the 2001 report. These are given in *Annex XV*. The Annual National Report Format was also reviewed and modified slightly. This report format is given in *Annex XVI.* Operators were requested to include in the "comments" section on the second page of the report information on system operators, e.g. ships crews, meteorological service personnel, etc. (**Action**: Secretariat, chairman and operators)

4.2.2 The panel recognized that the ASAP brochure required some revision, but recalled that it had agreed that publication of the revised version should be delayed until after the implementation of WRAP and E-ASAP. Noting that both these projects were now underway, the panel reviewed a draft revised brochure text prepared by Sarah North. It approved this draft, which is given in *Annex XVII*. It urged panel members to provide the Secretariat with some new or updated illustrations for the brochure. The Secretariat was then requested to proceed with its finalization and publication, using funds in the ASAP Trust Fund. (**Action**: Panel members and the Secretariat)

4.2.3 The meeting expressed its appreciation to the Australian Bureau of Meteorology for the article on ASAP which had appeared in Ocean Views, published by ABOM, and suggested that a similar article might also be published in the Mariners Weather Log (NOAA/NWS). (**Action**: USA). Furthermore, the meeting reiterated that an ASAP article based on that in the Marine Observer might be prepared and proposed for publication in the Inmarsat journal Ocean Voice. (**Action**: The Met Office, Gordon Mackie and the Secretariat.) The Secretariat was also requested to post the ASAP Annual Report in future on the WMO web site, so that it was available for wider use and distribution by operators. (**Action**: Secretariat)

4.2.4 The meeting noted with appreciation a concise ASAP operations guide, prepared by Gordon Mackie in the context of WRAP. It was agreed that this guide was of potential value to all operators. The meeting therefore decided that it should be published in the 2001 ASAP Annual Report. (**Action**: Secretariat and Gordon Mackie)

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9. Panel summaries and issues

9.1 The meeting recognized that, as the panel sessions had taken place in plenary, and all participants had thus had the opportunity to take part in all of these, there was no need at this particular session for formal panel summaries.

10. Coordination and integration issues

10.1 The panel reviewed a comprehensive set of coordination and integration issues presented by the chairman. These are reproduced in *Annex XVIII*. It recognized that many of these had already been addressed during the session, either (or both) in plenary and in the panels, with a number of actions already initiated. In addition, the following specific points and/or actions were identified during the ensuing discussions:

(i) Entraining and coordinating science projects using VOS into the work of the SOT was seen as important. This could be done through the use of JCOMMOPS as focal point and information source for the SOT, though this first required completion of the work of the Task Team to define the scope and role of JCOMMOPS. Once this was completed, this role should be widely publicized in the science community, in conjunction with information on the SOT itself, its status and work. (**Action**: Task Team, operators and SOOP coordinator)

(ii) Scientists using VOS were strongly encouraged to work through the PMO network in their dealings with shipping companies and crews. A VOS recruitment strategy is to be prepared by the Task Team, aiming to address this and other related issues. (**Action**: Coordinator and operators)

(iii) As an essential step in integration, the Data Management Coordination Group was encouraged to review all existing data management plans regarding ship data, and if possible suggest ways of integrating these. (**Action**: DM CG)

(iv) The DM Coordination Group was also encouraged to being thinking of how to manage non-physical data, such as pCO2, which would eventually be available from VOS, as well as to work on entraining the large numbers of existing data centres dealing with ship data into the JCOMM process. (**Action**: DM CG)

(v) Panel chairs were requested to begin the process of developing performance indicators for their specific data types, as a help to data centres. (**Action**: Panel chairs)

(vi) Recognizing that national activities, programmes and developments were critical components of the overall SOT programme performance, and that it was therefore essential to have updated information on these at frequent intervals, it was agreed that an annual SOT report should be produced, based on integrated national reports in a standard format. The SOT chairman, with the panel chairs and Secretariat, was requested to prepare a template for these reports, for distribution to all operators in the second half of each year. (**Action**: SOT and panel chairs, Secretariat). Operators were then urged to prepare their national reports in integrated form on this template, and submit these to the Secretariat by March each year, for compilation and inclusion on the JCOMMOPS web site. (**Action**: Operators, Secretariat and SOOP coordinator)

(vii) A need was identified for a general basic web site describing the SOT and its programmes. (**Action**: SOT chair with the panel chairs and the SOOP coordinator)

11. Review of the terms of reference of JCOMMOPS

11.1 The meeting agreed that the JCOMMOPS terms of reference could not usefully be reviewed before the Task Team on JCOMMOPS had completed its work. It therefore deferred this issue until SOT-II. The Task Team was requested, however, to have a draft review of JCOMMOPS available for consideration by the Observations Coordination Group at its meeting in April 2002, to provide feedback for its finalization. (**Action**: Task Team on JCOMMOPS)

12. Overarching implementation plan

12.1 The meeting recognized that work should begin immediately on the preparation of an overarching strategy and implementation plan for the SOT, which would obviously be based on an integration of the existing plans for the component panels. The SOT chairman agreed to undertake this work, in conjunction with the panel chairs and the Secretariat. A draft should be available for detailed review and adoption at SOT-II. (**Action**: SOT and panel chairs and Secretariat)

13. Reviews of the Terms of Reference

13.1 The team reviewed its terms of reference, including those of its component panels. A number of revisions were proposed, and these are shown in *Annex XIX*. Bearing in mind that any revisions to the terms of reference should be formally approved by JCOMM itself, the meeting requested the chairman and Secretariat to bring these revisions to the attention of (i) the Observations Coordination Group at its forthcoming session (La Jolla, 24-27 April 2002), for further review and endorsement; and (ii) the Management Committee, for its consideration on behalf of the Commission. (**Action**: Chairman and Secretariat).

14. Next session of the SOT

14.1 The meeting agreed that the SOT, including its component panels, required at least biennial meetings, to ensure ongoing programme coordination and implementation, as well as to address new requirements and technical developments in a timely manner. At the same time, it recognized that the convening of the present meeting had been extremely costly to the Secretariat, and that it would not be possible to continue such funding support in the future, in view of current and ongoing reductions in the regular budgets of both WMO and IOC. In addition, the team recalled that the DBCP, which was a similar body to the SOT, had, from its inception, held its annual meetings at no cost to the Secretariats. The meeting therefore agreed that future sessions of the SOT should be conducted, to the extent possible, under the same funding conditions, which would greatly facilitate the convening of the desired biennial meetings. It urged all team members to make every effort to include the cost of participating in SOT sessions in future forward budget plans.

14.2 The meeting noted with appreciation the tentative offer of the Bulgarian Meteorological Service to host SOT-II in Varna, Bulgaria. It agreed that the session should take place if possible in September 2003. The meeting requested the Secretariat and the SOT chairman to finalize dates and venue as soon as possible, and inform all concerned, to assist in planning participation.

15. Review of SOT-I session report, action items, and recommendations

15.1 The meeting reviewed, revised and adopted the final report of the session, including action items and recommendations. (**Action**: Secretariat and SOT Chair)

16. Closure

16.1 In closing the meeting, the chairman, Rick Bailey, offered his sincere thanks once more, on behalf of all participants, to Dr Ehrlich Desa, Director of NIO, to Dr G. Narayana Swamy, local convenor of the meeting, and to all the staff of the Institute, for hosting the meeting and for providing such excellent support and hospitality. He also thank all participants for their input to what had been a complex, but ultimately very productive and rewarding meeting. He recognized that the concept of an integrated Ship Observations Team had been successfully established, and he looked forward to the second session of the team in 2003, by which time many of the actions initiated at the present meeting would be coming to fruition. He concluded by also thanking the Secretariat for its ongoing support for the work of the team.

16.2 The Director of NIO, Dr Ehrlich Desa, once more expressed his pleasure at having had the opportunity to host the meeting in Goa. He recognized that this hosting had brought benefits to

both meeting participants and NIO scientists, in facilitating interactions at both the technical and personal levels. He assured the meeting of the ongoing interest and involvement of NIO in the work of the SOT, and wished all participants a safe return journey and a successful further development of the team.

16.3 The first meeting of the JCOMM Ship Observations Team, including sessions of the component VOS, SOOP and ASAP Panels, was closed at 1115 hours on Saturday 2 March 2002.

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Annex I

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Annex II

Agenda

I. Common session

1. Organization of the session

1.1 Opening of the session
1.2 Adoption of the Agenda
1.3 Working Arrangements

2. Reports by chairmen

2.1 Report on JCOMM
2.2 SOT
2.3 SOOPIP
2.4 ASAPP
2.5 VOSP

3. Reports on associated programmes and requirements for ship-based observational data

4. New types of observations from VOS

5. National reports

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II. Scientific and Technical Workshop

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6. Support infrastructure

6.1 Ship recruitment and servicing

- 6.1.1 PMO network and services
- 6.1.2 Cooperation on ship recruitment between VOSP and SOOPIP (and ASAPP)

6.2 Telecommunication Facilities and Procedures

- 6.2.1 Telecommunication facilities
- 6.2.2 Channels for data transmission via meteorological satellites and information dissemination

6.3 JCOMM in situ Observing Platform Support Centre

7. Operational programme requirements

7.1 Instrumentation standards
7.2 Data standards

9. Discussion of issues for the SOT panels to consider

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Breakout Panel Sessions
(agendas at the end)

III. VOSP
IV. SOOPIP
V. ASAPP

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9. Panel summaries and issues

12. Coordination and integration issues

13. Review of the terms of reference of JCOMMOPS

12. Overarching implementation plan

13. Reviews of the Terms of Reference

14. Next session of the SOT

15. Review of SOT-I session report, action items, and recommendations

16. Closure

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III. VOSP, Second Session

1. Programme Review

1.1 Monitoring report
1.2 Review of SGVOS-I action items

2. Review of the VOSClim project

3. Data Management

3.1 Review of MCSS including codes and formats (report by the chairman of ET on Marine Climatology)
3.2 Metadata

4. Organizational Matters

4.1 TOR of VOSP

5. Future Work Programme and Implementation Issues

5.1 SOT coordination and integration issues
5.2 Action items
5.3 Publications

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IV. SOOPIP, Fourth Session

1. Programme Review

1.1 Report by SOOP Coordinator
1.2 Monitoring report
1.3 User reports (e.g. NCEP, BMRC, FNOC, etc)
1.4 SOOPIP-III Action items review

2. Implementation

3. Instrumentation and procedure evaluations

4. Data Management

4.1 GTSPP overview and future direction
4.2 Real-time data exchange
4.3 Delayed mode data exchange
4.4 Quality control
4.5 Other measurement types

5. Organizational Matters

5.1 TOR of SOOPIP and Membership
5.2 SOOP Coordinator
5.3 Trust Fund
5.4 Election of the chairman

6. Future Work Programme

6.1 Action items
6.2 Publications required

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V. ASAPP, Thirteenth Session

1. Programme review

1.1 Report of EUMETSAT
1.2 Report of ECMWF
1.3 Report of ASAP monitoring centre
1.4 Report on the EUMETNET ASAP project
5 Worldwide Recurring ASAP Project (WRAP)

2. Coordination of implementation

3. Organizational Matters

3.1 TOR of ASAPP and Membership
3.2 ASAP Trust Fund
3.3 Election of the chairman and vice-chairman

4 Future work programme

4.1 Action items
4.2 Publications required including ASAP annual report

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Annex III

Summary report on JCOMM

1 The Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) was formally established in 1999 by Thirteenth Congress and the Twentieth Session of the IOC Assembly, through a merger of the Commission for Marine Meteorology (CMM) and the Joint IOC/WMO Committee for IGOSS. JCOMM is the reporting and coordinating mechanism for all operational marine activities in both WMO and IOC. As such, it is charged with the international coordination, regulation and management of an integrated, operational, oceanographic observing, data management and services system which will eventually become the ocean equivalent of the World Weather Watch.

2 The first session of JCOMM took place in Akureyri, Iceland, from 19 to 29 June 2001. The session was attended by 113 participants from 42 Members/Member States and 11 international organizations. It was particularly pleasing to note that almost all the national delegations included approximately equal numbers of meteorologists and oceanographers. This was an indication of the importance which both communities placed on JCOMM, and it also ensured a good balance in the debates during the session and in the priority issues to be addressed by the Commission.

3 There was full agreement at JCOMM-I that a major priority for the coming intersessional period would be the implementation and maintenance of an integrated, operational ocean observing system to provide the data required to support global climate studies. Detailed requirements for these data have been developed and will be maintained by the Ocean Observations Panel for Climate of GOOS, GCOS and the WCRP, which thus becomes one of the primary scientific advisory bodies for JCOMM. In reviewing the report of the OOPC to the session, the Commission recognized a number of priority requirements, including the implementation and long-term maintenance of Argo and its integration with the SOOP; operational implementation of VOSClim; long-term resources for system maintenance; and integrated data management.

4 JCOMM-I had recognized that existing and future operational ocean observing networks involve a complementary mix of in situ and remote sensing technologies and platforms. These included ship-based systems (the traditional VOS, the XBT ship-of-opportunity programme, ASAP and future non-physical measurements), autonomous unmanned devices (drifting and moored buoys, floats, other sub-surface vehicles), tide gauges and coastal stations, satellites, aircraft and ground-based radars. The increasing requirement of all users for the delivery of fully integrated data and product streams is, in turn, increasing pressure for a more integrated approach to the observing systems themselves. As a first step towards such enhanced integration, the Commission agreed to establish a Ship Observations Team, grouping the existing ship-based observing panels (VOS, SOOP and ASAP), and creating a mechanism to deal more easily with new observation requirements and technologies. Further with regard to ship-based observations, the Commission was particularly appreciative of the expansion of the ASAP network through the Eumetnet ASAP Project (E-ASAP) and the Worldwide Recurring ASAP Project (WRAP); the implementation of the VOSClim Project, to establish a high-quality reference subset of VOS meteorological data; and the restructuring of the SOOP XBT network in response to the upper ocean thermal review recommendations.

5 The Commission had strongly supported the proposal to establish a JCOMM in situ Observing Platform Support Centre (JCOMMOPS), based initially on the existing DBCP/SOOP and Argo coordination mechanisms. It recognized that the centre was already operational, and requested the Observations Programme Area Coordination Group and the Management Committee to undertake a review to assess the benefits and efficiency that might be achieved by extending the terms of reference of JCOMMOPS to include also support for VOS and ASAP.

6 The Commission had undertaken a thorough review of the status of existing marine data management activities falling within its area of responsibility, including in particular those for VOS data (the Marine Climatological Summaries Scheme, MCSS), for sub-surface temperature and

salinity (the Global Temperature and Salinity Profile Programme, GTSPP), and for buoy and float data (managed through the DBCP and Argo, respectively). The Commission adopted the comprehensive metadata format for ocean data acquisition systems, developed by the DBCP and the former CMM Subgroup on Marine Climatology.

7 At a general level, the Commission agreed that a fundamental principle for its data management was to integrate meteorological and ocean measurements and to provide multi-parameter products and services in response to user needs. It therefore charged its Data Management Coordination Group, together with the Expert Team on Data Management Practices, with reviewing and assessing overall JCOMM requirements for end-to-end data management, and with developing a strategy for the Commission in this regard.

8 The Commission had elected Mr Johannes Guddal (Norway) as its co-president for meteorology and Dr Savi Narayanan (Canada) as its co-president for oceanography.

Annex IV

Report of the Chairman of the Ship Observations Team

Introduction

1. The Ship Observation Team (SOT) work area consists of a collection of very successful and enduring data collection programmes, involving voluntary observing vessel (VOS) and ships-of-opportunity (SOO), which have supported a number of research and operational applications over many years. Indeed, marine meteorological and oceanographic observations have been collected by these vessels for well over a hundred years, and in many instances provide the longest climatological records for such these variables.

The New Challenge

3. The challenge for the SOT is to maintain, coordinate and wherever possible integrate these programmes to support a developing range of well defined operational and research applications. Under the JCOMM structure, scientific guidance will continue to be provided by the Ocean Observations Panel for Climate (OOPC), along with the CLIVAR Ocean Observations Panel (COOP). The SOT will need to have strong input into specification of the scientific goals, providing scientific and logistical advice.

4. The SOT will have to work closely with other *in situ* observational programmes within the JCOMM Observations Programme Area (OPA), such as profiling floats and sea level stations, to develop truly integrated systems observing the fundamental environmental fields of the ocean and marine environment. No longer can observational programmes operate in isolation, collecting similar variables. The power and effectiveness is in the integrated design and application of the data. With the JCOMM OPA, the SOT will also have to work closely with remote sensing programmes to provide the most efficient and cost-effective observing system covering the widest range of space and temporal scales.

5. The SOT will have to work closely with other Programmes Areas within JCOMM, such as the Data Management and Services Programme Areas, to ensure that the best end-to-end data management practices are implemented. The quality and quantity of data must be monitored at all times, with steps taken immediately to address any problems as they are identified. Mechanisms will need to be implemented to ensure cross-coordination and management of these activities.

6. The user requirements will have to be monitored and determined by the JCOMM Management Committee in collaboration with the relevant global observing programmes, such as the World Weather Watch (WWW), Global Ocean Observing System (GOOS), Global Climate Observing System (GCOS) and the World Climate Research Programme (WCRP). New applications and observing system requirements will be developed and formulated by the Global Ocean Data Assimilation Experiment (GODAE); representing an exciting new era for operational oceanography.

7. The SOT will have to work with the Capacity Building Programme Area to help further develop support infrastructure, such as the Port Meteorological Officer (PMO) network, and to raise the profile and need for these observations in developing and developed nations.

8. In conjunction with the overseeing and guiding bodies, the SOT will need to develop performance indicators to be able to measure the success of the data collection programme against the specified scientific goals. Success will necessarily have to be achieved through the utilisation of the most efficient technologies.

9. Whilst considering the global objectives, the SOT will also have to consider and be sympathetic to the national objectives of the participating nations.

SOT-I Objectives

10. The first meeting of the SOT in Goa, India, will provide an excellent opportunity for the team to begin addressing a number of important issues. Specifically SOT-I will help to:

- Provide a status and develop an understanding amongst the participants of the various programmes utilising merchant vessels and ships-of-opportunity.
- Develop mechanisms for coordinating and integrating these programmes.
- Discuss common implementation issues, such the present "volatility" in ship routing operations, coordination of ship greeting and recruitment, etc.
- Exchange information on instrumentation and data applications.
- Consider implications of contributing to operational programmes, such as the need for standardisation of data collection, data processing and data management.
- Consider the needs and specifications for instrument and procedure evaluations.
- Develop performance measures.
- Discuss and document resource issues.
- Identify general issues requiring consideration and support from JCOMM.

Working Arrangements

11. The following summarises the reporting and working arrangements for the SOT:

- The SOT reports to and is represented by the SOT Chair on the JCOMM Observations Programme Group. The first meeting of this group is on 24-27 April 2002 in La Jolla, USA.

- The Chair, SOT is a member of and represents the SOT on the CLIVAR Ocean Observations Panel (COOP). The next meeting of this panel is scheduled for the first half of 2002.

- The SOT will have representation at the next Oceans Observations Panel for Climate (OOPC) meeting, which is scheduled for June 2002 in Kiel, Germany.

- The SOT will have initially three, targeted panels overseeing the technical implementation of the three main programme areas, i.e. the Ship-of-Opportunity Programme (SOOP), the Voluntary Observing Ship Programme (VOSP), and the Automated Shipboard Aerological Programme (ASAP). Each panel will have its own terms of reference.

- Coordination support for the SOOP is provided by the JCOMM in situ Observing Platform Support (JCOMMOPS) Centre in Toulouse.

- Task Groups should be established to address cross-cutting issues for SOT as appropriate (such as programme promotion, satellite communications, ship recruitment, etc).

- Pilot projects will need to be considered for the design and evaluation of new observation programmes, such as the pCO_2 and sea surface salinity monitoring programmes.

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Annex V

Report of the Chairman of the SOOP Implementation Panel

Introduction

1. The coordinated international Ship-of-Opportunity Programme has now been in operation for the last 15-20 years. During this time ships-of-opportunity have proven to be the most cost-effective platforms for obtaining in situ observations of the upper ocean, enabling repeat global and ocean basin coverage. Ships-of-opportunity include volunteer merchant ships, fishing fleets, research vessels and naval vessels.

2. From 1985 to 1995 ad hoc biannual meetings of SOOP national managers were held under the auspices of the Joint IOC/WMO Integrated Global Ocean Services System (IGOSS). At these meetings information was exchanged on instrument technology and performance, data coverage, real-time data transmission capabilities and user requirements. The scientific objectives and design of the global network were also driven at this time by the implementation in 1985 of the Tropical Ocean Global Atmosphere (TOGA) Research Programme. The eXpendable BathyThermograph (XBT) network of SOOP formed a key component of the TOGA observing system, facilitating the broadscale coverage of upper ocean thermal structure which was required to monitor and better understand the ocean's role in climate variability and its predictability, especially ENSO. Although today's satellites enable broadscale sampling of the ocean surface, they still cannot sample the subsurface, dynamic structure and features of the ocean.

3. From 1990 the World Ocean Circulation Experiment (WOCE) of the WCRP also governed the scientific objectives of the SOOP XBT network. WOCE expanded and utilised the broadcast XBT network, developed under TOGA in the tropics. The scientific objectives and the implementation of the XBT network were overseen by the TOGA/WOCE XBT XCTD Programme Planning Committee (TWXXPPC).

4. With the findings of the Ocean Observing Systems Development Panel (OOSDP 1995), the XBT SOOP became an operational system in support of seasonal-to-interannual climate forecasting at the end of TOGA in 1995. The ad hoc meetings and activities of the SOOP national managers were formalised, with the IGOSS SOOP Implementation Panel (SOOPIP) being charged with overall responsibility for the implementation of SOOP in support of both research and operational applications (See Appendix).

The New SOOP Reporting Structure

5. With the establishment of JCOMM, SOOPIP now reports to the Ship Observations Team within the JCOMM Observations Programme Area. The SOOPIP Chairman has been an active member of the JCOMM TRANS Management Committee in formulating this new reporting and coordination structure. Scientific direction is to still be provided by the OOPC and the CLIVAR UOP, which has now been transformed into the CLIVAR Ocean Observations Panel (COOP). The SOOPIP is a member of this panel, and its new terms of reference in this context, as given by JCOMM-I, are in Doc. 3 for this meeting. Many of the members of these panels are also on SOOPIP. National contributors to SOOP at present include Australia, Canada, France, Germany, India, Japan, United Kingdom and the U.S.A., as well as several Mediterranean countries. Russia and China are aiming to develop formal programmes within their countries. With support from member states and the Data Buoy Coordination Panel (DBCP), the Technical Coordinator for DBCP will continue to provide part-time technical coordination for SOOP under the direction of the Chair of the SOOPIP.

Review of the Scientific Objectives

6. There have been a number of recent developments in ocean observations (profiling floats, satellite altimeters, equatorial mooring systems, etc), which have made it timely to

reconsider the upper ocean sampling network, particularly the SOOP XBT contribution. In response to these developments, the GCOS/GOOS/WCRP OOPC, SOOPIP and the CLIVAR UOP decided to convene a study and a workshop to review the upper ocean thermal network (see http://www.marine.csiro.au/JAFOOS). NOAA's Office of Global Programs (OGP), the Australian Bureau of Meteorology and CSIRO Marine Research provided funding for these activities. The workshop was held at the CSIRO/BMRC Joint Australian Facility for Ocean Observing Systems (JAFOOS) in Melbourne during August 1999, and was co-hosted with the Chair of OOPC by the Chairman of the SOOPIP. The comprehensive background study for the workshop was also prepared at JAFOOS by the SOOPIP Chairman.

7. The findings of the review, and subsequent paper by Smith et al. (1999, 2001) was presented to and endorsed by the international scientific community at the Conference on Ocean Observations for Climate in St. Raphael, France. The review recommended that the program should gradually withdraw from areal/broadcast sampling as *Argo* is implemented. At the same time SOOP should ramp up its effort in line (transect) sampling. The line sampling would include intermediate resolution, frequently repeated lines and high-density, quarterly repeated lines (see figures 1 and 2). It was argued that this change in approach enhances complementarity with existing elements, particularly TAO, profiling floats and altimetry. The SOOP will make unique contributions in terms of in-situ eddy-resolving data sets, monitoring of heat and mass transport, and increase coverage along repeating lines. It was stressed, however, that these recommendations concern the climate observational network, and are not intended in anyway to surpass individual sampling requirements for alternative national priorities and objectives.

8. Several recommendations were also made with respect to data management. These included: a) a system of data "tagging", and b) a system of quality accreditation. The review proposed that with these pieces of information it would be possible for users to first identify without confusion duplicates in the databases, and to choose a level of QC that was appropriate to their application. Real-time transmission of the full-resolution data was also highly recommended. The review argued that present arrangements prescribe against efficient and effective use of the data.

Implementation Status

9. The Ship-of-Opportunity Programme Implementation Panel (SOOPIP) last met during 28-31 March 2000 at the Scripps Institution of Oceanography (SOOPIP-3). Two of the main agenda items were 1) the status of the SOOP XBT network; and 2) how to implement the recommendations of the Workshop on the Global Upper Ocean Thermal Network Review.

10. Sampling maps for previous years are available on the SOOPIP web site (http://www.brest.ird.fr/soopip/). For example, figure 3 shows the XBT sampling by SOOPIP operators during the first half of 2001. Several data monitoring schemes have been implemented by the Panel to ensure the most optimal and coordinated sampling with available resources. Schemes are also in place to provide data of the highest quality possible in support of the identified scientific objectives of the sampling network. The SOOPIP web site, which is maintained by the SOOP Technical Coordinator under the guidance of the SOOPIP Chair and with the technical support supplied by IRD in France, provides details of many facets of the programme. These include data management, monitoring reports, information on contributors, technical information on instrumentation, and links to related sites (including those providing data products).

11. Although many of the XBT lines of the basic network are being sampled to requirements, SOOPIP-3 noted with great concern that a number of operators were faced with reducing their programmes during 2000. This was due to recent significant increases in XBT costs (50% increase), coupled in some cases with reduced programme funding. This also coming at a time when planning documents are calling for consolidation and a small expansion of the existing XBT network.

12. The limited availability of commercial shipping lines in the Southern Ocean, southern Indian Ocean, southeastern Pacific and South Atlantic Ocean continue to cause difficulties in

obtaining the required sampling in these areas. However, the limited lines that do exist in the Southern Ocean have helped to provide some of the most valuable time series in an ocean otherwise very much devoid of any other regular sampling.

13. SOOPIP-3 noted with great interest the new sampling programme in the Mediterranean being supported by the European Community for the Mediterranean Forecasting System Pilot Programme (MFSPP).

14. The French, with in recent years growing contributions from the US and Australia, continue to deploy thermosalinographs in the ships' engine intakes to monitor underway sea surface temperature (SST) and sea surface salinity (SSS) (figure 4). Salinity is an important variable in the density driven circulation, yet to date remains in general under-sampled. SOOPIP-3 initiated plan for the development of a coordinated SSS monitoring component of SOOP.

Multidisciplinary Sampling

15. Several of the contributing nations have also begun developing multi-disciplinary sampling programmes from ships-of-opportunity. Some of these programmes have in fact been running for many years. Most of these programmes, however, are pilot projects that are contributing to research programmes or satellite validation/calibration programmes (e.g. the SeaWifs ocean colour scanner). Sampling includes parameters such as phytoplankton and zooplankton distributions, pCO2, high-accuracy marine meteorological observations using automatic weather stations, and direct current measurements. With the potential for oceanographic observers onboard the vessels increasing, this new mode of operating opens up further opportunities for other observations from, though this has to be balanced against the good-will being offered by the ships.

Data Management and Programme Monitoring

16. All the upper ocean thermal data, and most of the surface salinity data, are transmitted in real-time via satellite to the Global Telecommunications System (GTS). The real-time (low-resolution) and delayed mode (high-resolution) data are managed through the Global Temperature Salinity Profile Project (GTSPP) and the WOCE/CLIVAR Data Assembly Centres (scientific data quality control). All the upper ocean thermal data is available via the World Data Centres (e.g. National Oceanographic Data Centre (NODC) in the US) (see figures 7 and 8).

17. Real-time data is assembled and quality controlled by the Marine Environmental Data Service (MEDS) in Canada. In order to circumvent problems of reliability concerning distribution of data via the GTS, data is assembled from several GTS hubs around the world by MEDS. Duplicates are eliminated and the subsurface temperature profiles quality controlled. These data sets are then available for use by operational centres. Information on data quality is fed back to the data collectors as appropriate to help maintain data a reasonable high level of quality.

18. Delayed mode data, usually submitted to the designated data centres one to two years after collection, undergo scientific quality control by three Science Centres established under WOCE for upper ocean thermal data. The objective of these centres is to involve scientists and users with intimate knowledge of the data in particular regions in the QC process. CSIRO/BMRC Joint Australian Facility for Ocean Observing Systems (JAFOOS) operates the Indian Ocean Science Centre, Scripps Institution of Oceanography the Pacific Centre, and the NOAA Atlantic Meteorology and Oceanography Laboratories the Atlantic Science Centre.

19. The SOOPIP Task Team on Quality Control and Automated Systems (TT/QCAS) has undertaken extensive field evaluations on the data acquisition and sensor systems used by SOOP. Corrections to field standards and in some case manufacturing processes have resulted from these evaluations, as problems and errors have been identified. The work is ongoing, but inadequately funded due to the limited resources of the participating agencies.

Sampling and Resource Issues

20. SOOP will adopt wherever possible the XBT network as recommended by the Global Upper Ocean Thermal Network Review (i.e. both frequently repeated and high-density line modes), and eliminate any areal/broadcast low-density sampling when and only if Argo is implemented and working satisfactorily. An overlap in this sampling is proposed to protect the valuable time series collected by SOOP, should Argo encounter problems. However:

- o A significant reduction in funding for some countries during 2000, coupled with increased XBT prices, has created considerable difficulties for implementing the complete network as recommended by the Review.
- o It was estimated that to support the sampling recommended by the review would require approximately 35,000 XBTs/year. During 1999 the number of XBTs deployed by all countries in support of the operational SOOP was of the order of 28,000 XBTs. This represents a deficit of 7,000 XBTs to support the complete recommended networks. This deficit became 10,000 XBTs as funding cuts and existing back-up stores of XBTs became greatly reduced in 2000.
- o Due to resource limitations a number of the existing areal/broadcast lines will have to be stopped before Argo is implemented and proven (not recommended by the Review).
- o Continual changes to commercial shipping operating on selected XBT lines, due to reasons of economic rationalisation, are creating difficulties for operators. Instrumentation must be constantly removed and installed on alternative shipping. This unfortunately cannot be avoided, but must be managed.

Specific Issues for JCOMM

21. There are a number of issues relevant to JCOMM:

- o As an operational system, mechanisms and procedures must be found to ensure data collected by operators conform to agreed upon basic standards, formats, levels of data quality, etc.
- o SOOP still relies heavily on the contributions of research agencies, which simply cannot commit to long-term support of an operational programme.
- o Extra bandwidth must be found in the real-time data distribution system to enable the data transmission of the full- resolution XBT data (as recommended by the Review).
- o An Evaluation and Accreditation Committee must be formed and adequately resourced to test all instrumentation and procedures used by this programme (and probably other JCOMM programmes).
- o Continued support recommended for the Technical Coordinator position.
- o Data management and data collection must continue to be driven by user requirements and best scientific practice.
- o Close coordination with the VOS, VOSClim, and ASAP activities is strongly recommended to promote the more effective implementation of observations from commercial shipping in support of joint scientific objectives and to maintain the harmony and support of the owners of volunteer observing ships.
- o Decreasing resources in support of the programme are a matter of extreme concern for both JCOMM/GOOS and CLIVAR. As a result of the recommended unique contribution of the XBT network, they will have serious ramifications to the implementation and complementarity of the proposed integrated observing system, which also involves Argo, TAO, and the satellite altimeters.

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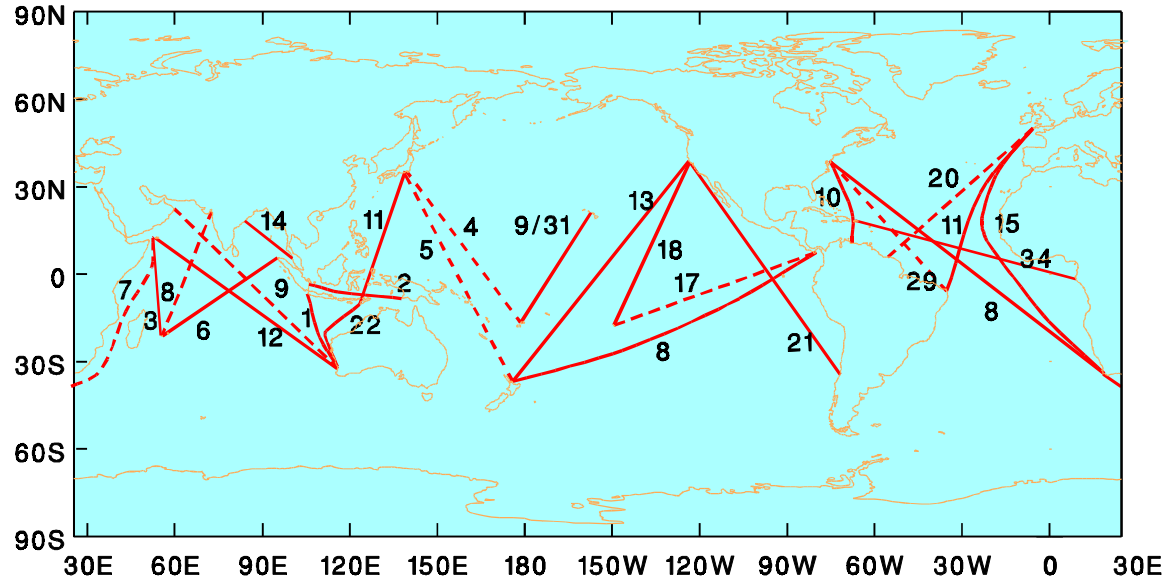

Figure 1: The frequently repeated XBT network, as recommended by the Global Upper Ocean Thermal Network Review.

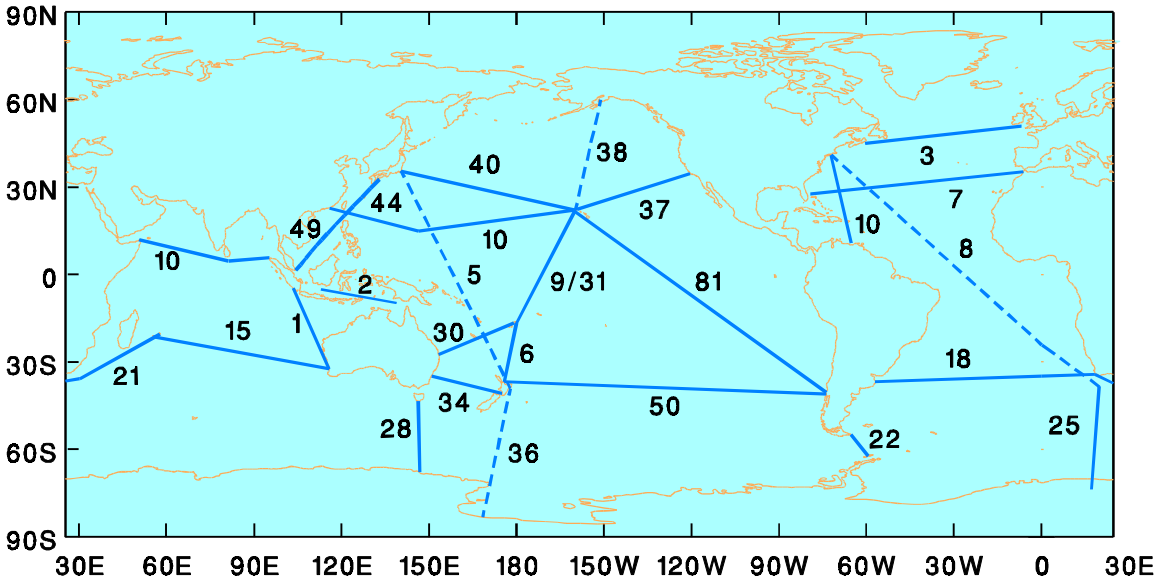

Figure 2: The high-density XBT network, as recommended by the Global Upper Ocean Thermal Network Review.

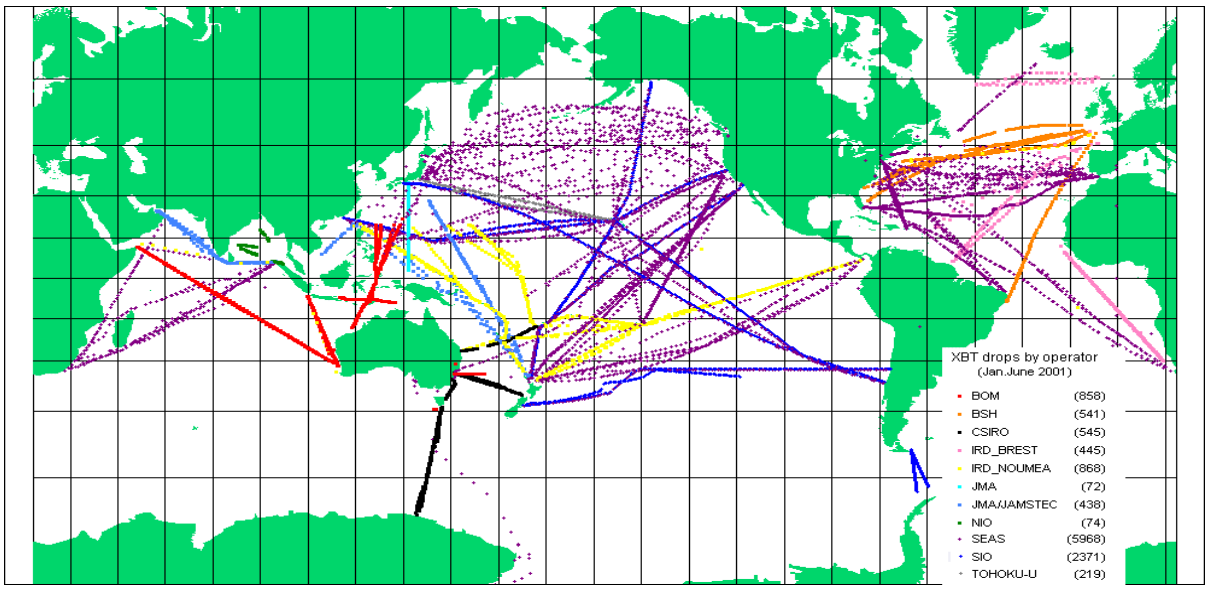

Figure 3. XBT sampling by SOOPIP during the first half of 2001

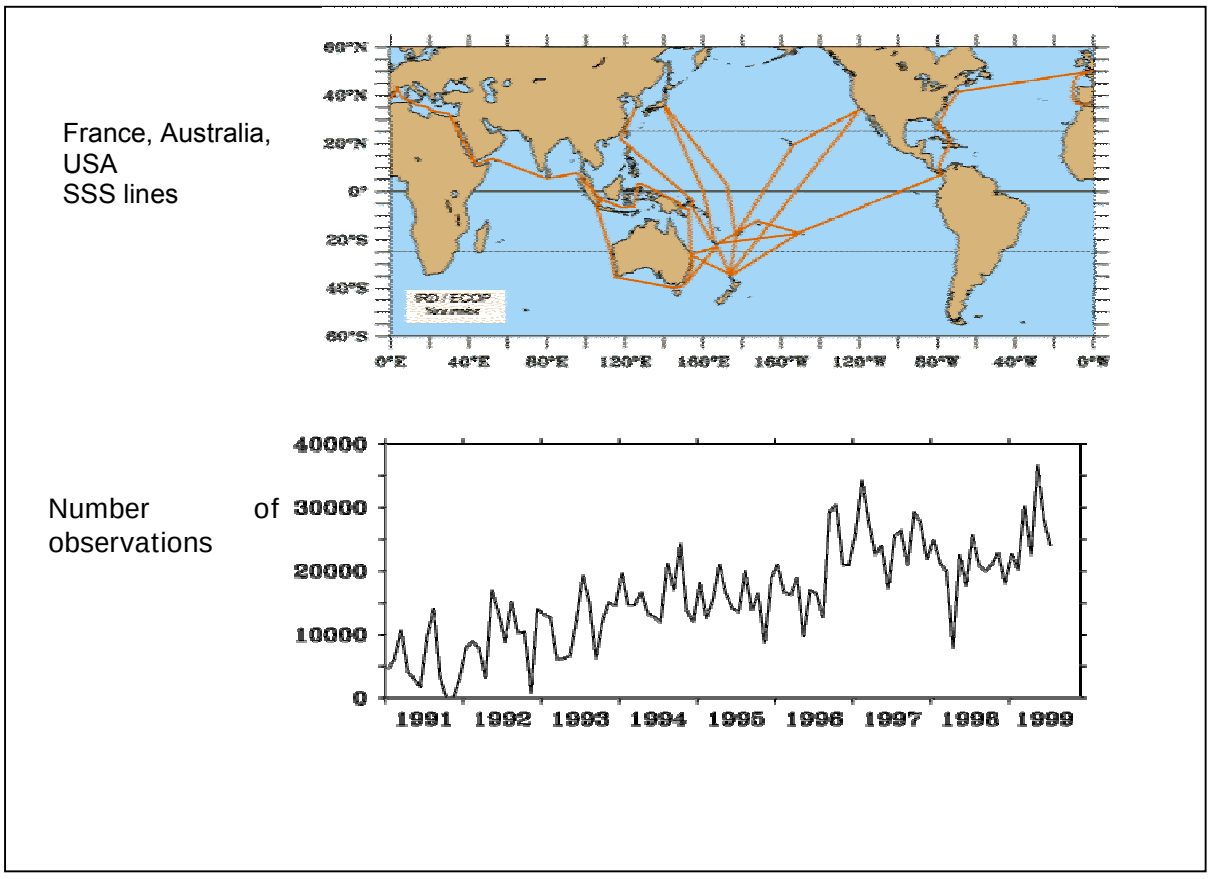

Figure 4. Surface salinity sampling using thermosalinographs

Appendix to Annex V

SHIP-OF-OPPORTUNITY PROGRAMME IMPLEMENTATION PANEL (SOOPIP)
Original Terms of Reference

The SOOPIP has the following responsibilities:

- Monitor and coordinate the observations to maintain the specified scientific sampling, revising sampling strategies in light of scientific design studies;

- Ensure the distribution of available programme resources to ships to meet the sampling strategy in the most efficient way;

- Coordinate the installation of shipboard recording equipment and ship greeting operations;

- Ensure transmission of low resolution data (profiles represented by inflection points) in real-time (within 30 days of collection) from participating vessels;

- Ensure that delayed mode high resolution (profiles sampled at 1 or 2 m resolution) data are checked and distributed in a timely manner to the data processing centres;

- Maintain, in conjunction with the IGOSS Operations Coordinator, an inventory of participating vessels, operators, on-board instrumentation, data accuracy, etc.;

- Provide general guidance to the IGOSS Operations Coordinator in his support for the SOO;

- Promote the exchange of technical information on equipment and expendable development, functionality, reliability, and accuracy;

- Liaise with other IGOSS groups and the WMO VOS programme as required;

- Establish ad hoc task teams to address such issues as:

    (i) accuracy of hardware and software used in the SOO programme;

    (ii) data quality control procedures for shipboard instrumentation, and other data quality control issues raised by the SOOPIP;

    (iii) specifications for modifications to data transmission codes and general data formats, on the basis of other findings of the task teams;

- Investigate, develop and implement new technology and techniques in data collection, processing and transmission;

- Provide information to the relevant scientific groups on sampling success, availability of ships for requested routes, etc.

Annex VI

Report of the Chairman of ASAPP

1. The previous session of the ASAP Panel was held in Bracknell [UK] 27 to 29 September 2000. The intersessional period has shown progress in both activity and knowledge of ASAP, and the programme continues as an important part of the WMO/WWW [World Weather Watch] providing upper-air profile data from sparse ocean areas.

2. ASAP activity in 2001 showed an important increase from several countries. The following table gives an indication of the evolution of launches per year:

	2000	2001	Units
Eumetnet	27	464	2
France	1360	1385	4
Japan	871	1008	6
Sweden/Iceland	117	129	1
UK	220	276	2

NB: Denmark, Germany, Russia and the WRAP project reports, with launch number, were not available at the time of preparing this report.

The E-ASAP [Eumetnet] consists of the two following units:

- in the Mediterranean Sea - 262 launches
- in the North Atlantic Ocean - 202 launches within 6 months

In fact this second unit is able to perform about 400 soundings annually.

For this new ASAP, we thank NOAA for the contribution of the USA to the route between the Florida Keys and Houston. We thank also Greece for the help to the Mediterranean unit set up on a Greek ship, with the support of the Hellenic National Meteorological Service.

3. It is worthwhile to note the important increase of ASAP launches by Japan, which offers with France an important contribution to the meteorological community.

4. However, France can no longer support the significant cost for the ASAP programme of the radio soundings performed by meteorologists and has decided to transfer this activity to private companies at the end of 2002.

5. Another important issue relates to the difficulties encountered with METEOSAT data transmissions. Germany and France have decided to change their data transmission and to use the INMARSAT transmission links in future with their upgraded containers at the end of 2002.

6. Another point to note is the difficulty in selecting new ASAP vessels suitable for carrying a 20 feet container, due to the lack of space on a high level bridge.

Annex VII

Recruitment/Inspection Form - pp. 60-61 - in separate file

Annex VIII

Review of Action Items from SOOPIP-III

Secretariats and Coordinator

1. Where applicable, include full SOOP metadata with ship listings in WMO-No. 47 (WMO and JCOMM SG/MC).

→The meeting decided that this was no longer needed.

2. Pass information on GTS redesign and upgrading to SOOPIP members (WMO).

→ Redesign still n conceptual phase in information passed to JCOMM.

3. Check on notifications for the BATHY and TESAC code changes scheduled for 3 May 2000, and ensure that all SOOP operators are also notified (WMO).

→Done.

4. Pass a proposal for a general JCOMM instrument quality assurance, standardization and intercalibration function to the interim JCOMM Management Committee for consideration.

→ Done.

5. Develop a format for SOOP metadata and compile catalogue. (TC with chairman, R. Keeley and operators.)

→ Done.

6. Arrange for relevant WMO/IOC bodies to be advised of the potential problem regarding observation programmes in Antarctic waters in the context of the Madrid Protocol to the Antarctic Treaty.

→ Done.

7. Solicit submissions from operators, compile a metadata base on a semestrial basis and submit to GTSPP (TC).

→ Done.

8. Develop a web site facility for manufacturers to provide information to operators on changes in probe manufacturing status (TC).

→ Web site facility now exists but manufacturers should still provide the information. Acton should continue.

9. Develop a format for collecting information on individual profiles and associated metadata, on a semestrial basis (TC wi8th chairman, S. Cook and A. Sy).

→ Done.

10. Contact relevant web masters to ensure SOOP site visible from other sites (TC).

→ Done.

11. Add links to mailing lists from SOOP site (TC).

→ Done.

12. Prepare proposal for inclusion of other GTS data types (BUOY, TESAC, TRACKOB) with SOOP monthly BATHY summary (TC).

→ Underway.

Operators and other participants

1. Provide WMO Secretariat, within 2 weeks, with details of the release of Navy data to archives (type, how, when, how much, etc.), for inclusion in an annex to the present meeting report.

→ Done.

2. Provide WMO Secretariat, through chairman, with full details of any additions required to the BATHY and TESAC code tables regarding recorder/probe types.

→ Bob Keeley will look into this.

3. A. Sy to develop a proposal for the future implementation of **ad hoc** Task Teams to address specific evaluation and related problems (with Chairman).

→ Action should continue (see agenda item IV-3).

4. R. Keeley to develop a proposal for the inclusion of a unique profile number, to be transmitted and remain with each profile throughout its history.

→ To be continued.

5. A. Sy to supervise finalization of the SOOP Operations Guide, to be available in at least a web-based form by end 2000.

→ Almost finished Some information already available on web site Some work still needs to be done.

6. S. Cook to prepare draft manual on data transmission techniques for SOOP, to be included in SOOPOG.

→ Done.

7. MEDS/GTSPP to include line number information with profiles.

→ Done.

8. Provide mandatory metadata to coordinator in agreed format.

→ Done.

9. A. Sy to develop a proposal regarding on-going monitoring of probe quality.

→ To be done.

10. R. Keeley to check with NODC/USA concerning extraction of transect-oriented data from CD-ROM data sets and inform members.

→ Done.

12. R. Keeley to prepare and circulate first draft of a data management plan for surface salinity data.

→ Done.

Chairman

1. Develop a proposal for an internet forum to discuss quality assurance issues. (With Coordinator and A. Sy, by mid-2000.)

→ SOOP internet forum exists. Forum needs to be used.

2. Prepare a proposal regarding compilation of quality assurance procedures, to be included in SOOPOG.

→ Still needs to be done.

3. Prepare introduction to SOOPOG – deadline mid 2000.

→ Still needs to be done.

4. Solicit input from operators for next iteration of the upper ocean thermal review.

→ Ongoing.

5. Bring issues relating to the future decrease in availability of probes to support revised SOOP network to the attention of JCOMM. (With Secretariats).

→ Done.

Other bodies

1. Agree and implement single format for GTS distribution of Argo data. (Argo Science Team and TC)

→ Done.

Manufacturers

1. Develop warranty criteria for probes. (With chairman and A. Sy)

→ Ongoing.

2. Provide information to operators, through coordinator and web site, on changes to probe manufacturing status.

→ Still need to stress on manufacturers to provide information .

Annex IX

Present and Future Implementation of the XBT Programme

Indian Ocean

IX03: Undersampled in FR mode. IRD does not sample the line at the moment but 4 cruises per year are being planned by IRD scientists. Ship recruitment is however difficult on that line. USA and France to cooperate.
IX06: Adequate LD coverage but it should be FR
IX07: Undersampled in FR mode. It's difficult to maintain the line. Ship opportunities missing.
IX09: Undersampled in FR mode
IX09N: Adequate LD. Japan samples 14 times a year in LD mode, also on IX10E.
IX10: Adequate LD coverage but HD needed. Japan drops XCTDs on this line and on IX09N.
IX12: Adequate LD. Undersampled in FR mode. CSIRO looking to shift resources to that line.
IX14: FR and HD coverage
IX15: Sampling in HD mode planned.
IX22: CSIRO has plans to shift resources from other lines
IX28: Adequate HD sampling.

Kenya to provide information on shipping opportunities to the Coordinator.

Atlantic Ocean

South Atlantic coverage is not adequately sampled. Efforts should be put by the programme in that region.

AX01: Undersampled in LD mode. Efforts should be placed on that line.
AX02: Adequate LD
AX03: Adequate HD
AX04: Check whether the sampling is adequate and take action accordingly.
AX05: Oversampled in LD mode. 2 vessels and 14 cruises by IRD who plans to stop XBT sampling on that line which is also an ASAP line.
AX10: Adequate LD and HD
AX11: Undersampled in FR mode. Resources should be shifted to this line. SEAS.
AX15: Adequate FR
AX18: USA has difficulties to recruit ships. Cooperation is being established with Argentina (hydrological service) and with South Africa (university of Cape Town). HD coverage is being sought.
AX20: Undersampled in FR mode. Resources should be shifted to this line. SEAS.
AX20b: Undersampled in FR mode.
AX22: Adequate HD coverage.
AX25: HD sampling is inadequate. Cooperation sought by SEAS with University of Cape Town.
AX29: Adequate sampling
AX34: Undersampled in FR mode. Resources should be shifted to this line. SEAS.

Pacific Ocean

HD coverage is adequate in the Pacific Ocean except for lines PX02 and PX49.

PX01: Adequate LD coverage. Line will probably stop.
PX05: Sample 8 times a year by JMA in LD mode. Undersampled in that mode. Japan drops XCTDs on this line.
PX08: Adequate FR coverage.
PX10: Adequate LD coverage.
PX13: SEAS is taking steps to tentatively establish sampling on this line.
PX18: Oversampled in FR mode as far as the number of transects is concerned. However, the total number of probes deployed in a year is consistent with what is expected, thus sampling (i.e. spacing along the transects) is not adequate.
PX21: No ship available. SEAS will stop sampling.
PX28:
PX40: Sampled 3 times a year by Tohoku University.
PX45: and
PX46: Sampled 4 times a year by JMA in LD mode by CTD. Undersampled in that mode.
PX70:

Annex X

Financial Statement by IOC
for the year 1 June 2000 to 31 May 2001

(all amounts in US $ unless otherwise specified)

BALANCE (from previous years)			**19,973**
FUNDS TRANSFERRED FROM WMO (relevant to the period)			
	(15.04.2000)	118,000	**118,000**
	(01.12.2000)	FF 80,000	**FF 80,000**
	TOTAL RECEIPTS		**137,973**
			FF 80,000
EXPENDITURES			
Technical Co-ordinator's employment:			
	Salary:	64,915	
	Allowances:	22,501	
	Relocation (yearly provision):	4,766	**92,182**
Technical Co-ordinator's missions:			
	Paris (13-16 June 2000)	842	
	Geneva (19-21 June 2000)	1,074	
	Paris (10-11 July 2000)	698	
	Brest (4 October 2000) [*paid for by IOC RP*]	0	
	Victoria/Washington DC (16 October - 3 November 2000)	4,547	
	Bergen/Tröndheim (11-12 December 2000)	1,308	
	Geneva (5-7 February 2001)	1,350	
	Southampton (1-2 March 2001)	1,037	
	Sidney (20-22 March 2001)	1,726	
	Geneva (9-10 May 2001)	1,100	
	Yokohama/Tokyo (30 May - 5 June 2001)	3,450	**17,132**
Contract with CLS/Service Argos			**FF 80,000**
	TOTAL EXPENDITURES		**109,314**
			FF 80,000
BALANCE (at 1 June 2001)			**28,659**

World Meteorological Organization

Data Buoy Co-operation Panel
Final Statement of Account as at 31 December 2001

	US$	US$
Balance from 1999		37,798
Contributions Paid for Current Biennium		291,909
Total Funds Available		329,707
Obligations Incurred		
Consultants	227,734	
Travel	55,281	
Bank charges	18	
Publication of Reports	12,242	
Printing Services	13,174	
ATLAS project	12,540	
Cancellation of prior years' obligations	-3,568	
		317,422
Balance of Fund		US $ 12,285
Represented by.		
Cash at Bank		18,368
Unliquidated obligations		6,083
		US $ 12,285

CONTRIBUTIONS	Received 2000	Received 2001	TOTAL
Australia		13,500	13,500
Canada	10,000	10,000	20,000
FAO		10,000	10,000
France	9,863	9,435	19,298
Germany	5,000	5,000	10,000
Greece	2,200	2,200	4,400
Iceland	1,500	1,500	3,000
Ireland	1,243	1,168	2,411
Japan		10,000	10,000
Netherlands	1,575	1,575	3,150
New Zealand		500	500
Norway	2,075	1,575	3,650
South Africa		3,000	3,000
United Kingdom	16,000	15,000	31,000
USA	79,000	79,000	158,000
TOTAL	128,456	163,453	291,909

EXPENDITURES AND INCOME FOR 1998-2003

	Actual 1998 and 1999 (2 years)	Estimated 2000/01 (2 years)	Estimated 2002/03 (1 year)
		USD	
Expenditures			
Technical Coordinator (Salary, Travel and Logistics)	249,211	252,000	126,000
Travel (chair, vice-chairs and JTA chair)	16,559	35,327	19,000
Experts	3,845		
JTA chairman	5,490	15,000	7,000
Publications	12,194	30,000	10,000
DBCP ties		1,350	
WMO	8,620	30	50
Contingencies			1,100
TOTAL	295,919	327,707	163,150
Income achieved/required to balance expenditures			
Contributions	300,072	276,909	162,650
DBCP ties		1000	500
Carry forward from Previous biennium	33,645	37,798	
Carry over to (or back from) next biennium	-37,798	18,000	
TOTAL	295,919	327,707	163,150

DRAFT TABLE OF PROVISIONAL CONTRIBUTIONS

	DBCP		
	2000-2001	**2001-2002**	**2002-2003**
AUSTRALIA (including JTA chair support 2000-02)	13,500	13,500	12,500
CANADA	10,000	10,000	10,000
FRANCE	9,863 (FRF 70,000)	9,435 (FRF 70,000)	10,000 (FRF 70,000)
GREECE	2,200	2,200	2,200
ICELAND	1,500	1,500	1,500
IRELAND	1,243 (IR£ 1,000)	1,168 (IR£ 1,000)	1,300 (IR£ 1,000)
JAPAN		5,000	5,000
NETHERLANDS	1,575	1,575	1,575
NEW ZEALAND	500	500	1,000
NORWAY	1,575	1,575	1,575
SOUTH AFRICA	3,000	3,000	3,000
UNITED KINGDOM (including JTA chair support 2000-02)	16,000	16,000	15,000
USA (including JTA chair support 2000-02)	69,000	69,000	68,000
JTA (for JTA chair support)			10,000
TOTAL	**129,956**	**134,453**	**142,650**

SOOPIP

	2000-2001		2001-2002		2002-2003
Germany	5,000		5,000		5,000
Japan	5,000		5,000		5,000
USA	10,000		10,000		10,000
TOTAL	**20,000**		**20,000**		**20,000**

TOTAL INCOME FROM CONTRIBUTIONS

	2000-2001		2001-2001		2002-2003
TOTAL	**149,956**		**154,453**		**162,650**

Annex XI

Preliminary Results of the Impact of WRAP Data from the m.v. Palliser Bay (GWAN) upon the Australian Bureau of Meteorology's Global Assimilation & Prognosis (GASP) analyses

Background

The Palliser Bay provided twice-daily radiosonde data as it travelled on four voyages between South Africa and Australia at about 40°S latitude. Soundings were generally made at 0000UTC and 1200UTC, to at least 50 hPa. The data were available to GASP analyses for most of the period.

Impact calculations

The impacts of the Palliser Bay soundings upon GASP analyses were calculated at the times of the soundings. The impact of a sounding upon an analysis is defined as the difference between analyses with and without the sounding, at the location of the station. Statistics of Palliser Bay sounding impacts were compared with the routinely calculated impacts of Australian and New Zealand upper air stations. The latter stations include island stations such as Macquarie, Willis, Norfolk and Chatham, as well as Australian and New Zealand mainland stations, but do not include stations on the Antarctic continent.

Summary of results

Voyage 1 - 20 April 2001 - 29 April 2001

The impacts of the Palliser Bay soundings upon both wind and geopotential analyses were overall higher than those of most other stations, particularly below 200 hPa. Indeed, Macquarie Island was the only station to consistently outperform the Palliser Bay at these levels.

The root-mean-square vector wind impacts at the Palliser Bay location typically ranged from about 1.5 m/s at low levels to about 3 m/s at 200 hPa. Geopotential impacts were of the order 4m rms. It must be remembered, however, that 10 days is only a small sample from a not particularly synoptically active period. In summary, the general conclusion is that, much as expected, the soundings from the Palliser Bay had greater impact than did mainland stations, and a similar order of impact to those of island stations in data-sparse areas.

Level (hPa)	1000	850	500	200	100
Geopotential impact (m) rms	4.4	4.6	3.1	4.2	2.1
Geopotential impact (m) max	9.5	11.1	6.5	6.7	3.8
Wind impact (m per sec) rms	1.4	1.7	2.5	3.1	2.6
Wind impact (m per sec) max	3.4	4.4	5.3	6.5	4.4

Voyage 2 - 14 July 2001 - 21 July 2001

The Palliser Bay provided thirteen valid sondes during the period, and thirteen surface ship reports between 12/7/01 and 17/7/01. Due to severe weather, the radiosonde program was somewhat irregular, with two being at 0600UTC and the remainder at 0000UTC or 1200UTC. All flights reached at least 50 hPa. The ship's track was mainly between latitudes 37°S and 40°S, from longitudes 20°E to 110°E.

The impacts tended to confirm the results from the previous voyage. The impacts were generally a little larger except for the lower level winds, although the sample sizes (10-15 sondes) were small on both voyages. Once again the impacts were similar to those observed at isolated island stations and usually greater than at mainland stations. The impact at sea level (1000 hPa) was about 0.7 hPa rms (max 2.1 hPa), which is similar to that at Amsterdam Island (at much the same latitude), and greater than for mainland stations.

Level (hPa)	1000	850	500	200	100
Geopotential impact (m) rms	5.7	5.9	9.5	4.5	3.8
Geopotential impact (m) max	11.8	14.2	20.9	11.5	7.2
Wind impact (m per sec) rms	1.1	1.2	2.1	3.5	4.1
Wind impact (m per sec) max	2.8	2.7	4.6	7.1	9.5

Voyage 3 - 5 October 2001 - 13 October 2001 and 16 October 2001 - 25 October 2001

The Palliser Bay on this voyage provided (i) fifteen valid soundings to 50 hPa over the southern Indian Ocean, and (ii) five valid soundings to 50 hPa in the Great Australian Bight and the Tasman Sea. On the Indian Ocean leg, the track was mainly between latitudes 37°S and 40°S; on the Bight/Tasman leg the track was mainly between latitudes 34°S and 36°S. Most reports were at 0000UTC or 1200UTC, however three were at 0600UTC or 1800UTC.

The impacts on the Indian Ocean leg were of similar magnitudes to those on the April and July voyages. The upper air impacts of geopotential and wind were similar to those at isolated island stations, and usually greater than those at mainland stations. The sea level pressure (1000 hPa geopotential) impact of 1.3 hPa was about the same as that for Kerguelen Island, and slightly greater than those at Amsterdam and Macquarie Islands. Although sample sizes (about 15) have been small for each voyage, the consistency between all three voyages lends support to the overall conclusions.

The impacts for the Bight/Tasman leg of the third voyage were based on a very small sample (5 cases), and were generally lower than those for the Indian Ocean leg.

Indian Ocean sector

Level (hPa)	1000	850	500	200	100
Geopotential impact (m) rms	10.2	8.0	8.5	2.9	5.8
Geopotential impact (m) max	15.4	13.4	12.0	5.5	4.4
Wind impact (m per sec) rms	1.3	1.5	3.3	3.3	3.1
Wind impact (m per sec) max	1.9	2.4	8.0	6.8	5.3

Great Australian Bight/Tasman Sea sector

Level (hPa)	1000	850	500	200	100
Geopotential impact (m) rms	4.9	5.9	6.4	2.5	3.3
Geopotential impact (m) max	9.8	9.3	8.7	4.8	4.5
Wind impact (m per sec) rms	0.6	0.7	1.4	2.3	1.8
Wind impact (m per sec) max	1.0	1.2	2.7	4.2	2.3

Voyage 4 - 29 December 2001 - 7 January 2002 and 10 January 2002 - 23 January 2002

The Palliser Bay on this voyage provided (i) sixteen soundings to 50 hPa over the southern Indian Ocean, and (ii) six soundings over the Great Australian Bight and the Tasman Sea. All reports were at 0000UTC or 1200UTC.

The impacts of the ship upon GASP analyses were of somewhat lesser magnitude than those on the earlier voyages, as might be expected due to seasonal influences. However, impacts of the ship relative those of mainland stations and isolated island stations were similar to those on the earlier voyages.

Indian Ocean sector

Level (hpa)	1000	850	500	200	100
Geopotential impact (m) rms	3.4	3.5	5.9	1.6	3.0
Geopotential impact (m) max	8.6	8.6	10.7	3.9	5.3
Wind impact (m per sec) rms	1.3	1.2	1.6	2.1	2.7
Wind impact (m per sec) max	2.2	2.5	3.3	3.6	5.2

Conclusion

The consistency between the impacts on all four voyages leads to the overall conclusion that the impacts of the Palliser Bay sondes are of similar magnitude to those of soundings at isolated island stations, and greater than those of soundings at mainland stations.

(Further information is available from Mr Bob Seaman <b.seaman@bom.gov.au>)

Annex XII

ASAP Sounding Log - p. 74 - in separate file

Annex XIII

WORLD METEOROLOGICAL ORGANIZATION

ASAP TRUST FUND

Interim Statement of Account as at 31December 2001

		SFR
Balance from 1999		18,771
Contributions received		7,500
Contributions received for WRAP project		43,811
Total Receipts		70,082
Travel	1,734	
Publication of reports	3,820	
Contribution to other funds	12,000	
Miscellaneous (WRAP proj.)	856	
Equipment-Other (WRAP proj. -Palliser Bay)	46,045	
Total Expenditure		64,455
Total funds available		5,627
Represented by:		
Cash at Bank		43,797
Less: Accounts Payable	37,628	
Unliquidated Obligations	383	
Exchange Difference	159	38,170
		5,627

Contributions	**2000**	**2001**	**TOTAL**
Denmark		2,000	2,000
Iceland	500	500	1,000
United Kingdom	1,500	3,000	4,500
Total	2,000	5,500	7,500

Annex XIV

ASAPP Estimated Income and Expenditure 2002

Income

	SFR
Funds available at 31 December 2001	5,627
Missing contributions 2000/2001	17,000
Contributions 2002	12,500
WRAP contribution	44,000
TOTAL	79,127

Expenditure

Publications (including brochure)	12,000
Travel, promotion and general support activities	8,000
Contract for WRAP Project Leader	12,000
WRAP (consumables, etc.)	44,000
WMO charges and contingencies	1,627
Carry over to 2003	1,500
TOTAL	79,127

Table of Provisional Contributions 2002

Denmark	2,000
Iceland	500
United Kingdom	1,500
USA (USD 5,000)	8,500
TOTAL	12,500

Annex XV

ASAP Annual Report Layout

FOREWORD

CONTENTS

1. Report
2. Tables
3. Figures

ANNEXES

I National Reports
II Monitoring Reports
III Other relevant Information
IV Summary of ASAP costs

Report Preparation Timetable

January: Secretariat to circulate ASAP operators and monitoring centres, requesting input to the report to be submitted to the chairman and Secretariat by end of February

March: Chairman to prepare text of report and send to Secretariat for publication

April/May: Publication of the report and distribution to EC, operators and others

Annex XVI

Annual National ASAP Report

COUNTRY ..... NAME OF AGENCY: ..... YEAR: .....

..... ASAP units operated during the year on ..... ships								
Type of ship[1)]	Name	Call sign	Comm. method[2)]	Windfind method / Sonde type[3)]	Launch Method[4)]	Launch height[5)]	Area of operations[6)]	ASAP Unit ID No.

1) Merchant ship, research ship, supply ship, etc.

2) Using IDCS, Inmarsat-C, or others

3) E.G. GPS/Vaisala RS80-G, Loran/Vaisala RS80-L, VIZ GPS Mark II Microsonde, etc.

4) Launch method e.g.: deck launcher (portable); deck launcher (fixed); container (manual); container (semi-automatic); other.

5) The height above sea level from where the sonde and balloon is released

6) Ocean area, e.g. North Pacific, North Atlantic, Indian Ocean, variable

Summary of performance of ASAP units during the year .....

Call sign	Total No. of sondes launched	No. of messages transmitted[1)]	No. of relaunches	Average terminal sounding height (km)	Balloon Size (gm)	Percentage on GTS[2)]
Total or average						

1) The number f messages transmitted should include only those soundings which give reliable results to 200 hPa or higher

2) Based upon reports received at a data centre or GTS insertion point, name: .....
Ratio of reports received against reports transmitted

COMMENTS (Information on system operators, e.g. ship crews, meteorological service personnel, etc. should be included) :

ESTIMATES FOR FOLLOWING YEAR:

Annex XVII

Automated Shipboard Aerological Programme

Cost-effective upper air data over the oceans

Reliable and effective data

The Automated Shipboard Aerological Programme (ASAP) provides data that is of vital importance to the World Weather Watch and is a cost-effective source of baseline upper-air data from the oceans. As part of the global observing system ASAP data can be used to support of many applications, including global climate studies.

BACKGROUND

ASAP in its present form began in the middle of the 1980's and was organized by the WMO's ASAP Co-ordinating Committee. In recent years the responsibility for coordinating the overall implementation of the programme, including monitoring its overall performance, both operationally and in respect of data quality, passed to a Ship Observations Team established by the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM).

The original ASAP system was developed as a modular 'containerized' unit that could be quickly installed on, or removed from, as host ship. The system was completely housed within a specially modified standard 6.1 metre (20 foot) shipping container. This container included all necessary electronics and antennas, the balloon launching system, stowage for consumable supplies such as helium, balloons and sondes, and adequate operator workspace. It only required a suitable open deck space and connection to the ship's power supply. The capital cost of the containerized ASAP system was found to be equal or less than that for a new land-based aerological sounding station.

Containerized ASAP systems met their original design concepts and had the advantage that they could relatively easily be transferred from one ship to another. However finding suitable ships with non obstructed and easily accessible deck space can be difficult. Furthermore the extra costs incurred in the maintenance of the container and its peripheral equipment, such as air conditioners and mechanical launching systems, is often restrictive.

In recent years an alternative system configuration, known as a 'distributed' system has been developed to expand the versatility of the ASAP concept. Distributed systems are essentially limited to the required electronics which are installed in existing ship spaces accessible to the operator, usually on the bridge or near by. Manual or remote launching techniques are employed and the consumable supplies are stored in an appropriate onboard space. Alternatively a 3.05 metre (10 foot) container is now often used for both launching and stowage purposes.

ASAP OPERATORS

Countries that currently operate ASAP systems on a regular basis are Japan (7), Denmark (3), France (4), Germany (4), Spain (1), Iceland/Sweden (1), USA (1) and the UK (1). However some countries also recruit ships to perform ASAP soundings on a less regular basis, when a perceived need is established.

In addition the eighteen participating European National Met Services which comprise Eumetnet have also recently become involved in ASAP operations. There are presently 2 Eumetnet ASAP (E-ASAP) ships in operation – one plying the North Atlantic route, where data sensitive areas have been identified, and the other in the Mediterranean. Further E-ASAP ships are planned for the future.

The ASAP concept gained a global dimension with the introduction of a new initiative entitled the Worldwide Recurring ASAP Project (WRAP). For this project a number of countries collaborated to install and operate a distributed ASAP system on board a scheduled round the world container ship. Soundings commenced in April 2001, as planned, when the vessel cleared the South African coast on the Indian Ocean leg of its passage.

DATA

The quality of ASAP data is generally found to be very high, comparable to the quality of data from dedicated ocean weather ships, with sounding heights exceeding 20 kilometres.

The quantity and quality of data collected in real time and transmitted over the Global Telecommunication System has shown significant improvement since the early years of ASAP. The total number of ASAP soundings has increased to approximately 5000 annually (see figure).

The majority of national programmes have now adopted the Inmarsat C system for transmitting data. This system has approximately 99% communications efficiency allowing data to be communicated as effectively as other upper-air data on a worldwide basis.

GPS and Loran are now the most commonly used systems for determining radiosonde speed and direction.

FUTURE GOALS

It is anticipated that ASAP activities will grow in the coming years with increased soundings in all ocean areas. To this end the SOT aims to arrange for and use funds and contributions in kind needed for the procurement, implementation and expansion of the programme. It will also focus on the following goals-

- To work effectively with countries adjacent to data sparse ocean areas to find potential ASAP operators with routes through these areas
- To encourage joint ventures to implement new ASAP observing programmes
- To continuously analyse, evaluate and implement more cost-effective means to communicate ASAP data
- To provide advice and assistance to new ASAP operators
- To improve efficiency in communicating data
- To design more robust, automated and deck-based launching devices

Annex XVIII

Coordination and Integration Issues

•Identified requirements increasing and accordingly the need for more, higher quality data.
•Value-add by integrating obs on vessels
•Need to complement other related observing systems (e.g. Argo, satellites, etc)
•Need to standardise recording methods
•Maintain and develop metadata
•Need to document and communicate recommended methods
•Need to continue to develop new, flexible instrumentation + further automate
•Need to coordinate ship recruitment and programme promotion
•Basic SOT web page for info with links?
•Need to work with shipping companies, etc, to provide “access” points (e.g. water intakes)•Cheaper to pay ship’s crew to undertake extra measurements?
•Decrease in available shipping + “volatile”
•Increasing demand for vessels to deploy other instrumentation, such as floats
•Coordinate deployment activities/opportunities
•Cost of data transmission for some countries prohibitive
•Coordinated strategy for PMOs re visiting and recruiting vessels
•Capacity building and training especially for PMOs in data sparse areas
•Need feedback loops to other JCOMM programmes to monitor data flow, quality, and use.
•Need connection to climate services
•Flexible sampling capabilities?
•Need end-to-end data management systems, able to “carry” new requirements (metadata, increased bandwidth, etc)
•Utilise and contribute to existing instrument evaluation mechanisms and infrastructure?
•Include VOS support under JCOMMOPS?

Issues for JCOMM

•Instrument evaluation
•Feedback loops between JCOMM Programmes
•Connections to climate services
•JCOMMOPS role in SOT
•Level of resources to implement requirements
•Capacity building and training in remote/data sparse areas

Annex XIX

Terms of Reference

Ship Observations Team

The Ship Observations Team shall:

1. Review and analyze requirements for ship-based observational data expressed by relevant existing international programmes and/or systems and in support of marine services, and coordinate actions to implement and maintain the networks to satisfy these requirements;

2. Provide continuing assessment of the extent to which those requirements are being met;

3. Develop methodology for constantly controlling and improving the quality of data;

4. Review marine telecommunication facilities and procedures for observational data collection, as well as technology and techniques for data processing and transmission, and propose actions as necessary for improvements and enhanced application;

5. Coordinate PMO/ship greeting operations globally, propose actions to enhance PMO standards and operations, and contribute as required to PMO and observers training;

6. Review, maintain and update as necessary technical guidance material relating to ship observations and PMOs;

7. Liaise and coordinate as necessary with other JCOMM Programme Areas and expert teams, as well as with other interested parties;

8. Participate in planning activities of appropriate observing system experiments and major international research programmes as the specialist group on observations based onboard ships, including voluntary observing ships, ships-of-opportunity and research ships;

9. Seek for opportunities for deploying various kinds of measuring devices and widely publicize those opportunities;

10. Develop as necessary new pilot projects and/or operational activities and establish new specialized panels as required;

11. Carry out other activities as agreed by participating members to implement and operate the SOT programme and to promote and expand it internationally;

Terms of Reference of Component Panels

SOOP Implementation Panel

1. Review, recommend on and, as necessary, coordinate the implementation of specialized shipboard instrumentation and observing practices dedicated to temperature and salinity measurements;

2. Coordinate the exchange of technical information on relevant oceanographic equipment and expendables, development, functionality, reliability and accuracy, and survey new developments in instrumentation technology and recommended practices;

3. Ensure the distribution of available programme resources to ships to meet the agreed sampling strategy in the most efficient way;

4. Ensure the transmission of data in real time from participating ships; ensure that delayed mode data are checked and distributed in a timely manner to data processing centres;

5. Maintain, through the SOOP Coordinator, appropriate inventories, monitoring reports and analyses, performance indicators and information exchange facilities;

6. Provide guidance to the coordinator in his support for the SOOP;

7. Prepare annually a report on the status of SOOP operations, data availability and data quality

ASAP Panel

1. Coordinate the overall implementation of the ASAP, including recommending routes and monitoring the overall performance of the programme, both operationally and in respect of the quality of the ASAP system data processing;

2. As may be required by some members, arrange for and use funds and contributions in kind needed for the procurement, implementation and operation of ASAP systems and for the promotion and expansion of the programme;

3. Coordinate the exchange of technical information on relevant meteorological equipment and expendables, development, functionality, reliability and accuracy, and survey new developments in instrumentation technology and recommended practices;

4. Prepare annually a report on the status of ASAP operations, data availability and data quality

VOS Panel

1. Review, recommend and coordinate the implementation of new and improved specialized shipboard meteorological instrumentation, siting and observing practices, as well as of associated software;

2. Support the development and maintenance of pilot projects such as VOSClim;

3. Develop and implement activities to enhance ship recruitment, including promotional brochures, training videos, etc.

4. Prepare annually a report on the status of VOS operations, data availability and data quality

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Annex XX

Intersessional Task Teams Established by SOT-I

Task Team on VOS Recruitment and Programme Promotion (para 6.1.12)

Tasks

- For the purpose of further encouragement of ship recruitment, address all the relevant issues as detailed below and prepare some specific proposals.

  (i) There was merit in and scope for some type of international recognition scheme for the VOS, as well as for enhanced information distribution to both ships and ship-owners, to enhance involvement in the VOS;
  (ii) An international newsletter for VOS would be useful, or if this proved impractical because of the resources required, enhanced use might be made among the VOS of existing information material such as national publications and documents such as the GOOS and GCOS newsletters;
  (iii) The recently agreed VOSClim Certificate of Participation might be adapted as a similar international certificate of participation for all VOS;
  (iv) Similarly, the VOSClim Newsletter might also be expanded for use with all VOS;
  (v) A central pool or bulletin board of existing publications related to VOS, perhaps maintained through JCOMMOPS, would be very useful to all ship operators;
  (vi) Information on ship-based environmental observation programmes published in the general maritime press could also serve to enhance understanding of these programmes;
  (vii) An international approach to both ship builders and ship classifiers was required, to ensure the inclusion during manufacture of the basic infrastructure needed now for many types of observation;
  (viii) The WMO, IOC and JCOMM logos could be included on national certificates and awards.

- Also address the issue that scientists using VOS were strongly encouraged to work through the PMO network in their dealings with shipping companies and crews. (para10.1)

Working procedure

- Work by email

- Make the proposals available within six months for consideration by the chairs of the SOT and the three panels

- If there was general agreement, then a decision could be made on those aspects for immediate action, and those which should be referred to SOT-II for further consideration

Members

Steve Cook (convenor, USA)
Rick Bailey (Australia)
Dave Evans (Australia)
Francois Gerard (France)
Gordon Mackie (U.K.)
Geoff Morrison (International Seakeepers)
Sarah North (U.K.)

Task Team on Satellite Communications System Costs (para 6.2.4)

Tasks

- Consider the problem that the arrangement of the code 41 short code dialing procedure leads to a relatively small number of countries bearing the full burden for the cost of such data transmissions via Inmarsat C

- Also take into account the possibility that this situation may become exacerbated if two or more of the LES are owned by the same company, in which case all the reports for all these LES will be channeled through, and paid for, by a single NMS

- Address this situation, with the idea of some form of global cost sharing scheme being suggested, among other possible solutions

- Prepare a report on the issue for consideration by SOT-II

Members:

Volker Wagner (Chair, Germany)
Francois Gerard (France)
Frits Koek (Netherlands)
Sarah North (U.K)
A representative of Inmarsat

Task Team on JCOMMOPS (para 6.3.8)

Tasks

- Develop a detailed development plan for SOT coordination activities, for the purpose of estimating and identifying the resources needed for JCOMMOPS development

- The plan should include a specification of requirements (in particular for VOS and ASAP under JCOMMOPS, together with the integration aspects)

- The plan also should plus an implementation plan to achieve full operational status

- Define the scope and role of JCOMMOPS

- Take into consideration that entraining and coordinating science projects using VOS into the work of the SOT was seen as important and that this could be done through the use of JCOMMOPS as focal point and information source for the SOT (para 10.1)

Working procedure

- A draft should be made available to the frst session of the Observations Coordination Group to be held in April 2002

- A further detailed plan should be available within six months, for circulation to SOT members for review

- Then the plan should be submitted to the Observations Coordination Group

- The plan should eventually be submitted to the second session of the JCOMM Management Committee to be held in early 2003.

Members:

SOT chair (chair)
Chairs of the SOOPIP, VOSP and ASAPP
JCOMMOPS Coordinator

Task Team on Instrument Testing and Intercalibration (para 7.6)

Tasks

- Address the issues below, and prepare specific proposals for JCOMM instrument evaluation and intercomparison procedures for consideration by the Observations Coordination Group and SOT-II

- Take the below into account

    - Regional Instrument Centres (RICs) have been established within CIMO.
    - CIMO has developed the WMO procedures and guidelines relating to formal instrument inter-comparisons
    - SOT-I noted that there were at least three different pathways possible for undertaking such evaluations:

        (i) Through the different panels and other platform-specific groups, as happened now on an ad hoc basis;
        (ii) Through the establishment of a formal JCOMM instrument evaluation, intercomparison and testing programme;
        (iii) Through existing CIMO mechanisms, with JCOMM providing the required technical expertise.

- SOT-I also noted relevant points as below:

    (i) The major problem for ship meteorological instrumentation related to instrument exposure, so that standards for instrument siting also needed to be addressed;
    (ii) Manufacturers paid their own costs for participating in most CIMO intercomparisons, such as those for radiosondes, and the same situation might also apply for oceanographic intercomparisons;
    (iii) Much intercomparison work was already undertaken at the national level and/or within research programmes, but the results of this work were not generally available, or easily accessible, internationally. There was therefore a need for a central information source for such results, perhaps maintained through JCOMMOPS;
    (iv) In general, an overall plan was required for monitoring and publicising existing instrument testing and calibration work.

Members (experts from each of the three panels):

SOT chair (Chair)
Steve Cook (SOOPIP)
Dave Evans (VOS)
Ulrich Leiterer and Horst Dier (ASAP)

Annex XXI

List of Action Items

Action items mainly done by Chairs of SOT, VOSP, SOOPIP and ASAP

	para	Action item	By	In conjunction with
1	3.1.2	Review and revise the Draft Statement for JCOMM Programme Areas prepared by Dr Kawamura and Mr Charpentier	SOT Chair (JCOMM PA Coordination Groups)	
2	4.5	Maintain close contacts with the CO_2 Panel, with a view to preparing a more concrete proposal for consideration by SOT-II	SOT Chair	SOOPIP Chair VOSP Chairs, Secretariat
3	6.1.7 (ii)	Investigate the possibilities for developing an integrated information stream to be made available to shipping (companies and crews) regarding the value and applications of ship-based observations.	SOT Chair	Secretariat
4	7.7	Bring the matter on data quality documentation and assurance to the attention of Observations and Data Management Coordination Groups	SOT Chair	Secretariat
5	III.2.7	Submit a recommendation with regard to reporting original wind data without height correction for consideration at JCOMM-II, through the Observations Coordination Group and the Management Committee	SOT Chair	VOSP Chair, VOSClim Project Leader Secretariat
6	III. 2.7	With regard to reporting the original wind, develop a procedure for obtaining information on data input software and on whether the reported value is the original wind or not.	VOSP Chair VOSClim Project Leader	
7	IV. 2.3	Give guidance to SOO operators how to proceed and get as exact sampling assessment as possible using a performance indicator to be proposed by the SOOP coordinator	SOOPIP Chair	
8	IV. 2.11	Define on-going requirements for the outcomes of pilot projects, which should be done through relevant science panel(s).	SOOPIP Chair	
9	IV.4.4 (iv)	Review the monitoring products generated by JCOMMOPS and GTSPP to determine if there was any significant overlap	SOOPIP Chair	SOOP Coordinator Bob Keeley
10	V. 1.5.4	Proceed with the recruitment of the new WRAP ship to operate a required high-density SOOP line from Australia to South Africa.	SOOPIP Chair	SOT Chair, G. Mackie
11	V. 1.5.5	After receiving a report on initial feasibility study of ships potentially participating in WRAP from Capt. Mackie, consider future action on this matter	ASAP chair	
12	10.1 (v)	Begin the process of developing performance indicators for their specific data types, as a help to data centres.	Panel chairs	
13	10.1 (vi)	Together with the Panel chairs and the Secretariat, prepare a template for SOT national reports	SOT Chair	Panel chairs, Secretariat
14	10.1 (vii)	Prepare for a general basic web site describing the SOT and its programme	SOT Chair	Panel Chairs SOOP Coordinator
15	12.1	Prepare an overarching strategy and implementation plan for the SOT	SOT Chair	Panel Chairs, Secretariat

	para	Action item	By	In conjunction with
16	13.1	Bring the agreed revisions of SOT terms of reference to the attention of (i) the Observations Coordination Group at its forthcoming session (La Jolla, 24-27 April 2002), for further review and endorsement; and (ii) the Management Committee, for its consideration on behalf of the Commission	SOT Chair	Secretariat
17	14.2	Together with the Secretarait, finalize dates and venue of SOT-II as soon as possible, and inform all concerned, to assist in planning participation	SOT Chair	Secretariat

SOT members and ship operators

	para	Action item	By	In conjunction with
1	6.1.7 (i)	Make efforts to impress upon national agencies the essential nature of specialized PMO functions and work	Ship operators	Secretariat
2	6.1.10	Regularly provide JCOMMOPS with up to date information	Ship operators	SOOP Coordinator
3	6.2.8	Participate in the annual Joint Tariff Agreement meetings, both to input to the tariff negotiations and also to pass requirements to CLS/Service Argos	Ship operators	
4	6.2.10	Be cautious before committing a new telecommunication system, Consider the potential cost advantages to be gained through the use of forward and bulk purchasing of satellite use time from system operators	Ship operators	
5	III.2.3.	Continue reviewing the metadata needed for VOS, SOOP and ASAP vessels with a view to a possible extension of the survey form in future to all SOT vessels	SOT, especially SOOPIP and ASAPP	
6	10.1 (vi)	Prepare their national reports in integrated form on this template, and submit these to the Secretariat by March each year	Ship operators	

VOSP members and VOS operators

	para	Action item	by	In conjunction with
1	3.2.5	Continue implementation of VOSClim and of improved instrumentation systems, ensuring homogeneity of the climate records	VOSClim project operators	VOS operators
2	6.1.4	Submit national updates of the PMO list to the Secretariat	VOS operators	Secretariat
3	III. 2.3	Use the recruitment/inspection form	VOS operators	
4	III. 3.1.3	Submit delayed mode data to the GCCs according to the agreed procedures	VOS operators	GCCs
5	III. 3.2.6	Ensure submission of national updates to WMO-No.47 with the correct information and correct format	VOS operators	Secretariat
6	III. 5.2.1	Try to arrange interaction with shipping companies at the national level, with a view to ensuring that automated and recommended sensors and communications facilities for meteorological and oceanographic purposes are installed on all new ships during construction	VOS operators	
7	III. 5.2.1	Arrange for tracking of the use of TURBO and similar software among national VOS	VOS operators	
8	III. 5.2.1	Make every effort to ensure that national services prepare, and QC, delayed mode observational data sets and submit these to the GCCs according to the WMO regulations	VOS operators	GCCs

	para	Action item	by	In conjunction with
9	III. 5.2.1	Where possible, arrange for national ship lists to be accessible, for reading and download, on national web sites	VOS operators	
10	III. 5.2.1	Ensure submission of national updates to No. 47 on a quarterly basis, with the correct information and in the correct format	VOS operators	
11	III. 5.2.1	Enhance automation of all aspects of shipboard procedures, from observation through to message transmission, using already available software and hardware wherever feasible	VOS operators	

SOOPIP members and SOO operators

	para	Action item	By	In conjunction with
1	IV. 1.1.13	Use the SOOP internet technical forum and upload useful information (e.g. instrument evaluation)	SOO operators	
2	IV. 1.2.4	Routinely provide the Coordinator with required information such as list of ships they operate or with the information on changes in ship recruitment	SOO operators	SOOP Coordinator
3	IV. 1.2.5	Provide the SOOP Coordinator with data/metadata to be used for computing sampling indicators for each line on a semestrial basis	SOO operators	SOOP Coordinator
4	IV. 1.2.5	Systematically and carefully check that information in the data they provide to the Coordinator	SOO operators	
5	IV. 1.2.7	Investigate the reason why USA did not provide the counts of duplicates in its input to the BATHY monthly report	Steve Cook	
6	IV. 2.3	Under the guidance of the SOOPIP chair, decide how to proceed and get as exact a picture of the situation (sampling assessment using a performance indicator) as possible	SOO operators	
7	IV. 2.4	Carefully check the number of transects achieved on each line, as well as the number of probes deployed	SOO operators	
8	IV. 2.4	Check the way the ships' crews were actually proceeding to probe deployments (especially regarding the periodicity of the deployments) and correct possible shortcomings through proper training	SOO operators	
9	IV. 2.5	Provide the technical coordinator with information regarding shipping lines potentially available for recruitment in the region related to Kenya	Ali Mafimbo	
10	IV. 2.8	Contribute data to the project of establishing the surface salinity network	SeaKeepers	
11	IV. 2.9	Keep track of possible developments in the field of sea surface current measurements and report on the topic at further panel's sessions, as necessary	SOO operators	
12	IV. 2.13	Install improved meteorological systems (such as the US IMET system) on-board ships ensuring high density XBT routes, as well as on ships equipped with pCO_2 measurement capability, or similar oceanographic sampling	SOO operators	
13	IV. 2.14	Consider adequately training and/or giving advice to PMOs with regard to greeting and servicing ships-of-opportunity	SOO operators	
14	IV. 3.5(I)	Advice of opportunities and implement further XBT/CTD comparisons in high latitudes wherever possible and provide data to NIO for analysis.	SOO operators	
15	IV. 3.5(ii)	Identify general opportunities and undertake XBT/CTD comparisons in the inter-sessional period and report results to the SOOPIP Chair and Technical Coordinator.	SOO operators	
16	IV. 3.5(iii)	Prepare guide to XBT/CTD evaluations to be placed on the web site.	Rick Bailey	Erriki Jarvinen
17	IV. 3.5(iv)	Make better use of the SOOP technical forum established by JCOMMOPS for the exchange of information on instrument and	SOO operators	

	para	Action item	By	In conjunction with
		procedures issues.		
18	IV. 3.5(v)	Take caution if considering using the Z-60-16-II and Z-60-16-III XBT recorders due to problems observed with measurements in the surface layers.	SOO operators	

ASAP members and ASAP vessels operators

	para	Action item	by	In conjunction with
1	V. 1.5.3	Continue the WRAP hopefully on y long-term basis	WRAP participants	
2	V. 1.5.3	Make use of the sounding log used on the WRAP vessel, as appropriate	ASAP operators	
3	V. 1.5.5	Undertake an initial feasibility study of the possibility of Constship vessels' participating in WRAP, covering ship recruitment and the availability of sounders, launchers and consumables and report the results to the panel chairman, hopefully within six months, for consideration for further action	Gordon Mackie	ASAP chair
4	V. 2.2	Report some results on development of a new deck launcher to SOT-II	USA	
5	V. 2.3	Investigate the possibilities for obtaining data during the sonde descent, following balloon burst, and to report on any results to the next session	ASAP operators	
6	V. 2.4	Update the list of operational ASAP ships	ASAP operators	
7	V.4.1.1 (ii).	Liaise with monitoring and NWP centres regarding ASAP impacts and quality	ASAP operators	
8	V.4.1.1 (iii)	Confirming support from EUMETNET for WRAP for years after 2002.	EUCOS Programme Manager	ASAP chair
9	V. 4.2.1	Submit ASAP annual national report using the revised format with the report information on system operators, e.g. ships crews, meteorological service personnel, etc.	ASAP operators	
10	V. 4.2.2	Provide the Secretariat with some new or updated illustrations for the ASAP brochure	ASAP operators	
11	V. 4.2.3	Publish an article on ASAP in the Mariners Weather Log (NOAA/NWS).	USA	
12	V. 4.2.3.	Make appropriate arrangements so that an ASAP article based on that in the Marine Observer might be prepared and proposed for publication in the Inmarsat journal Ocean Voice.	Gordon Mackie	Met Office (UK) Secretariat

Others

	para	Action item	by	In conjunction with
1	III. 1.1.2	Consider preparing the monthly monitoring report in a more use-friendly language	RSMC Bracknell	
2	III. 3.1.4	Inform the Secretariat when the MQCS software package was available and to distribute it upon request	GCCs,	
3	IV. 1.2.3	Continue to prepare the monitoring reports	GTSPP	SOOP Coordinator
4	IV. 2.15	Consider strong requirements for capacity building, more especially in data sparse areas more especially in data-sparse areas, where there was a need for local support to its activities	Capacity Building CG	SOO operators,
5	IV.	Provide regularly updated information on changes to production,	Manufactures	Manufactures

	para	Action item	by	In conjunction with
	3.5 (vi)	new products, etc.		
6	IV. 4.4(i)	Review the impact of the upgraded data stream at its upcoming meeting in Australia and devise a scheme to handle this data stream	GTSPP	
7	IV. 4.4(ii)	Review whether data QC procedures to be carried out on board ship can be applicable in the case where full resolution data was coming ashore	GTSPP	SOOPIP chair
8	IV. 4.4.(iii)	Consider the Australian scheme for unique data tags, to weigh it against proposals expected at the GTSPP meeting, to choose a solution and to implement this as soon as practical	GTSPP	
9	IV. 6.2.1	Seek written comments from OOPC in this respect, in order to be able to determine what action should be taken regarding the IOC Manuals and Guides series No.3.	Management Committee	
10	V. 1.1.3	Undertake a long assessment of MSG's new capabilities relevant to ASAP transmissions.	EUMETSAT	ASAP operators
11	V. 2.1	Continue investigating the problem with GPS wind measurements, including in strong winds., with a view to eventually proposing solutions.	Vaisala	ASAP operators
12	V.4.1.1	Continuation and enhancement of the ASAP monitoring	Météo-France	
13	10.1 (iii)	Review all existing data management plans regarding ship data, and if possible suggest ways of integrating these.	Data Management CG	
14	10.1 (iv)	Thinking of how to manage non-physical data, such as pCO_2, which would eventually be available from VOS, as well as to work on entraining the large numbers of existing data centres dealing with ship data into the JCOMM process.	Data Management CG	

Technical Coordinator

	para	Action item	by	In conjunction with
1	IV. 1.2.5	Define and compute sampling indicators (e.g. regularity of sampling, completeness of line sampling along the whole transect, adequate spacing between drops according to the type of line, adequate number of transects) for each line based upon the data/metadata provided by the SOOP participants on a semestrial basis	SOOP Coordinator	
2	IV. 2.3	Make proposals regarding possible performance indicators within a few weeks	SOOP Coordinator	
3	IV. 6.2.1	Review the status of the SOOP home page, of the Best Practices Guide and of SOOP Implementation Plans.	SOOP Coordinator.	SOOPIP Chair
4	10.1 (i)	After the completion of the work of the Task Team on JCOMMOPS, have JCOMMOPS act as focal point and information source for the SOT and publicise this role of in the science community, in conjunction with information on the SOT itself, its status and work	JCOMMOPS Coordinator	
5	10.1 (vi)	Include SOT national reports submitted by operators and complied by the Secretariat on the JCOMMOPS web site.	JCOMMOPS Coordinator	

Secretariat

	para	Action item	In conjunction with
1	5.1	Publish national reports presented to SOT-I as a JCOMM Technical Reports	Participants
2	II.1	Publish the full proceedings of the Scientific and Technical Workshop as a JCOMM Technical Report	
3	II.1	Organize a scientific and technical workshop in conjunction with the second session of the SOT	
4	6.1.4	Keep the list of "useful PMO contacts world-wide" updated	
5	6.1.6	Upgrade WMO guidance material dedicated to PMOs to include extensive guidance relating to both SOOP and ASAP operations as appropriate	chairs of SOOPIP and ASAPP
6	6.1.7 (iii)	Continue to work through organizations such as IMO and ICS to emphasise the value and applications of ship-based observations of all types	
7	6.1.12	Support the work of the Task Team on VOS Recruitment and Progamme Promotion and make their proposal available to the chairs of SOT and the panels. Prepare an appropriate document for SOT-II.	SOT and Panel chairs
8	6.2.11	Keep updating the review on satellite telecommunication facilities and make it available to SOT members and ship operators	David Meldrum
9	6.3.8	Circulate a detailed development plan for SOT coordination activities to be prepared by the Task Team on JCOMMOPS to SOT members for review, then submit documents to the Observations Coordination Group and to JCOMM Management Committee at its second session in early 2003	
10	III.1.1.2	Informally request RSMC Bracknell to prepare the monthly SHIP monitoring report in a more user-friendly language	
11	III.2.3	Make the ship recruitment/inspection and its instruction available to all VOS operators	
12	III.2.7	Submit a recommendation with regard to reporting original wind data without height correction for consideration at JCOMM-II, through the Observations Coordination Group and the Management Committee	VOSP chair, SOT chair, VOSClim Project Leader
13	III.3.1.4	Inform the Contributing Members when GCCs informed that the MQC software package was available and to distribute it upon request	
14	III.3.2.4	Make the updated electronic database of WMO-No.47 available as soon as possible	
15	III.3.2.5	Make arrangement to include digitized historical records of WMO-No.47 in the new electronic WMO database	SOC, NCDC
16	III.3.2.6	Send a formal letter to all the VOS operating Members requesting regular submission of national updates and copy it to PMO focal points and SOT members	
17	III.5.3.1	Make the VOS brochure available on the WMO web site, in pdf format, for download and use at the national level	
18	IV.5.3.1	Make necessary arrangement for SOOPIP contributions for 2002.	
19	V.1.5.3	Make necessary arrangements to formally engage Capt G.V. Mackie as a WRAP project Leader	
20	V.2.4	Circulate the existing list to ASAP operators for updating, with the new list to be disseminated in a forthcoming Operational Newsletter and in the 2002 Annual Report	ASAP operators
21	V.2.5	Reproduce the ASAP cost document in the 2001 Annual Report.	
22	V.3.2.1	Make necessary arrangement for ASAP and WRAP contributions for 2002	
23	V.4.2.1	Request ASAP operators to submit national annual report using the ASAP Annual Report Format to include information on system operators, e.g. ships crews, meteorological service personnel, etc. in the comment section	ASAP operators
24	V.4.2.2	Proceed with the finalization and publication of the revised ASAP brochure, using funds in the ASAP Trust Fund.	ASAPP members
25	V.4.2.3.	Contact Met Office (UK) so that an ASAP article based on that in the Marine Observer might be prepared and proposed for publication in the Inmarsat journal Ocean Voice	

	para	Action item	In conjunction with
26	V.4.2.3	Post the ASAP Annual Report on the WMO web site	
27	V.4.2.4	Publish a concise ASAP operations guide prepared by Gordon Mackie in the context of WRAP in the 2001 ASAP Annual Report	G. Mackie
28	10.1 (vi)	After SOT chair and panel chairs prepared a template for an annul SOT report, distribute it to all operators in the second half of each year	
29	10.1 (vi)	Compile submitted national report into ASAP annual report	
30	12.1	Help SOT chair prepare an overarching strategy and implementation plan for the SOT	Panel Chairs
31	13.1	Bring the agreed revisions of SOT terms of reference to the attention of (i) the Observations Coordination Group at its forthcoming session (La Jolla, 24-27 April 2002), for further review and endorsement; and (ii) the Management Committee, for its consideration on behalf of the Commission	SOT Chair
32	14.2	Together with the SOT chair, finalize dates and venue of SOT-II as soon as possible, and inform all concerned, to assist in planning participation	SOT Chair

List of Acronyms and Other Abbreviations

AIC	Argo Information Cerntre
Argo	Array for Real-time Geostrophic Oceanography programme
ASAP	Automated Shipboard Aerological Programme
ASAPP	Automated Shipboard Aerological Programme Panel
AST	Argo Science Team
BATHY	Bathythermograph report
BMRC	Bureau of Meteorology Research Centre (Australia)
BUFR	Binary Universal Form for Representation of Meteorological Data
BUOY	Report for Buoy Observations (GTS)
CAVASSO	Project for Atlantic VOS pCO_2 measurement
CBS	Commission for Basic Systems (WMO)
CIMO	Commission for Instruments and Methods of Observation (WMO)
CLIVAR	Climate Variability and Predictability (WCRP)
CLS	Collecte Localisation Satellites
CM	Contributing Member (MCSS)
CMM	Commission for Marine Meteorology (WMO)
CNRS	French National Centre for Scientific Research
CLIVAR OOP	CLIVAR Ocean Observations Panel
CREX	Character code for the Representation and Exchange of meteorological and other data
CSIRO	Commonwealth Scientific and Industrial Research Organization (Australia)
CTD	Conductivity-temperature-depth probe
DAC	Data Assembly Centre
DBCP	Data Buoy Cooperation Panel (WMO-IOC)
DMCG	Data management Coordination Group
ECMWF	European Centre for Medium-Range Weather Forecasting
EEZ	Exclusive Economic Zone
ETMC	Expert Team on Marine Climatology
EUCOS	EUMETNET Composite Observing System
EUMETNET	The Network of European Meteorological Services
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
GCC	Global Collecting Centre (for the MCSS)
GCOS	Global Climate Observing System
GODAE	Global Ocean Data Assimilation Experiment
GOOS	Global Ocean Observing System
GOOS/COOP	GOOS Coastal Ocean Observing Panel (GOOS)
GOS	Global Observing System (WWW)
GRIB	Processed data in the form of grid-point values expressed in binary form
GTS	Global Telecommunication System (WWW)
GTSPP	Global Temperature Salinity Profile Programme
ICSU	International Council for Science
IDCS	International Data Collection System
IFREMER	Institut Francais de Recherche pour l`Exploitation de la Mer
IGOSS	Integrated Global Ocean Services System
IMO	International Maritime Organization
IMSO	International Mobile Satellite Organization
INMARSAT	International MobileSatellite Organization
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IODE	International Data and Information Exchange (IOC)
MPDS	Mobile Packet Data Service
IRD	Instituit francais de recherche scientifique pour le dévelpment en coopération (ex ORSTOM)
JAFOOS	CSIRO/BMRC Joint Australian Facility for Ocean Observing System

JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
JCOMMOPS	JCOMM in situ Observing Platform Support Centre
JCOMMTRAN	JCOMM Transition Committee
JMA	Japan Meteorological Agency
JTA	Argos Joint Tariff Agreement
LDEO	Lamont-Doherty Earth Observatory
LES	Land Earth Station (Inmarsat)
MCSS	Marine Climatological Summaries Scheme
MEDS	Marine Environmental Data Service (Canada)
MPDS	mobile packet data service
MQCS	Minimum Quality Control Standards
MSG	METEOSAT Second ¨Generation
NCDC	National Climate Data Center (NOAA)
NCEP	National Centers for Environmental Prediction (NOAA)
NIES	National Institute for Environmental Studies (Japan)
NIO	National Institute of Oceanography (India)
NMS	National Meteorological Service
NOAA	National Oceanographic and Atmospheric Administration (USA)
NODC	National Oceanographic Data Centre
NWS	National Weather Service (NOAA)
OCG	Observations Coordination Group
ODAS	Ocean Data Acquisition Systems
OOPC	Ocean Observation Panel for Climate (of GOOS, GCOS, WCRP)
PMO	Port Meteorological Officer
QC	Quality Control
RIC	WMO Regional Instrument Centre
RM	Responsible Members (MCSS)
RTMC	Real Time Monitoring Center
RSMC	Regional Specialized Meteorological Centre
SCOR	Scientific Committee on Oceanic Research
SEAS	Shipboard Environmental Data Acquisition System (USA)
SGVOS	Subgroup on Voluntary Observing Ships (CMM)
SHIP	Report of Surface Observation from Sea Station
SOC	Southampton Oceanography Centre (U.K.)
SOO	Ship-of-Opportunity
SOOP	Ship-of-Opportunity Programme
SOOPOG	SOOP Operations Guide
SOOPIP	JCOMM Ship-of-Opportunity Programme Implementation Panel
SOT	Ship Observations Team
SSS	Sea Surface Salinity
SST	Sea Surface Temperature
SURFA	Surface Flux Analysis Project
TEMP-SHIP	Upper-level temperature, humidity and wind report from a sea station
TESAC	Temperature, Salinity and Current Report
TOGA	Tropical Ocean and Global Atmosphere (WCRP)
TOR	Terms of Reference
TRACKOB	Code for reporting marine surface observations along a ship's track
TSG	Thermosalinograph
TWXXPPC	TOGA/WOCE/ XBT XCTD Programme Planning Committee
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UOP	Upper Ocean Panel (CLIVAR)
UOT	Upper-Ocean Thermal Project (WOCE)
URL	Universal Resource Locator
VOS	Voluntary Observing Ship
VOSP	Voluntary Observing Shop Panel

VOSClim	Voluntary Observing Ships Climate Subset Project
VSOP-NA	VOS Special Observing Project-North Atlantic
WAVEOB	Report of Spectral Wave Data
WCP	World Climate Programme (WMO)
WCRP	World Climate Research Programme (WMO/IOC/ICSU)
WDC-A	World Data Center A
WGASF	Working Group on Air Sea Fluxes (JSC/SCOR)
WMO	World Meteorological Organization
WRAP	Worldwide Recurring ASAP Project
WWW	World Weather Watch (WMO)
XBT	Expendable Bathythermograph
XCTD	Expendable conductivity-temperature-depth probe

VOSCLIM

RECRUITMENT / UPDATE/ DERECRUITMENT ADVICE

Form 001

February 2002

Vessel Information

Vessel Name		Call sign	IMO Number	Recruiting Country	VOS Type	Auto-mation	Baseline check
1		2	3	4	9	10	11
Flag	**Home Port**	**Year of Construct.**	**Date of Recruitment /Derecruitment**		**Routes**		**3hr/6hr/Irreg**
					12		

Details of Ship's Manager		Details of Ship's Agent	
Name		**Name**	
Address		**Address**	
Email		**Email**	
Phone	**Fax**	**Phone**	**Fax**

Vessel Layout

Vessel Type
5
Gross Tonnage
t
Dist of bridge from bow
8 • m

Dimensions		
7 (a)	Length	• m
7 (b)	Breadth	• m
7 (c)	Freeboard	• m
7 (d)	Draught	• m
7 (e)	Cargo ht.*	• m

Digital Image	6

Location of observation points	
Height of barometer* :	15 • m.
Height of thermometers* :	23 • m.
Height of anemometer* :	30 • m.
Height of anemometer** :	31 • m.
Height of visual wind/wave observation point* :	38 • m.
Dist of anemometer (from bow) :	33 • m.
Dist of anemometer (from centre line) :	34 P/S • m.
Depth of sea surface temperature # :	28 • m.

* above maximum summer load line # below maximum summer load line
** above deck on which it is installed

Communications

Inmarsat	A B C …	
Inmarsat	A B C …	
Inmarsat	A B C …	
Inmarsat	A B C …	
Radio Telephone		
Mobile Telephone		

Email	
Facsimile	
Telex	
SEATEX	
Argos	

Equipment

Vessel Name

Instrument	Make	Owner	Type	Serial no.	Exposure	Location	Date in/last calibrated	Date Removed	National Use
Barometer	14		13			16 17-Units	18		
Barograph			29						
Screen						Port/Stbd/Midship			
Air Temperature	20		19		21	22 24-Units			
Wet Bulb/Humidity			25		26				
Sea Temperature			27						
Wind Speed			35			32 36-Usage	37		
Wind Direction			35						
Weather Radar			39						
Sea and Swell			39						
Sub Surface			39						
Upper Air Winds			39						
Upper Air Temps			39						
Rain Gauge			39						
Data Entry Terminal			39						
Data Entry Software				Version:					
Other									

Publications supplied to ship

- ☐ Marine Observers Handbook
- ☐ Meteorology for Mariners
- ☐ Cloud types for Observers
- ☐ Cloud Chart
- ☐ State of Sea Chart/Booklet
- ☐ NWS H/book No 1
- ☐ Ice Handbook

Footnotes:

Comments/Remedial Action:

Port Meteorological Officer

(Printed): _____ **(Signed):** _____ **Date:** _____ **Port:** _____

42 - dd/mm/yyyy

ASAP SOUNDING LOG

m.v.

Operator :

Voyage:

Year:

Ship					Start				End				
DDMMhh	Position		Course		Relative Wind		True Wind		Duration	Burst P	Burst Ht.	Sonde No.	Remarks
UTC	Lat	Long	Dir	Sp	Dir	Sp	Dir	Sp	Min	Mb	Km		Include time message sent

Please enter details of all balloon launches, including failures.