

Report on the
IOGOOS/JCOMM Western Indian Ocean XBT Training Workshop

Miramar, Goa, India

5-7 October, 2005

hosted by

**National Institute of Oceanography
Dona Paula, Goa – 403 004
India**

funded by

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1. Summary

The Indian Ocean Global Ocean Observing System/Joint Technical Commission for Oceanography and Marine Meteorology (IOGOOS/JCOMM) “Western Indian Ocean Expendable BathyThermograph (XBT) Training Workshop” was successfully initiated and organized by the National Institute of Oceanography (NIO), Goa, India and the US NOAA’s Office of Climate Observation (OCO) during 4-7 October 2005 for capacity building for XBT observations in the western Indian Ocean. The participants of the IOGOOS/JCOMM Western Indian Ocean XBT Training Workshop arrived in Goa on 3rd and 4th October. The participants stayed at Hotel Marriott, Miramar, Goa from 4th to 7th October. In the evening of 4th October 2005 a get-together was arranged in the Hotel Marriott, with all the participants. Before the meeting, a registration desk was opened and all the participants registered themselves and collected a workshop kit containing the workshop agenda, NIO annual report, brochures, an NIO’s publication booklet on ‘SAGAR’ and other regional tourist information brochures. A great deal of interaction was achieved among the participants including the Shipping and Customs officials from India. Dr. S.R. Shetye, Director, NIO was present at the meeting and interacted closely with the dignitaries and participants.

A total of 50 participants including 15 foreign nationals and 35 Indians attended the workshop. The foreign nationals were from US (2), Australia (2), South Africa (2), Sri Lanka (1), Malaysia (1), Indonesia (1), Seychelles Islands (1), Mauritius (2), China (1), Nigeria (1) and Kenya (1). The Indian participants included the representatives from the government departments such as the Department of Science and Technology (DST) (1), Department of Ocean Development (DOD) (1), Directorate of Naval Oceanography and Meteorology (DNOM)(1), National Center for Antarctic Ocean Research (NCAOR) (3), Shipping Corporation of India (SCI)(3), Directorate of Customs and Central Excise, Goa (2), NIO (17), Research Scholars and Project Assistants from NIO (15). The names and addresses of the participants were provided in the Annexures 3 and 4.

The Intergovernmental Oceanographic Commission (IOC), Paris supported the workshop with complete funding through its Regional Office in Perth, Australia. With the funding provided, the Shipboard Environmental (data) Acquisition System (SEAS) was procured for its demonstration at the workshop and its utilization on Western Indian Ocean XBT lines by the NIO personnel.

On 5th October 2005, the workshop was inaugurated in a traditional way by Dr. V.S.N. Murty, Chair of the Workshop, Dr. Sidney Thurston, National Oceanic and Atmospheric Administration (NOAA) Office of Climate Observation (OCO), US, Dr. Gary Meyers, Chair, Climate Variability/Global Ocean Observing System’s (CLIVAR/GOOS) Indian Ocean Panel (IOP) for Climate, Australia and Mr. Steven K. Cook, Chair, NOAA Ship of Opportunity Implementation Panel (SOOPIP), US. Subsequent sessions were devoted to

the scientific results from the XBT temperature measurements in the Indian Ocean along various shipping routes, and the R&D activities of the foreign participants' institutions. Presentations by the officials from the Shipping Corporation of India (SCI) and the Directorate of Customs and Central Excise, Goa, India focused on the shipping and customs procedures required for XBT measurements onboard merchant vessels steaming out of India.

The second day, 6th October, was devoted to the demonstration of SEAS to technical staff, project members and research scholars for hands on experience and to the XBT data quality control measures. In the latter half of the day participants visited NIO and attended the seminar at NIO's 'Cardium' by Dr. Gary Meyers on "*The years of El Nino, La Nina and interactions with the tropical Indian Ocean*". The NIO scientific staff, students and research scholars also attended the seminar.

The concluding session of the workshop was held on 7th October, and a draft 'Goa Plan of Action 2005' was proposed and presented by Dr. Sidney Thurston. This plan of action outlined specific milestones necessary to achieve the principal goal of the workshop which was to re-establish the western Indian Ocean XBT line IX-8 (Mumbai – Mauritius) recommended by the IOGOOS/CLIVAR Indian Ocean panel for Climate (IOP) and to present these observational results at the next IOC/WMO Ship Of Opportunity (SOOP) Meeting scheduled for approximately one year later in October, 2006.

Necessary supplementary information was provided in a total of 10 Annexures at the end. The annexures included 1) the workshop announcement, 2) workshop agenda, 3) list of foreign participants, 4) list of participants from India, 5) welcome address by the Chairman, 6) Opening Remarks from Dr. Sidney Thurston, NOAA Office of Climate Observation, 7) list of participants attended the SEAS demonstration, 8) the abstract of seminar by Dr. Gary Meyers, 9) the proposed draft 'Goa Plan of Action 2005' by Dr. Sidney Thurston and 10) SEAS Training Manual by Mr. Steven K. Cook.

2. Acknowledgements

The Chairman, the organizing committee members and the colleagues were thankful to Dr. S. R. Shetye, Director, NIO for his keen interest in hosting the workshop in Goa. They expressed their gratitude to the UNESCO's Intergovernmental Oceanographic Commission (IOC) for providing necessary funds to procure the SEAS unit and to meet the workshop logistics. The workshop was conducted under the regional bodies such as the Indian Ocean Global Ocean Observing System (IOGOOS) and the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM). Dr. Sidney Thurston, NOAA's OCO, Ms. Candyce Clark, IOC, Paris and Dr. William Erb, Director of the IOC Perth Regional Office, Australia coordinated well with the Chairman for the timely arrival

of funds to NIO. We were thankful to the participants from India and abroad for their participation and keen involvement in the proceedings of the workshop.

We were profusely thankful to the participation of officials from the Shipping Corporation of India (SCI), Mumbai and Chennai and the officials from the Directorate of Customs and Central Excise, Goa for their overwhelming interest and support for the XBT measurements onboard their merchant vessels. It is the hope of the participants that these Government of India Officials will continue to work closely with the scientific community for the fruitful observations of the Indian Ocean.

We are also thankful to the NIO purchase department personnel, Mr. Johnny Mascarnhas and his team, and Mr. Rommel Coelho and Mr. Jim Hannon, M/s Lockheed Sippicon Ltd., USA and the transportation agents M/s Mid-America in US and M/s Jeena & Co., in Goa for their fullest cooperation in the procurement and timely delivery of the SEAS unit to NIO for the successful demonstration and training. We thank Mr. Cook for assembling, configuring and testing the SEAS unit prior to shipment to NIO.

The Chairman of the workshop was thankful to his colleagues, Dr. S. Prasanna Kumar, Dr. Y.K. Somayajulu, Dr. V.V. Gopalakrishna, Dr. P.N. Muraleedharan, Mr. M.S.S. Sarma, Mr. Dasmond Gracias, Mr. Areef Sardar, Mr. C.M. Dias, Mr. Chitari, Mr. Shiek, Mr. R.L. Chavan for their cooperation and help rendered at various stages for the smooth organization of the workshop. Dr. Muralidharan and Mr. Gracias took excellent care of arranging lunch, dinner, boat cruises etc. The chairman was also thankful to Ms. Geeta Madasami and Ms. Leena Shirgaonkar for their finest secretarial assistance. Special thanks were due to Mr. Sanjay, the travel agent for arranging the Pre-Travel Advice to the foreign participants. The Chairman expressed his thanks to the Hotel Marriott management and the Hotel personnel, Mr. Pratyush Anand, for the excellent amenities provided for organizing the workshop.

3. Presentations at the Inaugural session

At the start of the formal invocation of the workshop, Dr. Prasanna Kumar, Deputy Director, NIO invited Dr. V.S.N. Murty, Chairman of the workshop, Dr. Sidney Thurston, Manager, Office of Climate Observation (OCO), NOAA, US, Dr. Gary Meyers, CSIRO, Hobart and Chairman, CLIVAR/GOOS Indian Ocean Panel for Climate, Mr. Steven K. Cook, Chairman, SOOPIP, NOAA, US to occupy the seats on the dais. This was followed by the floral presentations by young ladies. Dr. Murty gave the welcome address and invited participants of the “IOGOOS/JCOMM Western Indian Ocean Expendable Bathythermograph (XBT) Training Workshop” to Goa and to The Hotel Marriott, Miramar, Goa. The national invitees included the representatives of the Indian Organizations such as the NIO, National Center for Atmospheric and Oceanic Research (NCAOR), Department of Science and Technology (DST), Department of Ocean

Development (DOD), Directorate of Naval Oceanography and Meteorology (DNOM), Shipping Corporation of India (SCI), Directorate of Customs and Central Excise, Goa. The international participants were from US, Australia, South Africa, Malaysia, Indonesia, Sri Lanka, Seychelles Islands, Mauritius, Nigeria, Kenya and China. The Annexures 1 and 2 provide the necessary information on workshop announcement and the workshop agenda.

Dr. Sidney Thurston presented *an overview of the workshop* and the text of his presentation is given in Annexure 6. Dr. Thurston briefed a few of the ongoing and emerging partnerships in this part of the world between NOAA and regional Colleagues such as India, China, Indonesia and Japan. NOAA's Office of Climate Observation, the United Nations Framework Convention for Climate Change (UNFCCC), the Global Earth Observing System of Systems (GEOSS), WMO/IOC JCOMM Objectives & Priorities are now aligned and documented in the October 2004 Global Climate Observing System (GCOS) GCOS-92 Report. He informed the participants that the first GOOS milestone of 1,250 surface drifters deployed globally was achieved in September 2005 in Halifax Nova Scotia. A total of 4081 platforms are maintained globally and the U.S. supports 2315, of which the NOAA Office of Climate Observation supports 2148. With the Indian Ocean influencing the monsoons and climate variability in the region as well as possibly playing a role in the western United States precipitation patterns on decadal time scales, as well as the interaction between the Indian Ocean and Pacific Ocean *via* the Indonesian Throughflow and possible connection with El Nino, NOAA has been deploying drifting buoys, XBTs, Argo floats and tide gauges into the Indian Ocean region for years. At this stage, Dr. Thurston recalled the recent collaborative efforts between NIO, DOD and NOAA's Pacific Marine Environmental Laboratory (PMEL) for the deployment of 4 Atlas surface moorings and 1 sub-surface Acoustic Doppler Current Profiler (ADCP) mooring in the equatorial Indian Ocean from the Indian research vessel, the *ORV Sagar Kanya*. He has further expectations that this collaboration would continue and expand with Indian (NIO, NIOT, DOD/NCAOR, etc) and other regional institutions.

With regard to XBT measurements, Dr. Thurston pointed out the evolution from Broadcast XBT to High Density XBT Lines (HDX)/Frequently Repeated XBT Lines (FRX) mode as Argo comes online. Focusing now on the goal of this workshop and pointing out the global map of XBT lines, the western Indian Ocean is currently under sampled and the objective of this workshop is to remedy this revitalizing the dormant IX-8 XBT line and other high-priority XBT lines as determined by the IOGOOS/CLIVAR Indian Ocean Panel.

In conclusion, Dr. Thurston mentioned that NOAA had undertaken a major initiative to implement increased global ocean observations for GEOSS, and the UNFCCC via the GCOS Implementation Plan (GCOS-92), to include the Indian Ocean, and was looking forward to working closely with regional Institutes and other regional partners to provide

the needed global coverage for not only climate applications but other marine services and extreme events such as weather prediction, global and coastal ocean prediction, marine hazards warning, transportation, marine environment and ecosystem monitoring. Dr. Thurston concluded by thanking his audience and noting that there are many opportunities for fruitful Indian Ocean partnerships, NOAA seeks to engage with regional colleagues and we look forward to building this system together.

Following Dr. Thurston's presentation, **Dr. Gary Meyers** presented briefly on '*the XBT Network-an element of the sustained observing system in the Indian Ocean*'. Dr. Meyers started with the brief description of XBT and its different components, and the purpose of using of merchant ships for XBT observations was mainly due to the fact that these ships would cover nearly exactly repeated routes for long term measurements, cost effective of measurements, availability of volunteer observers, technical expertise and sea going people. The Indian Ocean Science Drivers are towards improved description, understanding and ability to predict seasonal monsoon, break-periods and ocean-interaction, Monsoon \Leftrightarrow ENSO Monsoon \Leftrightarrow Indian Ocean Dipole interactions and decadal variability and warming trends. Dr. Meyers further narrated the sustained, integrated Observing System (OS) consisting of XBT lines, Argo floats, surface drifters, biological sensors and Boundary arrays. He distinguished the need of XBT measurements from that of growing Argo floats deployment, the former serves the need to observe relatively small scale (50-100 km) features (e.g. boundary currents, upwelling zones, thermocline ridges and domes.), while Argo program caters the purpose of observing variations of basin-scale (>1000 km), decadal variation (e.g. change in subtropical gyre circulation.)

After Dr. Gary Meyer's presentation, the Chairman led the dignitaries on the dais to the traditional lamp to illuminate it. Then the Chairman declared the workshop was open for the sessions, scientific presentations and discussions, as per the workshop agenda (Annexure 2).

The inaugural function ended with a vote of thanks by Dr. Y. K. Somayajulu, Scientist, NIO, Goa.

Following the inauguration, **Dr. P. Sanjeeva Rao**, Representing the DST, presented the XBT observations in India – their origin, growth and sustainability as a major Ocean Observing System (OOS) in the Indian Ocean. The Indian TOGA (Tropical Oceans Global Atmosphere) was India's response from DST with full funding support for regular monitoring of the thermal structure along specified XBT lines in the Seas around Indian region:

- *Chennai (Madras) – Port Blair in the Bay of Bengal* (First sampling during mid 1990. About 2450 XBT profiles and 300 surface salinity samples were collected and analyzed)
- *Port Blair-Kolkata in the Bay of Bengal* (sampled at 3-monthly interval since 1991.

- About 1450 XBT profiles and 250 surface salinity samples were collected and analyzed).
- *Mumbai (Bombay) - Mauritius in the western Indian Ocean* (First XBT survey was undertaken during February 1992, at an interval of 4-months. About 500 XBT profiles and about 100 salinity samples were collected and analyzed)
 - *Chennai (Madras) - Singapore in the Bay of Bengal* (Observations along this line commenced during early 1995, sampled at 3-monthly intervals. About 500 XBT profiles and 250 salinity samples were obtained and analyzed)

XBT observational data was extensively used in understanding the ocean processes, the development/validation of various ocean models and also validated some of these models for studying the circulation features in the north Indian Ocean. Ships of opportunity were utilized to systematize the monitoring of upper ocean thermal structure using XBTs along the specified lines at 50 km interval close to the coast and 100 km in the open ocean. XBT observations also formed an important component of the Indian Climate Research Program's (ICRP) ocean-atmosphere field campaigns such as Bay of Bengal Monsoon Experiment (BOBMEX) and Arabian Sea Monsoon Experiment (ARMEX). Since 1997-98, the Integrated Indian Ocean Observing System (IIOOS) was evolved in India with the funding support from the Department of Ocean Development (DOD), with sustained XBT measurements as one of the observing system. About 300 XBT profiles were collected in the southern Ocean.

Dr. K. Somasundar, representing the DOD, presented a detailed account on the Ocean Observing System (OOS) in the northern Indian Ocean. Dr. Somasundar described the rationale for the observational network, covered wide variety of platforms that were in use and maintained by DOD in the Indian Ocean region. He also described the observational programs that were related to the national level and also international collaborations with the Indian institutions. The evolution of observational programs, their applications and utility of ocean data thus generated, the dissemination and exchange of information gathered through Global Telemetry System (GTS), Inmarsat/Argos in real time and Ocean portal for delayed mode data transfer, cost benefits of the observational network etc, were shown through a number of slides. Dr. Somasundar also presented some interesting results from the Argo data and moored buoy data, particularly with reference to extreme events such as cyclones. The various data products generated from the Argo program were also mentioned.

Mr. Steven Cook started his inaugural address with the broad JCOMM structure wherein SOOPIP is an activity related to oceans, and mentioned the Current SOOPIP Participants. The broader goals of SOOPIP are to 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.

Dr. Steven Cook put forward the future Plans of SOOPIP as 1) XBT Recorder intercomparison experiment – summer 2005, 2) NOAA (Hand & Auto-launcher), 3) CSIRO (Devil System), 4) SIO (Autolauncher), 5) Sippican (Hand launcher). The science drivers for the support of specific XBT Lines were based on the recommendations from “The Upper Ocean Thermal Network” paper published in the document “Observing the Oceans in the 21st. Century published in 2001. This document describes the scientific requirements and support needed on certain specific lines for

- ENSO Prediction.
- Tropical Ocean Variability and Prediction.
- Global and Regional Heat Storage.
- Transport and Circulation.
- Mid-high Latitude Variability.
- Ocean State Estimation and Model Testing.
- Climate Change.

Mr. Steven Cook further elaborated the issues concerning the Indian Ocean for XBT observations.

- Line support “Ownership”
- Logistical problems
- Shipping Companies and Agents
- Customs delays
- Shared expenses

What can SOOPIP do?

- NOAA has provided a pool of probes that can be used to partially support these lines.
- What can the SOOPIP community do to increase or initiated sampling along those lines that are presently being under sampled or not sampled at all?

Dr. Regina Folorunsho, Member of JCOMM Management Committee, Nigeria presented the JCOMM initiatives for the XBT observations in a detailed way starting with function of JCOMM, its global organization, its concerned program areas, XBT activities. The JCOMM, Joint Technical Commission for Oceanography and Marine Meteorology, is one

of the activities of the World Meteorological Organization/Intergovernmental Oceanographic Commission (WMO)/(IOC). The JCOMM provides international, intergovernmental coordination, regulation and management mechanism for operational oceanography and marine meteorological observations, data management and services system. One of the activities of global organization of JCOMM is its major focus on capacity building and implementation assistance for services.

JCOMM's Ships-of-Opportunity Programme (SOOP) is the most relevant to the present workshop. This SOOP has its primary goal to fulfill upper ocean data requirements from ships of opportunity (SOO). Its data management is taken care of through the Global Temperature Salinity Profile Programme (GTSP). The other types of measurements include pCO₂, phytoplankton concentration and collection of data using Thermosalinograph (TSG), Expendable Conductivity-Temperature-Depth probe (XCTD), Conductivity-Temperature-Depth probe (CTD), Acoustic Doppler Current Profiler (ADCP). JCOMM supports many other operational needs (e.g. fisheries, shipping, defense, etc.) through the provision of upper ocean data for data assimilation in models and for various other ocean analysis schemes.

JCOMM also puts in efforts to convince governments to provide funding to meet global implementation plan/targets and to the establishment of common fund (Trust Fund) for consumables. Dr. Regina showed a slide displaying the present XBT lines of High Density Lines (HDX), Frequently Repeated Lines (FRX) and Low Density Lines (LDX). As of December 2004, the number of sub-surface temperature profiles distributed via GTS from the global ocean under SOOP reached 18,253 from 1602 stations. Out of this number of profiles, the XBT temperature profiles distributed via GTS formed only 2061 from 40 platforms.

In conclusion, Dr. Regina intimated the participants that JCOMM considers XBT data as an important aspect to understanding global met-ocean processes and climate change and its activity has and will also address several important scientific goals, both for GOOS, CLIVAR and other MET- OCEAN programme, and the determination of JCOMM to support the XBT program.

4. Scientific presentations on the regional XBT programs

Dr. Gary Meyers in his address presented the scientific results along the IX01 (Perth – Java) and IX12 (Perth – Red Sea) XBT lines in the Indian Ocean, with which data he and his colleagues extensively worked. He discussed on two areas of research – the Indonesian Throughflow (IT) and Indian Ocean Dipole (IOD), their role, importance and variability. The IT transports warm water into the Indian Ocean near the equator and exits at the south end 10°C cooler. The heat gained by the equatorial Pacific is released to the atmosphere in the Indian sector. The 14 year long time series XBT data along IX01 gave a total transport

of $9.1 \times 10^6 \text{ m}^3/\text{s}$ with a transport weighted temperature of 19.7°C and salinity of 35.05. The corresponding values along PX2 (Singapore – Darwin) section are $8.8 \times 10^6 \text{ m}^3/\text{s}$, 18.1°C and 35.2. On the Indian Ocean SST dipole and wind, Dr. Meyers pointed out that since 1999 it was learnt that subsurface ocean dynamics plays a role in IOD, (upwelling, Rossby and Kelvin waves), and leads to a hypothesis on the mechanism of IOD growth. In general, XBT lines provide subsurface profiles through the most energetic areas and subsurface profiles are required for surface heat budget. The XBT lines IX01 and IX12 cross the cores of the major current systems – the South Equatorial Current (SEC), South Equatorial Counter Current (SECC) and Indonesian Throughflow (IT) and the zones of deeper thermocline in the Indian Ocean. Dr. Meyers also pointed out that the interannual standard deviation of temperature along these XBT lines was high in the depth range of 50 – 150 m. It was 2°C off Java coast and it was between 1.5° and 1.75°C in the central Indian Ocean. His examination of ocean-response to remote wind forcing highlighted the Pacific winds response on the Indonesian Throughflow and that of equatorial winds on the Java coastal upwelling region.

Dr. Lisa Cowen, Marine Operations Group, Australian Bureau of Meteorology, presented a detailed account on the Australian XBT SOOP which has its goals to sample the XBT lines according to the requirements determined by expert panels for GCOS/GOOS and complemented by national requirements, to provide timely and high quality upper-ocean thermal (UOT) data to support oceanographic research, climate analysis and research, defense and fisheries, and to meet agreed national and international obligations, and advance national interests in, and through the exchange of physical oceanographic data.

Dr Cowen described the status of the Australian XBT SOOP, including the real-time XBT data transmission. The data were sent via Argos and processed by CLS Argos. The number of transects covered and number of XBT profiles collected along the Frequently Repeated XBT lines (IX01), high density XBT lines (IX28, PX30, PX34) and Low density XBT lines (IX22, PX02) were also presented. Dr. Lisa also mentioned that both the Bureau of Meteorology and CSIRO would change to the latest software developed at CSIRO, called the Devil XBT system, in the coming years.

Dr. V.V. Gopalakrishna presented the XBT Observations in the Lakshadweep Sea. He began the presentation with the XBT lines being managed by NIO since 1992 with the funding from DST, New Delhi and subsequently by DOD, New Delhi. Dr. Gopalakrishna emphasized the recent progress of XBT observations for the national Indian Climate Research Program (ICRP), which Dr. Sanjeeva Rao described in his inaugural presentation. The XBT observations in the Lakshadweep Sea was part of the ICRP, wherein the sea surface salinity samples were also being collected regularly to understand the evolution of warm pool of the Laskhadweep Sea (Southeastern Arabian Sea). These specially designed XBT observations began from May 2002, and so far 668 XBT profiles and 1147 surface salinity samples were collected and analyzed. Dr. Gopalakrishna

emphasized the need of surface salinity samples and the important feature of subsurface temperature inversions in the Lakshadweep Sea during winter months. He described the evolution of surface circulation and westward propagation of temperature inversions in the study area. The remarkable drop in the sea surface salinity was reported between 1.7 and 3.4 during the winters of 2002, 2003 and 2004 and Dr. Gopalakrishna then discussed the associated dynamics and possible mechanisms for this observed surface salinity variation. One possible mechanism proposed was the large intrusion of more fresh water into Lakshadweep Sea during winter followed by a good monsoon.

Dr. Murty presented briefly the scientific results documented from the XBT observations along IX-08 (Mumbai – Mauritius) Shipping route carried out during 1992-1999. He highlighted the presence of the thermal front, as identified by the dome like structure, between 3°S and 8°S in the western Indian Ocean throughout the year. In some years, the front shifted equatorward during ENSO events. The westward volume transport associated with the South Equatorial Current (SEC) increased as a contribution of Indonesian Throughflow during the ENSO events. He opined further sustained XBT observations only would reveal the impact of ENSO on the western Indian Ocean thermal structure and the volume transport variability of SEC.

5. Presentations by the officials from Shipping Corporation of India and Customs and Central Excise

Capt. Praveen Kumar, the official representative from the Shipping Corporation of India, Mumbai, presented on the ‘Shipping procedures and clearances required onboard Merchant ships’. He described the various rules that are in force now and necessary procedures that should be followed for boarding the vessels for XBT observations. Capt. Kumar also provided a variety of hand-outs for all for the easy access to various proforma. He informed that the current Merchant Shipping Act (MSA) 1958 was the Governing instrument for regulation of merchant shipping in India. Under Section 100 of the MSA 1958 the Article Agreement was a legal document specifying the rights and duties of all persons engaged on board. The DG Shipping of India with its Order No. 7 of 2002 and of 3rd December 2002 revised the form for articles of Agreement and procedure for signing on, off etc. He stated that the revised procedures were in tune with international practices, catering to quick turn around of the vessels.

Signing on the Articles of Agreement (Details are as per Order no 7 of DGS) required

1. Valid Continuous Discharge Certificate.
2. Valid Passport (Ideally with six months validity).

The participants should have undergone basic courses prescribed in STCW 95 namely

1. Personal Survival Techniques.
2. Elementary First Aid.

3. Basic Fire Fighting

4. Personal safety and Social Responsibility.

He stressed that for all seafarers the medical fitness standards were very stringent and internationally applicable. Any person joining a Merchant vessel had to be medically fit as a minimum requirement (Copy of the medical examination format was given as hand out). He further stated that under section 456 Central Government of India was empowered to exempt or relax the application of the rules (Copy of the relevant section was given as hand out). The importance of risk and liability issues need to be addressed adequately prior to joining the vessel were highlighted. In the case of any eventuality involving diversions the stakes involved might be of very high financial value that had to be covered and provided for by the employers or the institutions. Capt. Kumar added that Individual Indemnity Bonds were not adequate for the risk and liabilities involved while sailing on merchant vessels (SAMPLE INDEMNITY BOND was given as hand out).

Following Capt. Kumar's presentation, Mr. Mukund Shinde presented the Indian customs procedures for handling and clearance of scientific equipment including the XBT probes.

6. Presentations on the R & D activities of participants' institutions

The session on the presentations continued after the lunch. At this session, the participants mostly presented the research activities at their respective institutes. However, they were open to collaborate with the international groups for the XBT and other ocean measurements.

Prof. Chris Reason, Dept of Oceanography, University of Cape Town, South Africa, presented South African research interests in the western Indian Ocean. He discussed collaborations of the University of Cape Town with NIOZ, KNMI & Utrecht concerning current meter moorings and XBT deployments in the SW Indian Ocean and with NOAA with regard to XBTs deployment in the Atlantic. The collaborative projects with the Dutch institutions are likely to be completed by 2007 whereas with that with NOAA is ongoing. In addition, as part of the Coelacanth project funded by the South African government, there are XBT and Argo float deployment opportunities from the *RV Algoa* in the Mozambique Channel, Comores and Kenyan regions in austral winter 2006-2008. He also pointed out that the potential SOPs were along Maersk Durban – Mauritius – Singapore and Durban – Mauritius – Fremantle Safmarine Durban – Comores; Durban – Mauritius; Durban – Madagascar; Durban – Dubai.

He also discussed the correlations between the Indian Ocean SST and Southern African rainfall with valuable illustrations. The necessity of seasonal forecast information relating to dry and wet spell occurrence, onset and end date of main rainy seasons to the farmers and other users was highlighted. His main conclusion was that designing an observing

system that monitors both tropical and mid-latitude South Indian Ocean areas (including XBTs) necessary to improve southern and East African climate prediction.

Dr. Mitrasen Bhikhajee, Director of Mauritius Oceanographic Institution (MOI) presented the various projects undertaken by the Institute, from the year of its establishment since January 2000. The policy statement of the MOI is to embark on scientific research in understanding the oceanic processes and facilitate harnessing resources for Mauritius from its legal maritime zones. Since this institute is established very recently, it has no established XBT observational program, however, the institute has already been involved in various national interest projects and some of them with international collaborations. Dr. Mitrasen asserts that his developing institute is open to collaborative research with the international organizations/institutes. Since many of the XBT lines in the southern Indian Ocean end at Mauritius, it is envisaged that there would be growing interest to enter into collaborations with the MOI in the coming years and as a developing Institute the MOI could cater the requirements.

Dr. Charles Magori, Dr. Rita, Mr. Xiang, Dr. Arulananthan, Mr. Roland Azemia, Mr. Ashok Paul made brief oral presentations about their activities in their respective institutes.

7. Demonstration of Shipboard Environmental (Data) Acquisition System (SEAS) by Mr. Steven K. Cook

The first half of the second day of the workshop was devoted to the SEAS demonstration and XBT data quality control (QC). **Mr. Steven Cook** gave a presentation on the SEAS and AMVER/SEAS 2000 to the participants at the Hotel Marriott. The actual demonstration of SEAS for hand on experience was conducted at NIO in the afternoon. There were 15 researchers and technical persons who specially attended the SEAS presentation lecture and demonstration. Mr. Steven Cook introduced the Automated Merchant Vessel Reporting program (AMVER)/Shipboard Environmental data Acquisition System (SEAS) 2000, its set up, operation, transmission and archive of the XBT data in a detailed way. The AMVER/SEAS 2000 was the improved version as it was based system to Windows, and provides a method for the “real-time” transmission of meteorological, oceanographic and AMVER messages from vessels at sea. This AMVER/SEAS could be used for:

- Synoptic Weather Observations.
- LDX & FSX Medium VOS handlaunch XBT's.
- AutoIMET – hourly transmissions.
- High Density XBT's using Auto Launchers.
- Other observations.

The procedures for the installation of the AMVER SEAS Software and hardware as well as other related issues were demonstrated to the participants. Mr. Cook also briefed the participants on the quality control procedures for SEAS data.

8. XBT data quality control procedures

Dr. Lisa Cowen presented the XBT data quality control techniques being practiced by CSIRO and Bureau of Meteorology. Dr. Cowen gave many examples of how XBT profile could be wrong and needed quality control, and the measures to be taken to improve such XBT profile. She answered a series of questions by the participants.

9. NIO visit and seminar by Dr. Gary Meyers in ‘Cardium’ at NIO

Though the workshop was devoted to the XBT measurements, Dr. Prabhu Desai and Dr. Antony Joseph, scientists from NIO wanted to share their latest research on the utility of cellular modem for real time data acquisition and transmission of sea level data from the tide gauges via internet, with the visiting participants from the developed and developing Indian Ocean rim countries. Dr. Antony made a brief presentation of his work at the NIO Cardium prior to the beginning of seminar by Dr. Gary Meyers. During his presentation, Dr. Antony discussed the merits of this net working system over the existing tide gauges along the coast and its major applications, particularly serving as an ‘Alert and Warning in the event of oceanogenic natural disasters. The present system provides the much needed capability for alert and warning in the event of oceanogenic disasters such as storm surges and tsunamis. Dr. Antony replied to some of the questions from participants.

Dr. Gary Meyers presented his seminar on his latest research work on the tropical Indian Ocean "The years of El Nino, La Nina and interactions with the tropical Indian Ocean". While elaborating his review on the Indian Ocean Zonal Dipole and its dependent/independent linkage to the of El Nino Southern Oscillation (ENSO), he proposed a method that identified when the positive or negative extrema of ENSO and Indian Ocean Dipole occurred, and used this method to classify each year from 1876 to 1999. The method was statistical in nature, but appeared to be a strong basis on the oceanic physical mechanisms that control variability of the near equatorial Indo-Pacific basin. He and his co-authors tested the sensitivity of the classification of years by calculating composite-maps of Indo-Pacific SST anomaly and probability of below median Australian rainfall for different categories of the El Nino-Dipole relationship. Finally, Dr. Gary Meyers pointed out that in order to describe, understand and predict ENSO and the dipole in the Indian Ocean, the CLIVAR/GOOS Indian Ocean Panel had prepared an implementation plan for sustained, basin-scale ocean observations that included the sustainable XBT measurements along many shipping routes in the Indian Ocean.

10. Concluding session and proposal of the ‘Goa Plan of Action 2005’ by Dr. Sidney Thurston.

The workshop concluding session began at the Marriott Hotel at 0900 hrs on 7 October. All members were asked to express themselves on the workshop proceedings and their suggestions. Starting the discussion, Dr. Sidney Thurston presented a draft “Goa Plan of Action 2005” and is given in Annexure 9. Dr. Thurston emphasized the requirement of 24000 XBTs in a year for a perfect deployment in the global oceans. As per the Goa Plan of Action 2005, plan, the organization of ‘Western Indian Ocean XBT Training Workshop, Goa, India’ and the shipment of SEAS equipment from IOC to NIO, to help revitalize IX-8 in the Western Indian Ocean, were completed. NOAA also proposed a series of additional milestones outlined in the “Goa Plan of Action 2005” with regard to the commencement of XBT observations along the Mumbai – Mauritius shipping route (IX-8) including supporting the Inmarsat Communications Costs for data transmission when SEAS was put to use, and shipping of 5 cases XBTs to NIO to support 50% of the XBTs for IX-8.

The future proposals of NOAA with regard to enhancement of the XBT observations in the Indian Ocean were presented in the “Goa Plan of Action 2005” and include the planned ‘Eastern Indian Ocean Capacity Building Workshop’, “Use of Ocean Observations to Enhance Sustainable Development”, Bali in early 2006, and a proposed follow-up on the ‘Western Indian Ocean Training and Capacity Building Workshop in Mauritius in June 2006’, and the SOOPIP Meeting at SOT-4, where the results of the revitalized IX-8 line will be presented along with other Indian Ocean XBT Lines in October 2006.

Some members expressed that the future workshops should cover a session on the XBT data analysis and techniques for the members who were not familiar with XBT measurements and their utility. The Chairman and the members felt that it was an important suggestion. Ms. Regina Folorunsho, the member of JCOMM from Nigeria suggested a 3-tier XBT training involving the use of SEAS software, Quality Control (QC) of XBT data and Data analysis techniques and further expressed her opinion that the advanced countries such as Australia, India and China should come forward to share their capabilities and facilities with the less developed nations of the Indian Ocean in ocean based research.

South African participants showed interest in maintaining the designated XBT lines in the tropical and southern Indian Ocean, and offered to help in looking for international funding support.

It was important to note that the participating members from South Africa, Sri Lanka, Mauritius and Kenya expressed their interest to establish collaborations with the NIO for

carrying out joint research and ocean observations, particularly XBT and others, in the Indian Ocean. This workshop was therefore quite successful in bringing together the participants from the Indian Ocean rim countries

11. Outcome/Recommendations from the workshop

After all the members expressed their suggestions, the Chairman replied to the proposal of the 'Goa Plan of Action 2005'. The Chairman appreciated the activities proposed for the action plan. The activities 1 and 2 were already completed. He, however, expressed immediate concern for the activities from 3 to 6. He informed the members that at present the XBT observational program along IX-8 (Mumbai – Mauritius) was discontinued for want of ships from Mumbai to Mauritius and the non-availability of funds. Resumption of XBT observations along IX-8 would have to be looked into afresh. The Chairman felt that one of the outcomes of this workshop is to put forward the recommendation by the members to the resumption of IX-8 XBT line for the sustainable XBT observations along this line that helps cover the equatorial and western Indian Ocean in the context of Indian Ocean climate and monsoon variability research. This recommendation would have to be intimated through the Director, NIO to the national funding agencies – the Department of Science and Technology (DST) and the Department of Ocean Development (DOD), along with a science plan in the form of a formal proposal. In general, the scientific proposal requests for 1) funding support for procurement of XBTs, 2) to cover travel costs for technical/scientific personnel to board the merchant vessels at the port of embarkation and return to the institute from the port of disembarkation and 3) the service costs towards the real time data transmission on the use of SEAS *via* GTS or inmarsat or internet etc. From the Shipping Corporation of India (SCI) participants, it was learnt that the most important issue appeared to be the resumption of ships along the IX-8 shipping route for a longer period either by the Shipping Corporation of India or other private liners, before submitting the scientific proposal to the appropriate national funding agency. The Chairman intimated that the personnel involved in the XBT measurements at NIO would have to do their best to liaison with the shipping companies (as that was done in the past), when there was information of resumption of ships along IX-8 for a longer period. The NIO personnel would also have to interact with the funding agencies with the timely submission of a project proposal on a long-term basis. Therefore, fixing of specific time frame for XBT measurements along IX-8 is entirely dependent upon the availability ships and the availability of full funding support to meet all the logistics from the national agencies. It is anticipated that progress in this area will be made after knowing from SCI about the availability of ships along IX-8 for scientific observations. This is expected to occur when NIO and SCI meet in December 2005, per the "Goa Plan Of Action 2005" milestone to successfully achieve the goals of this workshop.

Meanwhile, the participating member from Kenya pointed out about the availability of a regular cargo ship from Mombasa port to Mauritius port. This member and the Director of

Mauritius Institute of Oceanography (MIO) also expressed their interests to take up the XBT measurements along this shipping route in the western Indian Ocean. While there are a lot of other measures to be considered on this shipping route, the Chairman expressed that this was an excellent idea of considering this shipping route for sustainable XBT measurements in the western Indian Ocean. This matter could be taken up at the appropriate level by Dr. Gary Meyers, the Chairman, IOP for discussion with the IOP members, for the science plan of IOGOOS/CLIVAR.

Thus, the western Indian Ocean XBT training workshop was successful and concluded satisfactorily.

Annexure – 1

Announcement

International Workshop IOGOOS/JCOMM Western Indian Ocean Expendable Bathythermograph (XBT) Training Workshop

The National Institute of Oceanography (NIO), Goa, India is hosting an international workshop “IOGOOS/JCOMM Western Indian Ocean Expendable Bathythermograph (XBT) Training Workshop” during 5-7 October 2005 at Hotel Marriott, Miramar, Goa, India.

The UNESCO’s Intergovernmental Oceanographic Commission (IOC) is funding this event. We at NIO are in close coordination with the regional Indian Ocean Global Ocean Observing System (IOGOOS), the WMO/IOC Joint Technical Commission for Oceanography and Marine Meteorology’s (JCOMM) Ship of Opportunity Implementation Panel (SOOPIP), the CLIVAR/GOOS Indian Ocean Panel (IOP) and IOC Perth Regional Office.

Target Participants:

Operational Managers and Technical Support staff from regional (Indian Ocean) Expendable Bathythermograph (XBT) programs. Shipping agents, scientists, transportation officials, ship crews, port ship greeters, Port Meteorological Officers (PMO) and other personnel will be trained in logistical and implementation topics such as receiving XBT shipments, facilitating their clearance through customs, delivering the shipment to the appropriate in-country agency and then forwarding it to ports for deployment, coordinating with port authorities, installing equipment on ships, XBT deployment, SEAS Training and other operations and logistics related to XBT operations.

Goals of the Workshop:

To build the very much needed regional capacity to enhance XBT observations in the sparsely sampled western Indian Ocean and to ensure that these operations are sustained
Reestablish XBT line route IX-08 (Mumbai and Mauritius),
Reestablish XBT line route IX-06 (Mauritius to Malacca Straits),
Reestablish XBT line route IX-21 (Cape of Good Hope to Mauritius),
Reestablish XBT line route IX-15 (Fremantle to Mauritius),
Provide SEAS (Shipboard Environmental (data) Acquisition Systems) unit training for regional technical support staff.
Develop logistical support procedures including the import of scientific instrumentation into country(s).

Develop recruiting procedures for Voluntary Observing Ships.

It is expected that this workshop will significantly enhance in-situ ocean observations in the sparsely sampled Western Indian Ocean, provide complementary data to that currently being provided by Argo floats and other existing and planned in-situ networks, fill an existing gap for the “Global Earth Observation System of Systems (GEOSS)” ten-year implementation plan, and build the desperately needed regional capacity to ensure that these XBT operations are sustained in the Western Indian Ocean.

Dr. V.S.N. Murty,
Chair, WIO XBT Workshop

Organizing Committee

1. V.S.N. Murty	-NIO, Chair	vsnmurty@darya.nio.org
2. V.V. Gopalakrishna	-NIO	gopal@darya.nio.org
3. T. Srinivasa Kumar	-IOGOOS Secretariat	srinivas@incois.gov.in
4. William Erb	-IOC Perth Regional Office	w.erb@bom.gov.au
5. Gary Meyers	-CSIRIO, Chair, IOP	gary.meyers@csiro.au
6. Steve Cook	-NOAA, Chair SOOPIP	steven.cook@noaa.gov
7. Clark Candyce	-NOAA, JCOMM, Paris	c.clark@unesco.org
8. Sidney W. Thurston	-NOAA OCO	Sidney.thurston@noaa.gov

Annexure - 2

Workshop Agenda

- 4 October 2005 - Arrival of participants at Hotel Marriott, Goa
4 October 2005 1900-2130 - Ice-breaker meeting at Hotel Marriott

Workshop Venue : Hotel Marriott, Miramar, Goa

Day 1: 5 October 2005

- 0930 – 0940 Welcome to the invitees – Chairman – *V.S.N. Murty, NIO*
0940 – 0950 Opening remarks – *Sidney Thurston, NOAA*
0950 – 1000 XBT observations in Indian Ocean – IOP Chair – *Gary Meyers, CSIRO*
1000 – 1010 XBT observations: Indian initiatives - *P. Sanjeeva Rao, DST, New Delhi*
1020 – 1030 Ocean Observing System in the northern Indian Ocean: Indian Perspective - *K. Somasundar, DOD New Delhi*
1030 – 1040 SOOPIP, Chair - *Steven Cook*
1040 - 1050 JCOMM Initiatives - *Regina Folorunsho*
- 1100 – 1130 Tea break
- 1130 – 1140 Introduction of the invitees from the Shipping Corporation of India (SCI), Customs, Private Shipping Personnel, Indian Navy
- 1140 – 1210 XBT observations in the Indian Ocean: Scientific results along Perth – Red Sea route and Australia – Java Routes
– *Gary Meyers*
- 1210 – 1225 XBT observations in the IO: Scientific results of Lakshadweep Sea
– *VV Gopalakrishna*
- 1225 – 1240 XBT observations in the IO (IX-08): Scientific results along Mumbai – Mauritius shipping route
– *VSN Murty*
- 1240 - 1250 XBT observations in the IO (IX-22, PX-02): Summary of Australian efforts
- *Lisa Cowen*
- 1250 - 1300 South African's interests and plans in the western Indian Ocean
- *Chris Reason*
- 1300 – 1430 Lunch
- 1430 - 1450 Presentation by Mr. Mukund Shinde, Customs Appraisal, Goa
1450 - 1510 Presentation by Capt. Praveen Kumar, Official from Shipping Corporation of India, Mumbai

1510- 1530 Discussion

1530 – 1600 Tea Break

1610 – 1620 R&D activities of the Kenya Marine Fisheries & Research Institute (KMFRI) and their possible plans of XBT observations in the IO
- *Charles Magori*

1620 – 1640 Present and Planned research activities of NARA, Sri Lanka in the IO
- *Arulananthan*

1640 – 1650 XBT observations in the IO: Activities at the First Institute of Oceanography (FIO), Qingdao, China
- *Baoquiang Xiang*

1650 – 1700 XBT observations in the eastern Indonesia and research activities of the Center for Maritime and Fisheries Research, Indonesia
- *Anastasia Rita Tisiana Dwi Kuswardani*

1700 – 1710 Research activities at Mauritius Oceanographic Institute (MOI)
- *Mitrasen Bhikajee*

1710 – 1720 Marine activities at Mauritius Marine Meteorological Section
- *Ashok Gopaul*

1720 - 1730 Fisheries Research activities in the Republic of Seychelles
- *Roland Azemia*

1900 – 2100 Dinner

Day 2: 6 October 2005

0930 – 1100 Demonstration and training on AMVER/SEAS 2000 System to the invitees and NIO research students
- *Steve Cook*

1100 – 1130 Tea break

1130 – 1220 Quality Control of XBT data, Procedures from the Australian Bureau of Meteorology, the CSIRO Cookbook and GTSP
- *Lisa Cowen*

1220 – 1230 XBT observations in the Southern Indian Ocean
- *Anil Kumar*

1230 – 1330 Lunch

1430 – 1530 Visit to NIO

1530 – 1600 Tea break

1600 – 1700 Seminar by Gary Meyers at NIO ‘ Cardium’

1700 Back to Hotel

1830 – 2100 Boat cruise in the Mandovi Estuary and onboard Dinner

Day 3: 7 October 2005

0900 – 1030 Workshop concluding session and discussion on report preparation

1030 – 1100 Tea Break

1100 - 1130 Concluding and Vote of Thanks

1130 onwards: Lunch and Departure of participants

Annexure – 3

List of foreign Participants to the workshop

Sl. No.	Name, affiliation and addresses of foreign participants
1.	<p>Dr. Sidney Walter Thurston III Office of Climate Observation, NOAA 1100 Wayne Avenue, Suite 1210 Silver Spring, Maryland 20910 USA Tel. No. +1 301 427 2329 Fax No. +1 301 427 0033 e-mail: Sidney.Thurston@noaa.gov</p>
2.	<p>Mr. Steven Kenneth Cook NOAA, OAR, AOML GOOS Center 8604 La Jolla Shores Dr. La Jolla, CA 92037 USA Voice: 858-546-7103 Fax: 858-546-7185 Email: Steven.Cook@noaa.gov</p>
3.	<p>Dr. Gary Albert Meyers CLIVAR/IOC Indian Ocean Panel - Chair CSIRO Marine and Atmospheric Research P.O. Box 1538, Hobart TAS 7001, Australia e-mail: Gary.Meyers@csiro.au</p>
4.	<p>Dr Regina Folorunsho Nigerian Institute for Oceanography and Marine Research PMB 12729 Victoria Island LAGOS Nigeria Telephone: +234-1 2619517 Telefax: +234-1 261 9517, 262 9738 e-mail: niomr@linkserve.com.ng e-mail: rfolorunsho@yahoo.com</p>
5.	<p>Dr. Alui Bin Bahari Director of Marine Meteorology and Oceanography Malaysian Meteorological Department.</p>

	<p>Jalan Sultan 46667 PETALING JAYA Malaysia Tel: 603 - 7967 8080 Fax: 603 - 7957 8046 e-mail: alui@kjc.gov.my</p>
6.	<p>Ms. Anastasia Rita Tisiana Dwi Kuswardani Research Center for Maritime Territories and Non-living Resources Agency for Marine and Fisheries Research Jl. M.T. Haryono Kav 52-53 Jakarta 12770 Phone : +62-21-79180303 ext 2368 Fax : +62-21-79191202 e-mail: tisiana@lycos.com</p>
7.	<p>Dr. K. Arulanathan, Head of the Oceanography Division National Aquatic Resources Research & Development Agency Crow Island., Colombo 15. Sri Lanka TP : 0094-11-2521008 (Office) FAX: 0094-11-2521932 e-mail: arul@nara.ac.lk</p>
8.	<p>Mr. Ashok Gopaul Principal Meteorological Technician Head Marine Meteorology Section Mauritius Meteorological Services Mauritius Fax No. 230 686 1033 e-mail: mauritius meteorological services</p>
9.	<p>Dr. Charles Magori Research Scientist Kenya Marine & Fisheries Research Institute P.O. Box 81651 Mombassa 80100 Kenya Tel: +254 722 475565 Fax: +254 41 475157 e-mail: cmagori@kmfri.co.ke e-mail: cmagori@yahoo.com</p>

10.	<p>Dr. Christopher James Charles Reason Oceanography Department University of Cape Town Private Bag Rondebosch 7701 South Africa e-mail: cjr@egs.uct.ac.za tel 27-21-650-5311 fax 27-21-650-3979</p>
11.	<p>Dr. Juliet Clair Hermes Oceanography Department University of Cape Town Private Bag Rondebosch 7701 South Africa e-mail: cjr@egs.uct.ac.za e-mail: jhermes@ocean.uct.ac.za Tel 27-21-650-5311 Fax 27-21-650-3979</p>
12.	<p>Dr. Lisa Cowen Bureau of Meteorology Marine Operations Group GPO Box 1289 Melbourne, VIC 3001 Australia Tel: +61 3 9669 4155 Fax: +61 3 9669 4168 Email: l.cowen@bom.gov.au</p>
13.	<p>Dr. Mitrasen Bhikajee Mauritius Oceanography Institute France Centre, Victoria Avenue Quatre Bornes Mauritius Tel: +230 427-4432 (office) Fax: +230 427-4433 e-mail: moi@intnet.mu</p>
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15.	<p>Mr. Baoqiang Xiang The First Institute of Oceanography State Oceanic Administration P. R. China No. 6 Xian-Xia-Ling Road, Qingdao 266061 Tel: 86-532-88960702 Fax: 86-532-88967403 e-mail: xiangbq@fio.org.cn</p>

Annexure 4

Indian Participants (including the LOC members)

Sl. No.	Name of the Invitee	Institution/Organization
1.	Dr.S.R.Shetye, Director Phone.+91-(0)832-2450 201 Fax +91-(0)832-2450 602 shetye@darya.nio.org	National Institute of Oceanography Dona Paula, Goa – 403 004, India
2.	Dr. V.S.N. Murty Chairman of the Workshop Phone.+91-(0)832-2450 460 Fax +91-(0)832-2450 608 vsnmurty@darya.nio.org	NIO
3	Dr. V.V. Gopalakrishana Scientist gopal@darya.nio.org	NIO
4.	Dr. N. B. Bhosle, Scientist bhosle@darya.nio.org	NIO
5.	Dr. M.D. Rajagopal Scientist rgopal@darya.nio.org	NIO
6	Dr. R.G. Prabhu Desai Scientist prabhu@darya.nio.org	NIO
7.	Dr. Y.K.Somayajulu Scientist yksoma@darya.nio.org	NIO
8.	Dr. S. Prasanna Kumar Scientist prasanna@darya.nio.org	NIO
9	Mr. M.S.S.Sarma Scientist msarma@darya.nio.org	NIO
10.	Mr. P.N.Muralidharan Scientist murali@darya.nio.org	NIO
11.	Mr. Dasmond Gracias, Technical Officer dasmond@darya.nio.org	NIO

12.	Mr. Areef Sardar, Technical Officer areef@darya.nio.org	NIO
13.	Mr. Jonney Maschernas, Dy. Stores and Purchase Officer johnny@darya.nio.org	NIO
14	Mr. C.M.Dais, Finance and Accounts Officer cmdias@darya.nio.org	NIO
15	Mr. A. Muthkrishnan, Controller of Administration krishnan@darya.nio.org	NIO
16.	Mr. Suresh Pant, Stores and Purchase Officer	NIO
17	Dr. P. Sanjeeva Rao, Director psrao@alpha.ren.nic.in	Earth Sciences Division Department of Science & Technology (DST) Technology Bhavan New Meharuli Road New Delhi
18	Dr. K. Somasundar, Scientist somasundar@ren.nic.in	Department of Ocean Development (DOD), Mahasagar Bhavan Block -12, C.G.O. Complex Lodi Road New Delhi
19	Cmdr. M. Sarangapani	INS Hamsa, Indian Navy Vasco-da-Gama Goa
20	Dr. Shailesh M. Pednekar, Scientist shailesh@ncaor.org	National Center for Antarctic and Ocean Research (NCAOR), Department of Ocean Development (DOD) Headland Sada, Vasco-da-Gama Goa

21	Dr. Anil Kumar, Scientist anil@ncaor.org	NCAOR
22	Dr. Alvarinho J. Luis, Scientist ajluis@ncaor.org	NCAOR
23	Mr. Raju Arumugam, Manager	Shipping Corporation of India (SCI), Chennai
24.	Mr. Jagadish Narayana Rao, Manager	SCI
25.	Capt. Praveen Kumar, Manager	Shipping Corporation of India (SCI), Mumbai
26.	Mr. Mario Furtadao, Customs Agent	Customs Building Marmugoa Harbour Vasco-da-Gama, Goa
27	Mr. Mukund Shindge, Customs Appraiser	Customs Building Marmugoa Harbour Vasco-da-Gama, Goa

Annexure 5

Welcome address by the Chairman

It is indeed an honour for me to be the Chairman of this international workshop on the “IOGOOS/JCOMM Western Indian Ocean Expendable Bathythermograph (XBT) Training Workshop” for organizing and also inaugurating this international workshop at The Hotel Marriott, Miramar, Goa. On behalf of the Director of NIO and my own behalf, it is my immense pleasure to welcome Dr. Sidney Thurston, Manager, Office of Climate Observation (OCO) Program, NOAA, US, Dr. Gary Meyers, CSIRO, Hobart and Chairman, CLIVAR/GOOS Indian Ocean Panel, Dr. Steven Cook, Chairman, SOOPIP, NOAA, US and all the invitees from the Indian Organizations such as the NIO, NCAOR, DST, DOD, DNOM (Indian Navy), SCI, Customs and Central Excise.

I especially welcome the invitees who have come all the way traveling from the Indian Ocean rim countries such as Australia, South Africa, Malaysia, Indonesia, Sri Lanka, Seychelles Islands, Mauritius, Nigeria and Kenya and from China.

The NIO has been in close coordination with the regional Indian Ocean Global Ocean Observing System (IOGOOS), the WMO/IOC Joint Technical Commission for Oceanography and Marine Meteorology’s (JCOMM) Ship of Opportunity Implementation Panel (SOOPIP), the CLIVAR/GOOS Indian Ocean Panel and IOC Perth Regional Office.

The participants in this workshop do cover the Operational Managers and Technical Support staff from regional (Indian Ocean) Expendable Bathythermograph (XBT) programmes, shipping agents, scientists, custom officials and research students. During the workshop, the participants will be trained in various aspects dealing with the XBT temperature measurements, XBT data quality control measures, and also will be trained to the use of specially procured Shipborne Environmental (data) Acquisition System (SEAS).

It is expected that the presentations by the invitees and demonstration of the SEAS would help the invitees to learn more about the XBT measurements, and would enhance the very much needed regional capacity to ensure that the XBT operations are sustained in the Western Indian Ocean.

Once again I welcome you all to Goa and to the workshop.

Annexure 6

Opening Remarks by Dr. Sidney Thurston, NOAA Office of Climate Observation.

Thank you Dr. Murty, Mr. Chairman, Dr. Gary Meyers, Chair of the Indian Ocean Panel, Dr. Steven Cook, Chair of the Ship of Opportunity Implementation Panel, Dear Colleagues, it is a distinct privilege and honor for me to be with you this week in beautiful Goa, India to coordinate XBT operations for the Western Indian Ocean. As we get started I would first like to recognize and thank Dr. Murty, Dr. Shetye and Dr. Gopalakrishna and the Local Organizing Committee for their truly outstanding hospitality and fine arrangements. Thank you all for traveling long distances away from your Families and homes so that we may meet personally this week to come to a common understanding. With all of our modern information technology today, there is still no substitute for personal relationships.

Science and technology are giving us a remarkable capability to observe and, with the resulting observations, understand the Earth as a system. Today there is an unprecedented convergence of sophisticated platform and sensor technology, super-computing horsepower and communication throughput. This scientific understanding in turn provides us with a means to enhance our operational predictive capabilities to meet a variety of pressing societal needs. All this begins with Observations, the first step in the scientific process. As many of you know, there is a new framework for sustaining Earth Observations; the Global Earth Observation System of Systems (GEOSS). GEOSS is not just about making observations but also about applying this information for benefits to society such as mitigating natural disasters, improving weather forecasts and warnings, monitoring climate change, protecting human life, managing fisheries, and exploring the oceans – just to name a few. All of this begins with observations and their importance is now recognized by world leaders through the GEOSS Initiative. Just two months ago in Scotland, the members of the G-8 welcomed the adoption of the GEOSS 10-year Implementation Plan in their “G-8 Glen Eagles Plan of Action”. We at NOAA are excited about the prospects that, for the first time in the history of civilization, the global scientific community is on the cusp of having the capability to observe nature on nature’s scales.

The United States Contribution to GEOSS is the Integrated Earth Observation System (IEOS). IEOS will meet our Country’s needs for high-quality, global and sustained information on the state of the earth for policy decisions makers in every sector of our society. The U.S. ocean contribution to IEOS and GEOSS will be the Integrated Ocean Observing System (IOOS) which will have coastal components and a global component. The NOAA Office of Climate Observation (OCO) is tasked with the implementation and management of the IOOS Global component.

The Mission of OCO is to Build and sustain a global climate observing system that will respond to the long-term observational requirements of the operational forecast centers,

international research programs, and major scientific assessments. The OCO Objectives are to: 1) Document long term trends in sea level change, 2) Document ocean carbon sources and sinks, 3) Document the ocean's storage and global transport of heat and fresh water and 4) Document the ocean-atmosphere exchange of heat and fresh water. With this mission and objectives, OCO was established to manage the implementation of NOAA's in-situ, operational ocean observations for climate to include: the Tropical Atmosphere Ocean (TAO) Array of moorings in the equatorial Pacific, the Global Surface Drifters Array, the Global Sea Level Network, Volunteer observing ships, the Global XBT Network, the Global Carbon and Hydrographic Surveys and Ocean Reference Stations.

Annexure – 7

List of participants attended the SEAS unit demonstration

Sl. No.	Name of participant	Designation	E-mail ID
1	Mr. Anselam Almeida	Technical Officer	anselm@nio.org
2	Mr. R. J. K. Charyulu	Scientist E II	charyulu@nio.org
3	Mr. S. Murali Krishna	Project Assistant	oceanographer@rediffmail.com
4	Mr. P.S.V. Jagdeesh	Project Assistant	vjagadeesh@nio.org
5	Mr. Nagraju	Project Assistant	Ocean_raju@yahoo.co.uk
6	Mr. Nuncio Murukesh	Research fellow	nuncio@nio.org
7	Ms. Jayu V. Narvekar	Research fellow	jnarvekar@nio.org
8	Ms. M. Deepthi	Project Assistant	Deepthi_oceans@yahoo.co.in
9	Ms. Nisha Kurian	Project Assistant	neeshakurian@gmail.com
10	Mr. Gourish Salgaonkar	Project Assistant	gsalgaonkar@nio.org
11	Ms. Leena Shirgaonkar	Project Assistant	l_shirgaonkar@yahoo.co.in
12	Ms. Madhumita Tripathy	Student	madhumitageo@rediffmail.com
13	Mr. Mohammad Alsafani	Research Fellow	alsafany@nio.org
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15	Mr. Anness Kumar	Research Fellow	aneeshkumar@email.com

Annexure 8

Seminar by Dr. Gary Meyers

Title: "The years of El Nino, La Nina and interactions with the tropical Indian Ocean"

Abstract

The Indian Ocean Zonal Dipole is a mode of variability in sea surface temperature that seriously affects the climate of many nations around the Indian Ocean rim, as well as the global climate system. It has been the subject of increasing research, and sometimes scientific debate concerning its existence/non-existence and dependence/independence of El Nino Southern Oscillation, since it was first clearly identified in Nature in 1999. Much of the debate occurred because people did not agree on what years are the El Nino or La Nina years, not to mention the newly defined years of the positive or negative Dipole. We propose a method that identifies when the positive or negative extrema of El Nino Southern Oscillation and Indian Ocean Dipole occur, and use the method to classify each year from 1876 to 1999. The method is statistical in nature, but has a strong basis on the oceanic physical mechanisms that control variability of the near equatorial Indo-Pacific basin. Early in the study we found that some years cannot be clearly classified for a variety of reasons, and these years also must be recognized, with the reason for their ambiguity. We test the sensitivity of the classification of years by calculating composite-maps of Indo-Pacific SST anomaly and probability of below median Australian rainfall for different categories of the El Nino-Dipole relationship. Finally, in order to describe, understand and predict ENSO and the dipole in the Indian Ocean, the CLIVAR/GOOS Indian Ocean Panel has prepared an implementation plan for sustained, basin-scale ocean observations.

Annexure 9

Following are the proposed milestones by Dr. Sidney Thurston for the ‘Goa Plan of Action 2005’

1. October, 2005: Western Indian Ocean XBT Training Workshop, Goa India
2. October, 2005: IOC Provides NIO With SEAS Equipment, NOAA Provides SEAS Training and Inmarsat Communications Costs when SEAS is operationally contributing to a revitalized IX-8 XBT Line.
3. November, 2005: NOAA Commences Shipping of 5 Cases of XBTs to NIO to Support 50% of IX-8 and notifies Goa customs to expect Shipment
4. December, 2005: NIO Convenes Meeting with SCI in Goa “The Next Generation of Indian Ocean Observations”
5. January, 2006: IX-8 Ship Identified, Logistical Arrangements Commenced
6. January, 2006: NOAA’s 5 Cases of XBTs arrive at NIO to Support 50% of IX-8
7. March, 2006: Eastern Indian Ocean Capacity Building Workshop, “Use of Ocean Observations to Enhance Sustainable Development”, Bali
8. April, 2006: IX-8 Operational, Unrestricted Data Available in Real-Time Over GTS and the Internet
9. June, 2006: Follow-up Western Indian Ocean Training and Capacity Building Workshop in Mauritius
10. October 2006: SOOPIP Meeting at SOT-4, IX-8 Results Presented along with Other Indian Ocean XBT Lines

Annexure -10

Operating SEAS2000 Hand Launch Only – System Ver 1.0

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1.) Amver Seas Hardware

Hardware List:

Power:

- 240 VAC appropriate power leads and strips. Equipment below needs 7 outlets. Use an 8 outlet power strip or a 6 outlet strip and the power outlet on the Thrane & Thrane power converter.
- Plug adaptor(s). Appropriate power cords, depending on type of strip used.
- Cheater plug to float off of ships ground – use cheater plug on power strip so all equipment is floated
- Ground wire - From Connector Box or Hand Launcher to hull (use handy porthole window screw).
- 2nd Ground wire - connect hull ground to ground screw on Thrane & Thrane. See Figure 2

Computer:

- Shuttle computer.
- Shuttle Flat screen Monitor.
- Keyboard.
- Mouse.

MK21:

- MK21 card in powered USB Enclosure.
- Connector Box Used for MK21.
- Hand Launcher.
- MK21 Cable – Connector Box to MK21 USB Box.
- Cable - Connector Box to Hand Launcher.

Transmitter and GPS:

- Thrane & Thrane Transceiver with Antennae & power adaptor (extra power port here).
- Serial Cable – Thrane & Thrane to P.C. – COM1.

Data Storage:

- USB Micro Drive – 512MB is a good size for backing up data or transferring files. Do not leave it in the USB port – it can offset XBT data. Plug it in to the powered hub (if available) to be safer.
- Blank CD's for backups.

Software:

- WinMK21 for Windows.
- NOAA AmverSeas.
- Cap Sat - Thrane and Thrane Software.
- Easy Mail Software.

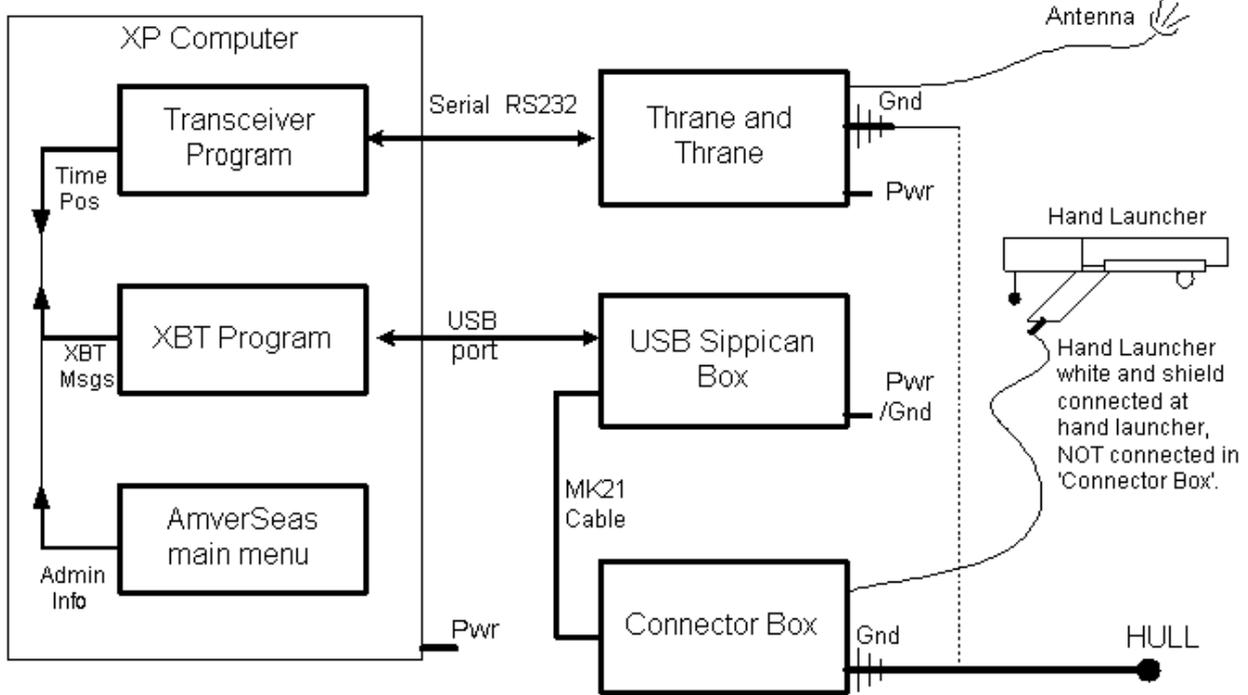
Hardware Setup

Please read the Sippican Inc “MK-21/USB Installation, Operation and Maintenance Manual” (Sipp Op Doc.). Give particular attention to sections: 3.1 – 3.1.4, 3.1.6, 4.1, 4.2 These sections cover the proper turn on and off sequences of the MK21 and computers.

MK21 USB Box should be set up with all power OFF. Then the MK21 USB Box is started before anything else. This insures that no voltages enter the MK21 USB Box while it is off. This has been known to damage MK21 cards.

- 1) Start With Everything Off, Computer off, MK21 USB off .
- 2) Plug Thrane & Thrane into Comm 1 of the shuttle. (T& T can be on or off.)
- 3) Plug, MK21 USB Box (switched off) into 100-240 VAC , 50-60 HZ power source. (3.1.4 Sipp Op Doc.).
- 4) Plug the cable from the Connector Box into MK21 USB Box. (3.1.6 Sipp Op Doc.)
- 5) Plug the MK21 USB Cable into back of the computer. (3.1.3 Sipp Op Doc.)
- 6) **Now POWER UP The MK 21USB Box.** (3.1.4 & 4.1 Sipp Op Doc.)
- 7) Power up the computer and Log on. (4.1 Sipp Op Doc.)
- 8) Restart the computer. Computer may not recognize the MK21 unless computer is restarted with USB plugged in.
- 9) Ground Connector Box. (See Appendix 2 or 3.1.6 Sipp Op Manual)
- 10) When turning off system, The MK-21USB should be **the LAST POWERED OFF.** (4.2 Sipp Op Doc)

Float All power so it is not connected to ships electrical ground.
 All grounding should be to single "Gnd Mecca" from the connector box to ships hull.



If XBT's are not recognized in the water: 1) Check 'Hull' Gnd, 2) Try with main electrical ground intact - unfloat.

'Connector Box' Gnd to 'Hull': e.g. a wire to a nearby window or metal plumbing pipe. Connect 'Thrane & T' Gnd to this Gnd.

Figure 1 XBT Hand Launcher wiring diagram

2.) Software Installation

Installation of WinMk21 Surface Software from Sippican, Inc:

These steps may not be necessary as “WinMk21 Surface” Software may already be installed on your computer. If this is the case then move on to Amver Seas software installation. It is installed if there is “Program Files / Sippican” directory, additionally there should be a “WinMk21” Logo on the desktop. Double click this logo to run the software.

If “WinMk21 Surface” Software is not installed then install it. See section 2.2 of the Sippican Inc. “MK-21/USB Installation, Operation and Maintenance Manual” (Sipp Op Doc.).

When the computer is first turned on with the Mk21 USB plugged into the back of the computer windows XP will detect new Hardware and ask you to install the drivers. See section 3.1.4.1 of the “Sipp Op Doc”.

Please Insure the system is up and running with “WinMk21 Surface” Software before proceeding with “Amver Seas” software. Instructions for testing the Mk 21 using the “WinMk21 Surface” Software are in sections 4.1 - 4.3 of the “Sipp Op Doc”.

The “WinMk21 Surface” Software is not used to drop XBT’s during the cruise, always use the “Amver Seas” Software!

Installation of New Amver Seas Software:

These steps may not be necessary as the correct version of Amver Seas may already be installed on your computer. If this is the case then move on to step III.

Generally:

1. Rename existing AMVERSEAS directory (usually C:\Program Files\AMVERSEAS) to AMVERSEAS_old or similar.
2. Right mouse click on the Windows: Start > Properties > Start Menu (tab) > Customize > Advanced. Go to “...\Start Menu\Programs\Startup” in the Explorer Window that pops up.
3. DELETE THE EXISTING shortcut to AMVERSEAS.exe
4. Install AMVERSEAS by double clicking “setup.exe” on Amver Seas install CD. This will walk you through the Amver Seas install procedure.
5. In “C:\Program Files\AMVERSEAS”, right mouse click on newly installed “AMVERSEAS.exe” > Create shortcut. Move that shortcut to “...\Start Menu\Programs\Startup” (step 2). This will open AMVERSEAS (and Time Sever, Transceiver, XBT Program, and Auto IMET if enabled) upon booting, provided there is only one user on the computer. Double check that shortcut is pointing to the appropriate target usually:
“C:\Program Files\AMVERSEAS\AMVERSEAS.EXE”.
6. Often the Admin.txt from the “Administration” folder of the original AMVERSEAS folder can be copied and pasted to the new AMVERSEAS directory. This keeps original ship info. Also XverSetup.txt & Automet.txt.

3.) Amver Seas Software Setup
Setup from Amver Seas Main Menu:



Figure 2 AMVER SEAS Main Menu

The following programs start on their own when the computer is turned on.

- a. **Amver Seas** – All other programs can be opened from here. You may need to set up Administration upon opening for the first time.
- b. **Transceiver Interface.**
- c. **XBT Program.**

If the programs do not start on their own they need to be setup from the Amver Seas Main Menu. Transceiver program can be started from the “Setup | Transceiver | Start button”. The XBT program can be started by selecting “XBT button”.

View Html Help Pages.

Go to menu item “Help | Help”. This will open a very detailed and thorough help guide.

Set System Clock:

Please set the system clock to “Casablanca Monrovia” Time Zone. Make sure that the computer is displaying the correct date and time. It should match the UTC date and time. In order to do this: double click the time showing at the bottom right of the computer screen. When the “Time and Date Properties” dialog appears, select “Time Zone” tab and select “Casablanca Monrovia” as the time zone. Then put in the correct date and time using the “Date & Time” tab.

AMVER Button refers to “sail”, “dev”, “pos” and “arrv” buttons below and is not applicable for systems doing XBT only.

SEAS Button used to enable “Meteorological”, “XBT” or “TESAC” Observations.

Setup Button used to Enable Administration Program.

1. Select “Administration”.

2. Fill out “Administration” screen (note “Mandatory” fields)
 - a. Ships name.
 - b. Ships Call Sign.
 - c. Maximum Ship Speed.
 - d. Inmarsat Std. C number.
 - e. Medical Staff.
3. Select “Transmit Binary”.
4. Select “Browse” to save for later transmission.
5. Save in “Reports_Amver/Admin (default).
6. Select “OK”.

Return to “Setup” and Enable XBT Program.

1. Select “XBT”.
2. Enable “XBT”, if not already.
3. Select “OK”.

Return to “Setup” and Enable Transceiver Program

1. Select “Transceiver Enabled”.
This will also activate “Automatic Binary File Transmission”.
2. Alternate NEMA GPS is not applicable for Hand Launch XBT operation.
3. Transceiver Settings should default as follows:
 - a. Com Port = 1.
 - b. Enter X.25 Address from pull down menu.
4. Enter appropriate “Coast Earth Station” from pull down menu.
5. Select “Start”.
6. Selecting “OK” will save for later transmission.

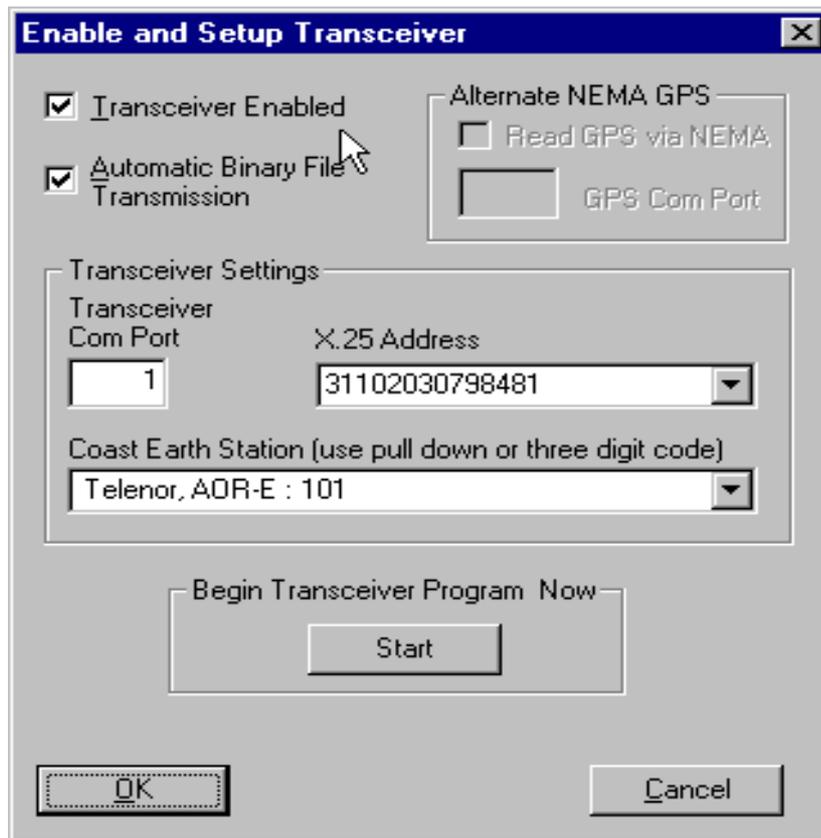


Figure 3 Transceiver Setup

Enable XBT Program from SEAS Button on main AMVER SEAS Screen.

1. **XBT program will start automatically with opening Amver Seas, once XBT has been enabled.**
2. **From the XBT Graphs Screen select “Setup” and then “System” and then “XBT Instrumentation”**
 - a. Choose the type of probe you are using. Should be “Deep Blue”. Make sure the recorder type is MK-21 and the Terminal depth is 1000m.
 - b. Select “OK”.
3. **Return to “Setup | System | System Configuration”:**
 - a. Make sure the information is correct for your cruise from the Amver Seas screen i.e.: “Ship Name”, “Call Sign, “IMO Number”.
 - b. Set “Scale of Graph”. (Usually -2 to 32 Deg. C)
 - c. Set “Launch Probe Type” to “Hand Launch”.
 - d. Set “Transmit” to “Automatic Transmit Binary Real-Time XBT” to “On”.
 - e. Set “Data Type” to “Full Resolution”.
 - f. Set “Query Reduction” to “Save Binary File without Question”.
 - g. Input of XBT probe serial number is optional.
 - h. Select “OK”

Admin

System Configuration

Identification

Ship Name: Blue Mermaid

Call Sign (WMO_ID): TEST

Lloyds Number (IMO): 123456

Override

Cruise Name: Ocean2

Operator Name: Jill

Cruise Line: IX 1

Launch Probe Type

Hand Launch Auto Launch

Auto Launch Type

ADML SCRIPPS

Transmit

Automatic Transmit Binary Real-Time XBT

On

Data Type

Full Resolution, Two Meter Values, Inflection Point Values

Scale of Graph

	Minimum	Maximum
Temperature (C)	-2.00	32.00

Query Reduction

Save Binary File Without Question

Mandatory Input of Serial Number

Yes No

OK Cancel

Figure 4 System Configuration

Transceiver Program Operation:

(Once it is up and running).

When the transceiver is up and running it should look like figure 5. The transceiver Program reads the GPS position and time for use by the system as well as transmitting binary message.

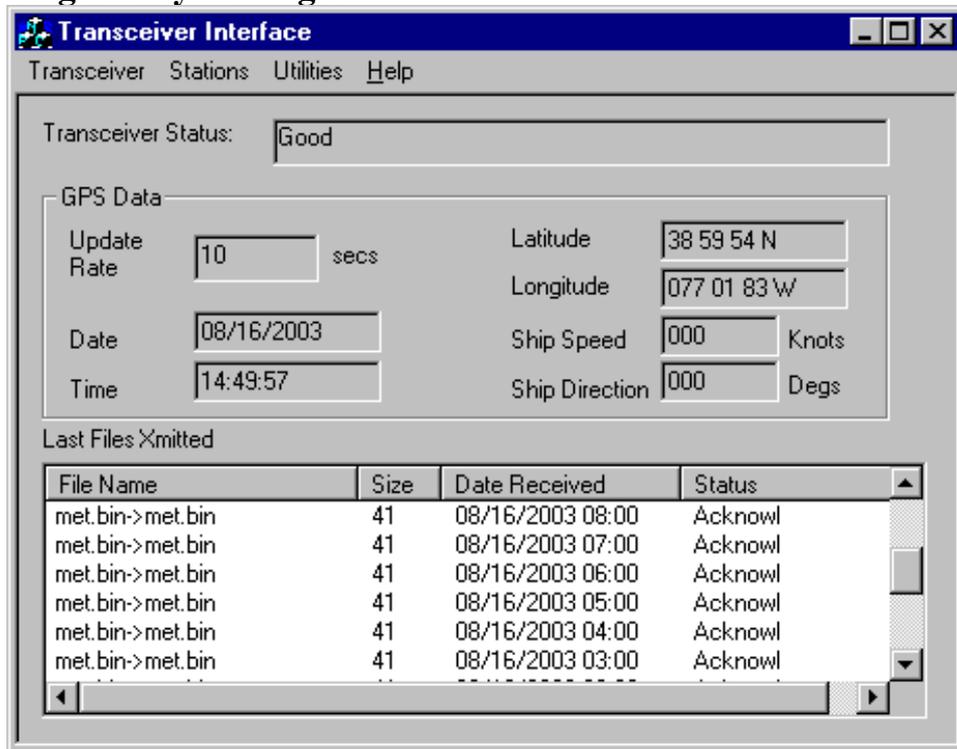


Figure 5 Transceiver Status

Display:

Transceiver Status: **Displays current status of transceiver.**

GPS Data: **Position and Time information displayed is from the Thrane and Thrane GPS.**

Last Files Xmitted: **When a binary message is sent to the transmitter its status is displayed on the front of the Transceiver Interface window. The status “Acknowl” standing for Acknowledged is what should be seen after the binary file has been transmitted. Any other status means that the message was not transmitted.**

Menu items:

Stations: **Allows view of current land earth station or to select a new station. The stations are originally set in the Amver Seas main menu. User can also select a new station. Open up “Select New” stations dialog and then double click on station in “Allowed Station” list box to select new station.**

Command Interface: **This opens a window allows for interacting directly with the Thrane & Thrane transceiver. The window is reached by selecting “Transceiver | Command Interface”. There are various status buttons:**

The “Transmit” Status button should display the information about all the recently transmitted files.

The “Hardware” Status button should display the local oscillator and offsets, antenna receive and transmit current, and signal strength

The “GPS Receiver” status button should display the navigational status, the number of visible satellites, software version of the GPs module, navigation mode, figure of merit (estimated position error), UTC, numbers representing the geometric properties of the satellites and positional error, and satellite tracking status.

The “Position and Time” button of course displays the GPs position and time.

The “Transceiver Command” edit box (small box in upper right corner) allows the user to input any Thrane and Thrane command and see the response in the “Command Response” field.

Utilities:

Check For Files To Transmit: **Will transmit all files located in the “C:\Program Files \ Amver Seas\ Transceiver \ Xmit directory”.** Please only select this feature when there are not files currently waiting to be transmitted.

View Transmit Log: **Opens up the transmit log so that the user can view the status of the last few hundred transmissions. Once the log is greater than 50K then the Log is moved to the 2nd transmit log and a new transmit log is begun.**

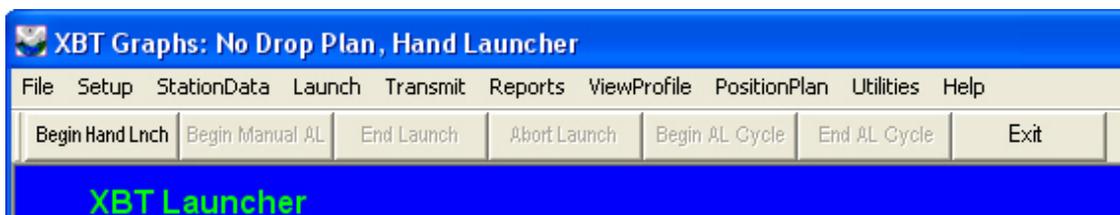
View 2nd Transmit Log: **Allows the user to view the 2nd transmit log. See entry above.**

Change Transmission Type: **Allows for SEAS or X.25 transmission. This option should never be used as all transmissions are of type SEAS.**

Allow NEMA: **This feature is not used at this time.**

XBT Program Operation.

(Once it is up and running).



Start the XBT program from the Amver Seas Main Menu. It may already be up because it will start automatically from Amver Seas program. The XBT program reads the data from dropped XBT's. The data is displayed real-time on a graph. If set up to do so, binary messages are automatically transmitted as well.

Many of the items in the XBT Program main menu are disabled for Hand Launcher Only systems.

Launching from the XBT Program:

1. Press the  button.
2. Waiting for “Connection to Mark 21 I/O” dialog will pop up on first launch. The MK21 card will click twice indicating that the MK21 card is responding.
3. Screen will display “Spent Canister/ Load Probe” if Hand Launcher (HL) contains a probe. If empty, it will display “Unknown / Load Probe” and then move to “Empty/ Load Probe”.
4. Open the Latch on the HL. Wait for screen to display “Empty/ Load Probe”. This will take a few seconds. Load the XBT Probe, and then close latch. More clicking noises should be heard from the MK21 card.
5. Screen will then display “New Canister / Testing Probe” then “New Canister / Prepare for Launch” then “New Canister / Launch Probe”. At this point launch XBT probe in the water.
6. Program should now say “New Canister / Collecting Data”. The graph of the data will appear.

Menu Items: (XBT Program)

File:

Open binary: Choose which binary file you want to open in the main XBT window.

Use Ctl or Shift to select multiples

Copy Binary JJVV's: Transfers binary files.

Save ASCII for Export: Converts NOAA XBT YYMMDDN###.bin data to full resolution, 2 meter or inflection point ASCII text files.

Save ASCII JJYY: Converts NOAA SBT YYMMDDN###.bin data to 2m or inflection point ASCII data for transmission.

Print: Print the plot displayed.

Exit: Exit XBT Program. Use **this EXIT button, NOT the X in the corner to Exit.**

Set Up:

XBT Instrumentation: choose the type of probe you are using. Should be “Deep Blue”. Make sure the recorder type is MK-21 and the Terminal depth is 1000m.

System Configuration: This is where you enter the cruise name, operator name, choose the type of auto launcher or hand launch. Make sure that: data type is Full Resolution, and “Save Binary Without Question” is selected. You can select or deselect “Automatic Transmit Binary Real-Time XBT”. Mandatory Input of Serial Number should be NO.

Advanced system configuration: Not used for Hand Only systems.

Autolauncher: Not used for Hand Only systems

Drop Plans: Not used for Hand Only systems

StationData:

Station data for upcoming trace: This lets you input position information for the upcoming drop.

Station data for completed trace: Allows you to input data about the previous drop. Changes last.bin File information.

Launch: (buttons on main screen)

Begin Hand Launch: For Hand launching, follow instructions in lower left XBT Program window, must “Stop AL Cycle” first. Launch Status will continue to update, and data will be acquired.

Note: Below options are not used for Hand Only Systems.

Begin Manual Launch: Use for Re-drops and tests, must “Stop AL Cycle” first. Launch Status will continue to update, and data will be acquired.

End: This will terminate the current drop. Can freeze XBT Program if in AL Cycle.

Transmit:

Last Profile: **Transmits last drop.**

Selected Profile: **Transmits selected drop.**

Re-enable: Allows auto transmit. This should not be necessary at this time and will hopefully become obsolete. It used to be used if Auto Transmit Failed.

Reports:

Launch Status: Not used for Hand Only Systems.

Alarms: Not used for Hand Only Systems.

History Profiles: Gives you the list, in a .txt file, of successful drops including time and location.

History no-splash: Gives you list, in a .txt file, of most recent drops that did not have water contact.

History Alarms: Not used for Hand Only Systems.

View Profile:

These options affect the XBT display window.

Number to display: How many profiles to display in XBT window. Can display up to 20 profiles at a time. Default is 5.

Clear Selected Profile: Use right mouse button to select the profile you want to clear from the screen.

Clear All Profiles: Removes all profiles showing

Graph Scale: Set whatever you want as the temperature scale, or use AutoScale.

Zoom:

On: If on can zoom in on graph by left clicking and dragging. Autoscale must be on for Zoom to work.

Off: Turns Zoom Off.

Out: Pulls out of zoom.

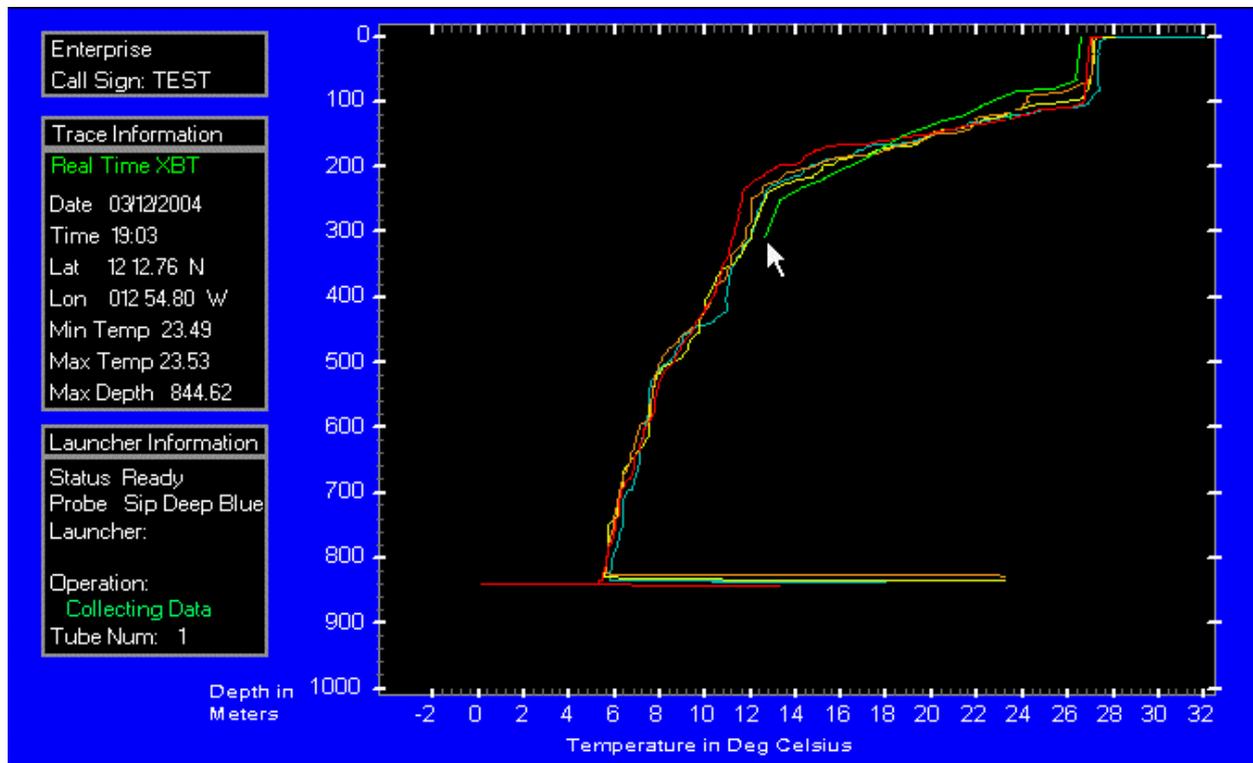


Figure 6 XBT drop profiles

Position Plan : Not used for Hand Only Systems.

Help:

About Version: Use to check that you have the correct version of XBT Program

Help Manual: Help Topics – Useful.

Utilities:

Display Mapped Profiles: Once this window is open go to “FILE | OPEN” and then pick all archived files you want to view from C:\Program Files\Amverseas\XBT\Archive.

Start of Cruise remove old logs: Not applicable for Hand Launching operations.

Create Pos Plan, Drop report from Drops: Not applicable for Hand Launching operations.

XBT Data Handling:

Data Storage:

Location of Archived XBT Files: All the archived files can be found in “C:\Program Files\AMVERSEAS\XBT\Archive”. They are named according to the date and what drop number for that day it is. For example, the archived file name will look something like this: X050110N15. This drop was done on January 10 2005 and was the 15th drop done that day. The “N” number does not correlate to what drop number in the plan it is. It’s helpful to keep track of what day (GMT) you’re on for tracking purposes.

Data Transmission:

With Automatic Transmission:

Files Should Be Transmitted automatically from the XBT Program. See “XBT Program | System Configuration | Automatic transmit”. You can view all the files transmitted by going to “Transceiver Program” and Select “Utilities | View Transmit Log”.

Or alternatively go to “C:\Program

Files\AMVERSEAS\Transceiver\Reports\XmitLog.Txt”. Once the log is greater than 50K then the Log is moved to the 2nd XmitLog2.Txt and a new XmitLog.txt begins.

Without Automatic Transmission:

Transmitting multiple XBT files:

If you are not using Auto transmit, find the files you want to transmit and copy them to the “C:\Program Files \ Amver Seas\ Transceiver \ Xmit directory”. Only send copies – files are DELETED after transmission. See the “Transceiver Program | Utilities | Check For Files To Transmit” for more instructions.

Transmitting Single XBT files:

From the XBT main menu select “Transmit | Last Profile” to transmit last drop. Select “Transmit | Selected Profile” to transmit any binary file in the Archive Directory.

Archive XBT Data:

This is to be done at the end of a cruise. Go to Amver Seas main menu item “Utility | Archive XBT Data”. After the archiving is done a dialog pops first informing that XBT Files in the “C:\Program Files\Amver Seas\XBT\Archive” directory have now

been zipped and saved. Then another dialog pops up asking “Do you want to delete Archive XBT Files?”. If you answer “OK”, files in Archive directory will be cleared out and deleted. Of course files have just been zipped and saved so no problem in deleting these files. If you answer “Cancel” files are not deleted

Trouble Shooting:

At the First Sign of Trouble.

Close Amver Seas. Copy the entire AMVERSEAS directory to your backup directory and rename it (eg AMVERSEAS_BkUp). Reboot computer.

GPS mouse

Windows XP has a known problem where it identifies streaming GPS data as an active mouse. If you ever see what looks like a satanic active mouse on a computer connected to a GPS (like the SIO Furunos):

1. Turn OFF the GPS
2. Go to Device Manager and find the extra mouse (Usually a “Serial Ball Point Mouse”)
3. Disable the offending alien mouse. Make sure you do not disable your working mouse!
4. Do this to every COM port that might have a Furuno plugged into it one day to avoid any nasty surprises.
5. Turn on the GPS, check that you are receiving data in to the appropriate program or check with Hyperterminal.

MK-21 USB

Reboot: MK-21 USB adaptors are in no way plug and play. If ever XBT Program or Sippican MK-21 program can not “see” the MK-21, reboot with the MK-21 USB plugged in (and powered, if applicable). Sometimes you have to pull the USB out and reseal it while the computer is up, then reboot. If you have a power failure, you may need to reboot. Make sure MK21 is on while you do this.

You see “Spent Canister” on the XBT Program display when you try to drop a probe. It stays in “Spent Canister” mode until the drop time out. This is a serious error and this could mean that the MK21 USB card is blown.

Incorrect Dates/Times in Transceiver interface, Windows or XBT data

Uninstall EasyMail. Sometimes Easy Mail changes the computer time. Check all computer settings to make sure you are set to the Correct UTC Date/Time and Casablanca, Monrovia. Timeserver sets computer date and time to UTC from GPS every 15 minutes? See section III) Amver Seas Setup, Set Up System Clock.

Thrane & Thrane

The Thrane & Thrane transceiver should be powered down for a few seconds every voyage. Apparently the buffer can fill. If you’ve been using “Transceiver Interface

Program” exclusively and start having problems, power down the transceiver for a few seconds then power back up. This will not affect Amver Seas other than clearing out the directory of the Thrane and Thrane.

Useful Information:

ScreenShots

Screen shots are useful for diagnostics, troubleshooting, sharing information or when reporting a problem or unusual program behavior.

1. Take a screen shot:
Shift+Print Screen - copies entire desktop, including bottom task bar. You can arrange various windows to show whatever you want.

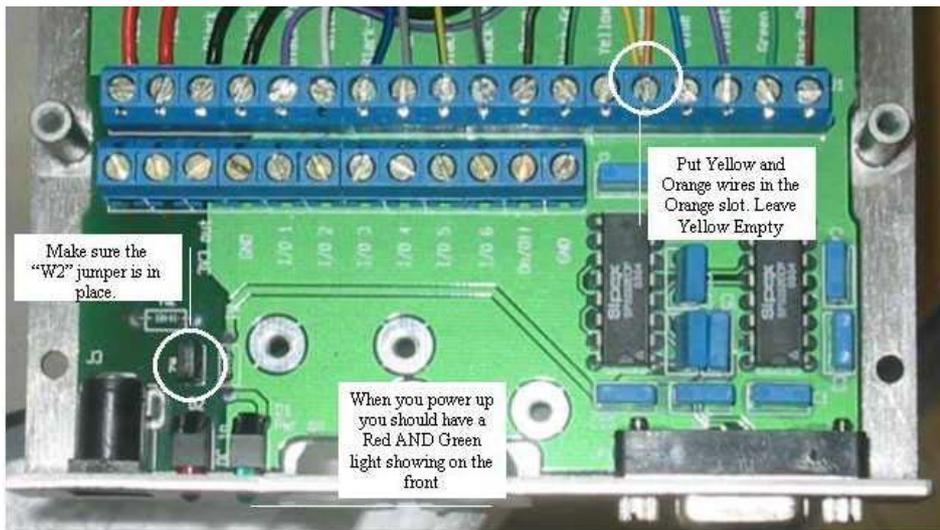
Alt+Print Screen - copies a selected window. Use this to record whats going on in a single window.
 1. Open a program that can manage images: Open Office Draw, Paint, MS Photo Editor, are all good options. Both Open Office and Paint are available on all Shuttle computers.
 2. Paste screen shot:
Shift+Insert- pastes your selection (desktop or window) into the image program. Or paste directly in to your report.
- Save Screen Shot:
Some programs like Paint allow you to save as .JPG, in others you need to click to select the screen shot and use File>Export>.JPG(Open Office Draw for instance). Some programs (Such as MS Photo Editor or Paint) you may need to crop the image. You want the resolution of the .JPG to be adequate to see details in the screen shot, but not so high to make a monster file. Play around with it to find what suits you.
 - Use in reports:
Open Office text docs use Insert>Graphics>From File>screenshot.jpg
Save the report as an MS Word Doc format and your report will be readable by a wide range of programs. But label each imbedded screenshot in your text doc with the screen shot name and include those .JPEGs in a separate folder as backup.
 - Save as a .PDF document (optional):
Open Office allows any document, spreadsheet, drawing or presentation to be exported as a .PDF file (File>Export as PDF). This can be very useful if you want to make an uneditable report that can be read by anyone who has Adobe Acrobat

Reader. Its also useful for reports with imbedded images where the images or formatting may shift depending on software and settings over various computers. However - only a computer with Acrobat Professional installed can edit that document or copy text and images out of it.

Thrane & Thrane 3026 Mini-C transceiver setup

All of the circuitry is now in the head/egg/antennae of the unit, replacing the blue box of the TT3022's. You wire the many wires of the "antennae" cable into a small connector box (pictured). DO NOT just wire color to color. That is only IF you have remote on/off (we don't).

You must put BOTH the yellow and orange wires into the orange slot. This is very briefly described in section 2.2.2 of the manual.



This image shows:

- 1) the correct wiring,
- 2) the location of the W2 jumper (should be in the correct place when you get a unit), and
- 3) the 2 lights on the front that should light up when you put power to the box.

Hint for wiring: use tweezers and the smallest

screwdriver you have. You may want to tin the ends.

Plugging into a WinXP computer:

Windows XP may see the serial connection and streaming data from a T&T MiniC as a **Serial Ballpoint Mouse**. We have seen this before with the Furuno GPS's.

If you connect the MiniC to your computer and 1) your computer auto recognizes a new device and identifies it as serial ball mouse, and/or 2) your mouse starts jumping around the screen:

- Turn OFF the power to the Mini-C terminal block (just unplug it)
- Go to device manager (right mouse click on My Computer >Properties > Hardware > Device Manager)
- Click on mice and other pointing devices
- Right mouse click on the Serial Ball Mouse and select DISABLE
- Exit device manager
- Reboot.

EasyMail:

Testing, setup & sending messages via EasyMail:

Software:

- Thrane & Thrane EasyMail v1.10. Available for download at <http://www.tt.dk/Land%20Mobile/Products/easyTrack/easyMail.aspx> or the NOAA SEAS FTP site.
- NOTE: if you install over an earlier version of EasyMail (or even if you have uninstalled previous versions), it will keep your addresses but will update your ISP list – this update is necessary!

Installation:

1. Double click on the setup icon.
2. Follow instructions, click next to continue, accept the licensing agreement.
3. Set for “Anyone who uses this computer (all users)” unless you want this available only to the current logged in user.
4. Click install, then finish.

Settings (with the Transceiver powered up and connected to the computer):

1. **Turn OFF SEAS Transceiver Interface**, and anything else that might be using the COM port and Thrane & Thrane.
1. Start EasyMail either from the desktop shortcut or from Start>Programs>Thrane & Thrane>EasyMail>EasyMail 1.10
2. Accept Warranty disclaimer.
3. First message asks if you want to “Adjust the time of the PC to the local GPS time” CLICK on “Save settings and don’t show this message again” and click NO. **This is important or you can mess up the XBT drop time!**
4. IF you are NOT using COM1, go to OPTIONS>CONFIGURATION>COM settings and select the COM port you wish to use. Keep at default baud rate 4800. If you are using COM1, you do not need to change anything.
5. Go to OPTIONS>CONFIGURATION>ROUTING and select to 1) send mail to disk & 2) local printer setting to OFF. Do this quickly or the program may shut down with an error in its attempt to find a printer. Make sure nothing is going to printer, just to disk. Click or unclick the rest of the EGC messages as you wish – the safety messages can’t be de-selected.
6. Go to OPTIONS> Set Default LES to these values:
 - W. Atl : 001 Southbury
 - E. Atl : 101 Southbury
 - Pac. : 201 Santa Paula
 - Ind. : 304 EIK
7. Go to OPTIONS>Set Default ISP to “Telenor01” in the dropdown box. According to Telenor we can also use Telenor04. Don’t change any of the default settings.

8. Go to CONTACTS and add new addresses:
 - i. Click New Entry
 - ii. Enter name
 - iii. Enter email address
 - iv. Select Email
 - v. Select 7-bit
 - vi. Click OK

To send an email:

2. Turn OFF SEAS ‘Transceiver Interface’ and ‘TimeServer’ programs or anything else that might be using the COM port and Thrane & Thrane.
3. Click on the TO... and select the email addresses you wish to send to, cc or bcc, click OK. NOTE – use this function rather than manually entering email addresses in the TO... line.
4. Enter a subject
5. Type your message, keep it short!
6. When ready to send, click Send - in the settings box for sending:
 - i. Keep Text in Editor checked
 - ii. REMOVE Confirmation Request (unless you are having problems/trouble shooting)
 - iii. Keep send later and print option deselected.
 - iv. Click OK
7. Click on OUTBOX, and wait for status = delivered for your message.

To check email:

1. Click on INBOX.
2. Double click on new message. Note that you have the option to save or reply from here (but if you reply, delete excess text to keep costs down).

When finished with email:

1. Exit EasyMail
2. Turn ON Transceiver Interface &/or TimeServer or whatever wants to use that COM port and the Thrane unit.

Trouble shooting:

1. EasyMail has many message windows for errors – read and follow instructions if they pop up.
2. On the left side of the main window you should have 3 green bars for GPS, Ant. Signal and PC connection. If you click on the Ant. Signal it will show hardware status. Under the Rx/TX/AGC you want the 2nd value (TX = transmission) to be over 1,000. If its not, check your antennae and connections.

3. In certain parts of the ocean you may wish to change LES if you are having problems sending or receiving. For instance AOR-W works better than POR in the northern and southern areas of the eastern Pacific.

Other Programs:

Sippican WinMK-21: very handy for checking the MK-21 USB if you are having problems. Try Activate to get the MK21 clicks. All MK-21 USB drivers are in Programs>Sippican>MK-21USB>Win-XP if Windows asks or you are doing a fresh installation. INSTALL BEFORE AMVER SEAS on a fresh install.

Acrobat Reader: Helpful to read many electronic technical manuals.

AntiVirus Software: Apply updates when you meet the ship.

BurnIn Test: Hardware test software. Need USB and Serial Test plugs to test USB and Serial ports. But you can check hard drive, video driver, floppy (need blank disk) and CD (need data CD).

Hyperterminal: Start>Programs>Accessories>Communications>Hyperterminal. Use to check is Windows is “seeing” data coming in through a COM port. Works for GPS NMEA data or AutoImet data. Settings should be 4800, 8 N 1, no handshaking.

Open Office: Similar to MS office, but Open Source. Can create documents, spreadsheets, drawings and spread sheets. Handy ability to export docs as .PDF files. Save documents as something universal (.txt, .jpg, .xls, .rtf etc, NOT in Open Office native format). This allows everyone else to open and read/edit your stuff.

Shuttle Build and Installation Checklist

This checklist is what Carrie Wolfe uses to build a Shuttle computer. Everything needed to do this is included in the box the computer came in (of course you wont be able to get the latest Windows updates at sea). Info below is included in computer boxes too.

Tasks:	SSID	
General	Install/update drivers	+
	Acrobat Reader	
	Updates incl XPSP2	
	Set time to Casablanca Monrovia GMT	
	Check HD, CD, FDD	
	Install serial 3 & 4 drivers -Optional	
	Install Open Office	
	Set to numlock on boot	
	Set SEAS user as admin & only user - boot to desktop	
	Run BurnInTest 15 minutes	

GPS NMEA 0183 Windows issue	Boot w/ Furuno GPS plugged into comm port. Allow to recognize, then disable "serial ball mouse" for COMs 1-4. (Windows Key + Break brings up "Device Manager", or START>Settings>Control Panel>System>Hardware[tab]>Device Manager). In Dev Manager "Mice and other pointing devices" Right click on "serial ball" and disable. DO ALL 4 COMM PORTS!
COM Ports	Test COM 1-4 w NMEA in hyperterminal 4800 8N1 None (START>Programs>Accessories>Communications>Hyperterminal)
Sippican	Install Sippican Data Acquisition Software
**see below	Plug in MK-21 USB - let windows XP recognize and find ARSUSB1.dll and ISAUSB.sys from HDD (not CD).
	Initiate MK-21 board (click)
AMVERSEAS	Install latest AMVERSEAS200 w/ AutoIMET
admin=TEST	Set & check Transceiver Interface Program to COM1. Set to SEAS xmit
	Enable XBT
	configure XBT for Deep Blue, auto xmit, save w/out question
	Check XBT HL w/test canister in all USB ports
	Check AutoImet COM2, hourly (AutoImet 9600 8N1 I think LL)
	Send test XBT & Met message
	Put AMVERSEAS.exe in start menu
CapSat	Create folder C:\Temp
	Install CapSat V3.03 to C:\CapSat
	set to no printers in routing and COM 1

****Sippican drivers etc. Install from CD:**

- 1) Install WinMK21 from Sippican Surface MK-21>SETUP>WinMK21 (ftp.aoml.noaa.gov/phod/pub/seas/)
- 2) Plug in MK21 USB, and get "found new hardware" msg. Pull out CD here. Let WinXP search for drivers. Install from Location C:\program files\Sippican\MK21USB\WInXP It should find ARS Tech USB Device, arusb1.dll & isausb.sys and install drivers automatically.
- 3) REBOOT with USB plugged in. For some reason, the MK-21 cant initiate unless the machine shuts down and starts with the USB plugged in.

- 4) Check MK-21 USB via Sippican\WinMK21 > Actions > Initiate MK IO board. Hear the "click of love".
 - 5) plug MK-12 USB cable in to all 4 USB ports following steps 2-4 above.
- From then on AMVER SEAS XBT will work just fine. Only need to restart if the USB plug is removed and plugged in again.

READ ME FIRST

- 1) This computer has been tested with all of the items and components on the attached list. Please read these notes on the care and feeding of these computers.
- 2) This computer was working when it left me. But it **WILL NOT RECOGNIZE THE USB MK-21 UNLESS YOU REBOOT WITH THE USB PLUGGED IN**. So if you plug the USB in with every thing shut down, and the MK-21 is not recognized in SEAS2000, reboot.
- 3) All of the system software used on this computer is being shipped with this computer. Store this software in a safe place (not on board the ship). Windows XP pro is licensed to each individual computer, the key is on the computer case, and these are single licenses. AMVERSEAS2000 Sippican MK-21 , and a whole lot of other stuff is on the SEAS2000 etc disk. Other useful stuff like Open Office is included on the Open CD.
- 4) Right now these computers have no virus protection. I recommend going to <http://www.free-av.com/index.htm> and down-loading software & updates to install every time you visit the ship.
- 5) All of these computers have Open Office software involved that can open, create and save any type of MS Office-type files (documents, spreadsheets, drawings and presentations).
- 6) I do not think that we want bridge personnel installing software on these machines, and we are looking at security options that will disallow this. Right now the SEAS login has administrative rights with no password.

Appendix 1 -Quality Control Codes

The complete list of quality control codes is defined in Bailey et al., 1994. The following are those most commonly used.

Profile Rejected - R Codes

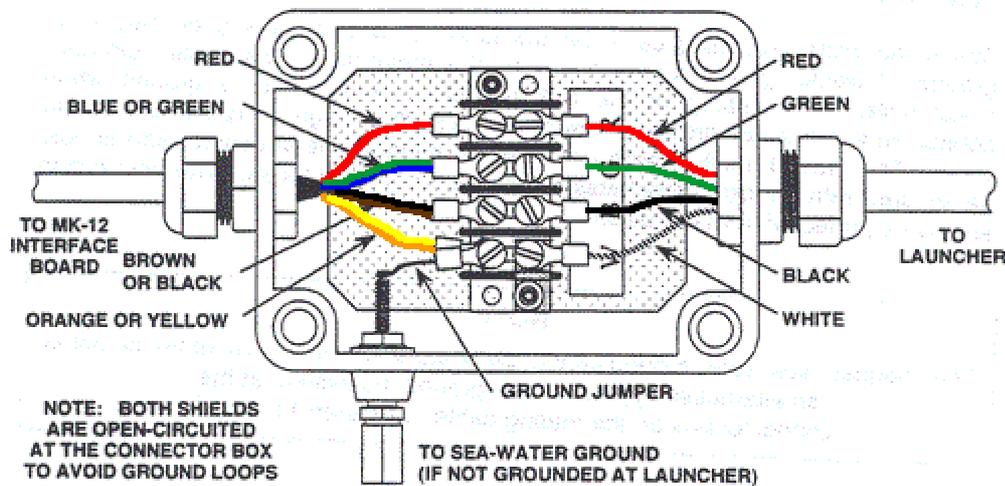
RER - Bad Redrop
WBR - Wire Break
WSR - Wire Stretch
IPR - Insulation Penetration
LER - Leakage
CTR - Constant Temperature
OPR - Other / Probe Error
HFR - High Frequency Interference

Profile Accepted - A Codes

REA - Redrop
DUA - Duplicate Drop
WSA - Wire Stretch
IPA - Insulation Penetration
HBA - Hit Bottom
SAA - Surface Anomaly
PIA - Probable Inversion
IVA - Inversion Confirmed
NUA - Nub
TDA - Temperature Difference
PSA -Possible Fine Structure
STA - Step-like Fine Structure
EFA - Eddy Front

Appendix 2 - Connector Box and System Grounding

The launcher is connected to the MK21 card through the Connector Box. This is also where the system ground is connected to seawater ground. This connection is made from the lug on the outside of the connector box to some metal part on the ship's hull (rudder post, plumbing pipe, lug to the metal hull). The seawater ground should be as electrically clean and pure as possible. This connection should make excellent metal-to-metal contact with a 12 awg minimum wire or braided cable, and be protected from corrosion and vibration. It should measure less than 100 ohms (from connector box lug to seawater). There should be only one ground in the system to avoid ground loops. For hand-held launchers, the internal connector box wiring should look like the drawing below.



The grounding approach for the hand-held launcher differs from the approach for the deck-mounted and thru-hull launchers. For the hand-held launcher the ground is made at the connector box, while for the others it is usually right at the launcher. In either case only a single ground point should exist on the launcher and its cabling to the PC.

Appendix 3 - XBT - Principle of Operation

The circuit diagram of the XBT probe is shown in Figure A3-1. Supplying a constant current (about 30×10^{-6} A) through both the thermistor and resistor to ground allows V_1 and V_2 to be measured with respect to ground (point D in Figure 12). Using $V = I \cdot R$:

$$V_1 = I \cdot (R_{\text{thermistor}} + R_{\text{wire}} + R_{\text{water}}), \text{ and}$$

$$V_2 = I \cdot (10^4 \Omega + R_{\text{wire}} + R_{\text{water}}).$$

The difference, $V_2 - V_1 = I \cdot (10^4 \Omega - R_{\text{thermistor}})$, yields $R_{\text{thermistor}}$ and hence the ocean's temperature, given the calibration curve of the thermistor. Resistance of thermistors vary inversely with temperature.

Depth is simply inferred from time. The probe lightens as its wire unspools, so depth is calculated from a second degree polynomial (Sippican, 1994) to include acceleration:

$$z \text{ (meters)} = 6.472 t - 0.00216 t^2 \quad (\text{t in seconds}).$$

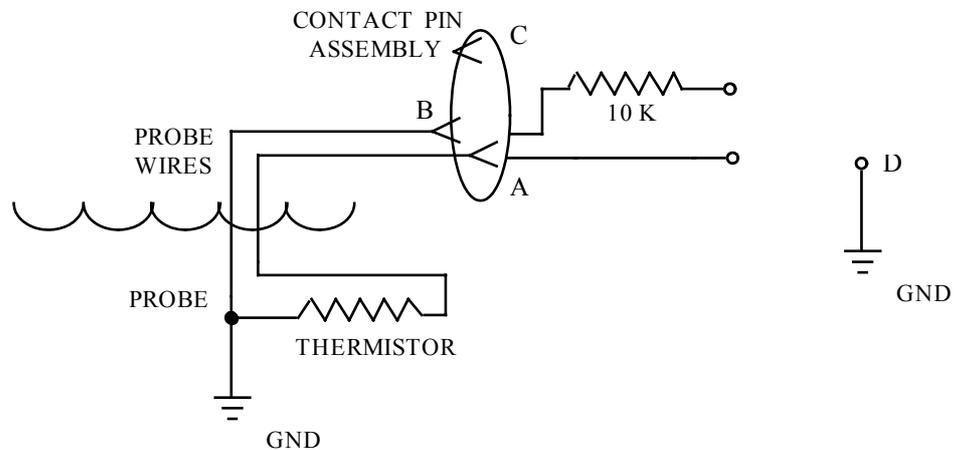


Figure A3-1. Circuit diagram of the XBT probe.