FINAL CRUISE INSTRUCTIONS
NOAA Ship *Ronald H. Brown*
29 March 2001

Cruise No:	RB-01-03 Leg 1
FOCI No:	GLOBEC-1
Operating Area:	Unimak Pass, Shelikof Strait, N.E. Gulf of Alaska

Dates:	6 May 2001 Depart: Dutch Harbor, AK 13 May 2001 Arrive: Seward, AK

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1.0 Cruise Overview

1.1 Program Description: The Fisheries Oceanography Coordinated Investigations (FOCI) are an effort by NOAA and academic scientists to understand the physical and biological processes that determine recruitment variability of commercially valuable fish and shellfish stocks in Alaskan waters. FOCI consists of several projects including the present one funded by the North Pacific Marine Research (NPMR) Program.

1.2 Cruise Objectives: The NPMR program element objective is to monitor the water properties and circulation along an oft-repeated oceanographic section in Shelikof Strait and the Northern Gulf of Alaska. We will deploy 1 mooring in Unimak Pass, 3 moorings in Shelikof Strait, 3 moorings near Gore Point, 5 moorings south of Kodiak Island and 9 moorings on the Seward line. There will be 4 CTD casts conducted during the cruise, all less then 500 meters in depth. Satellite drifter buoys will be deployed along our transect route.

1.3 Applicability: These instructions in conjunction with the "FOCI Standard Operating Instructions for NOAA Ship *Ronald H. Brown*, 2001" provide complete information for this cruise. The Chief Scientist is authorized to alter the scientific portion of this cruise plan with the concurrence of the Commanding Officer, provided that the proposed changes will not

(1) Jeopardize the safety of personnel or the ship,
(2) Exceed the time allotted for the cruise,
(3) Result in undue additional expense, or
(4) Change the general intent of the cruise.

1.4 Operating Area: Unimak Pass, Shelikof Strait, N.E. Gulf of Alaska (see Fig. 1).

1.5 Participating Organizations

A. NOAA/Pacific Marine Environmental Laboratory (PMEL)
7600 Sand Point Way NE
Seattle, WA 98115-6439

B. National Marine Fisheries Service
Alaska Fisheries Science Center
7600 Sand Point Way N.E.
Seattle, WA. 98102

1.6 Personnel

	Name	Title	Affil.	Sex	Nation
1.	William Floering	Chief Scientist	PMEL	M	USA
2.	Carol DeWitt	Research Scientist	PMEL	F	USA
3.	William Parker	Research Scientist	PMEL	M	USA
4.	Steve Smith	Mooring Specialist	PMEL	M	USA
5.	Mike Strict	Mooring Specialist	PMEL	M	USA
6.	Calvin Mordy (Phd)	Research Scientist	PMEL	M	USA

7.	David Wisegarver	Research Scientist	PMEL	M	USA

1.7 Administrative

A. Ship Operations:

CDR Jon Rix
Chief, Operations Division
Marine Operations Center, Atlantic
439 West York St.
Norfolk VA 23510
Phone: (757) 441-6842
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439 West York St.
Norfolk VA 23510
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B. Scientific Operations:

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E-mail: stabeno@pmel.noaa.gov

2.0 Operations

2.1 Data to be collected: Measurements will be collected with shipboard sensors including the ADCP and Sea Beam, a CTD profiler with water bottles, and thermosalinograph. A few satellite-tracked drifting buoys will be deployed along our scheduled trackline.

2.1.1: SCS will be configured to record the following:

Navigation -	Differential GPS position, time, COG, SOG and data-quality parameters; Ring-Laser-Gyro heading; "iron gyro" heading; Seapath 200 position, time, COG, SOG, heading, pitch, roll and data-quality parameters; bottom depth.
Flow-through sampler -	Thermosalinograph temperature, conductivity and salinity, and fluorometer temperature and fluorescence
Meteorological -	Solar radiation, relative and absolute wind speed and direction, barometric pressure, air temperature and humidity, precipitation

2.1.2: The ADCP will be configured according to the Chief Scientist's and University of Hawaii's specifications. It should receive position from a DGPS input and heading from the Ring-Laser Gyro and auxiliary heading from the Seapath 200. Data will be stored on 3.5" floppy disks or 100 MB Zip disks.

2.1.3: Sea Beam or other bottom sounding data will be collected on mooring site locations to verify depth. Mooring depths will range from 60 meters to 2200 meters. Data should be recorded on SCS or CD format for transport off the ship.

2.1.4: CTD cast data will be collected on PMEL's Sea Bird 911+ system with the ship's system as a back-up. There will be approximately 4 CTD casts. Up to ten 10-liter water samples will be taken on most casts.

2.1.5: AutoSal runs will be done to compare salinities with CTD values. Usually 1 sample will be taken per cast – at depth.

2.1.6: The ship will maintain a Marine Operations Abstract (MOA) on paper giving the date, time and location of significant events such as CTD casts, drifter deployments and mooring deployments.

2.2 Staging plan: All scientific equipment will be shipped via Western Pioneer to Dutch Harbor, AK to be loaded aboard at the vessel's convenience prior to 1000 May 6th. The Chief Scientist will arrive in Dutch Harbor May 3rd to assist in loading equipment on 4 May.

2.3 Cruise plan: The cruise's primary goal is to deploy 21 oceanographic moorings. (See attachment for mooring positions and an approximate time line for cruise activities.) The ship will depart Dutch Harbor at 1000 hrs May 6th and proceed to the Unimak Pass mooring site. One mooring will be deployed at this site followed by one CTD. The vessel will steam to the Shelikof Strait line (FOCI Line 8) to deploy 3 ADCP moorings and to conduct a CTD cast at each of the 3 mooring locations. Next the ship will proceed to the Barnabus Canyon, Ugak Bay and Chiniak Bay mooring locations for deployments. Next deployment site is the inshore station on the Gore Point line followed by the remaining 2 deployments on this line. Upon completion of the Gore Point line the ship will proceed to the offshore FATE-1 mooring site working toward

Seward on the Seward line of 9 mooring deployments. The scientific party will disembark at Seward Alaska on 13 May.

Detailed drawings of each mooring are not available at this time. A representative collection of 3 drawings, ranging from the most complex to the least complex mooring are included with these instructions. A number of the moorings consist of little more then a float, an ADCP and a release. The two surface floatation moorings are more complex.

There are no plans to conduct any dragging operations on this cruise.

2.4 Station Operations
2.4.1: A Standard CTD cast will be to 10 meters off bottom. The PMEL SeaBird 911plus CTD system will be used as the primary CTD system on this cruise. Since this is the first time many of these moorings have been placed at these sites some surveying of the ocean bottom may be required to locate suitable deployment depths.

2.5 Underway operations: Several underway measurements are required. The Thermosalinograph, flow-through fluorometer, and ADCP will be used continuously. These and other SCS data should be logged throughout the cruise.

2.6 Applicable restrictions: None.

2.7 Small boat operations: None planned.

2.8 Diving operations: None planned.

2.9 De-staging plan: All equipment for leg 1 of this cruise will be offloaded in Victoria on June 22nd.

3.0 Equipment and capabilities provided by ship:

- Oceanographic winch with slip rings and 3-conductor cable terminated for CTD,
- Readout for oceanographic winch,
- Spare Sea Bird 911 plus CTD system including underwater CTD with twin temperature and conductivity sensors (plus spares), 12-bottle rosette, pinger, weights, deck unit, PC with Seasoft software and tape recorder,
- 10-liter sampling bottles for use with rosette (12 plus spares),
- AUTOSAL salinometer for CTD salinity calibration,
- Thermosalinograph,
- Flow-through fluorometer,
- For meteorological observations: radiometer, 2 anemometers, barometer, air temperature sensor, relative humidity sensor and rainfall sensors
- Distilled or reverse-osmosis water source,
- Laboratory space with exhaust hood, sink, lab tables and storage space,
- Echo sounders for deep and shallow water measurements,

- RDI 150-KHz ADCP with position input from GPS receiver, heading input from Ring-Laser Gyro and Seapath 200 and output to Iomega Zip drive,
- SCS (Shipboard Computer System),
- One or more networked PCs,
- Network connection for science-party-supplied Macintosh, NT and Unix computers,
- Networked black-and-white and color PostScript printers,
- Sea Beam 2112 swath bathymetric sonar system,
- Adequate deck lighting for night-time operations,
- Safety harnesses for working on deck.

3.2 Equipment and capabilities provided by scientists:

PMEL:

- Primary Sea Bird 911 plus CTD system including underwater CTD with twin temperature and conductivity sensors (plus spares), fluorometer, Benthos altimeter, 12-bottle rosette, 12 sample bottles and weights,
- IAPSO water,
- Argos-tracked drifting buoys with optical sensors,
- Miscellaneous scientific sampling and processing equipment,
- Discrete Sample Data Base software and forms,
- Float coats,
- Office supplies: paper, pens, pencils, data storage disks.

4.0 Disposition of Data and Reports

4.1 Data responsibilities: The Chief Scientist will receive all original data gathered by the ship for the primary project, and this data transfer will be documented on NOAA Form 61-29 "Letter Transmitting Data". The Chief Scientist in turn will furnish the ship a complete inventory listing all data gathered by the scientific party detailing types and quantities of data. The Chief Scientist will be responsible for the disposition, feedback on data quality, and archiving of data and specimens collected on board the ship for the primary project. The Chief Scientist will also be responsible for the dissemination of copies of these data to participants in the cruise, to any other requesters, and to notify NODC of measurements and samples taken at sea via a Cruise Summary Report (IOC ROSCOP, Third Edition). The ship may assist in copying data and reports insofar as facilities allow. Metadata describing data collected during FOCI and NPMR cruises must be submitted to the Bering Sea Ecosystem Biophysical Metadatabase within one month of completion of the cruise. On-line guidance and submission forms are available through the World Wide Web at http://www.pmel.noaa.gov/bering/mdb/. Alternatively, forms may be requested from the FOCI Coordinator.

4.1.1: The Chief Scientist will ensure that all stations, deployments, etc. are entered into the FOCI Discrete Sample DataBase.

4.1.2: Individuals in charge of supplementary ("piggyback") projects conducted during the cruise have the same responsibilities for their project's data as the Chief Scientist has for primary project data. All requests for data should be made through the Chief Scientist.

4.1.3: The Commanding Officer is responsible for all data collected for fleet ancillary projects until those data have been transferred to the project's principal investigators or their designees. Data transfers will be documented on NOAA Form 61-29. Copies of fleet ancillary project data will be provided to the Chief Scientist when requested. Reporting and sending copies of fleet ancillary project data to NESDIS (ROSCOP) is the responsibility of the program office sponsoring those projects.

4.2 Pre- and post-cruise meetings: All scientific personnel will meet with ship's representatives in a pre-cruise meeting the day of departure to discuss scientific objectives, operations, safety and Standing Orders. A post-cruise meeting will be scheduled between the Chief Scientist and Commanding Officer for a convenient time at the end of the cruise. Project accomplishments will be reviewed, as will general aspects of ship's performance and any administrative issues.

4.3 Ship operation evaluation report: Reporting requirements for the Shipboard Operations Evaluation Form, to be completed and submitted by the Chief Scientist to the Office of Marine and Aviation Operations (OMAO) within 30 days of cruise completion, will also be reviewed.

5.0 Additional Projects

Any additional work will be subordinate to the primary project and will be accomplished only with the concurrence of the Commanding Officer and the Chief Scientist(s).

5.1 Supplementary ("Piggyback") projects:

5.1.1 Underway Measurements in support of Global Carbon Cycle Research, (GCC)

5.1.1.1 Request: As part of the ongoing research to quantify the CO2 uptake by the world's oceans we have installed underway systems on BROWN. On many cruises we request bunk space for one scientist of our laboratories to maintain the many systems outlined below. If we cannot send a dedicated person we try to have a scientist of the specific scientific party look after the Underway pCO2 system (described in section A4 below). On some cruises we are unsuccessful in attracting a volunteer and would like to use the services of the survey technician for the Underway pCO2 system only. After initial start-up, which requires about one hour of monitoring, the system needs checking twice a day requiring a total of about 20-minutes. We would also request weekly data downloads and transmission such that we can perform on shore near-real-time quality control to assess if the instrument is operating satisfactorily. All costs of the email transmissions and survey technician overtime would be covered by AOML. The chief survey technician, J. Shannahoff, has operated the instrument before with good results. In the event of system malfunction that cannot be easily repaired, we will ask Mr. Shannahoff to shut

the system down. The shoreside leader of the effort, Mr. Robert Castle has interacted closely with J. Shannahoff and feels that this arrangement would work well.

5.1.1.2 Introduction: The underway sensors on RHB will be used in support of the objectives of the Global Carbon Cycle Research (GCC) to quantify the uptake of carbon by the world's ocean and to understand the bio-geochemical mechanisms responsible for variations of partial pressure of CO2 in surface water (pCO2). This work is a collaborative effort between the CO2 groups at AOML and PMEL.

Principal investigators:

Dr Rik Wanninkhof 305-361-4379 wanninkhof@aoml.noaa.gov AOML
Dr. Richard Feely 206-526-6214 feely@pmel.noaa.gov PMEL

The semi-automated instruments are installed on a permanent basis in the hydrolab of RHB and are operated by personnel from AOML and PMEL. All work is performed on a not-to-interfere basis and does not introduce any added ship logistic requirements other than the continuous operation of the bow water pump and thermosalinograph. This effort requires one permanent berth for the operator of the systems. The instrumentation is comprised of an underway system to measure pCO2, a SOMMA (single operator multi-parameter metabolic analyzer)-coulometer system to measure total dissolved inorganic carbon, a Turner Designs fluorometer, and a YSI oxygen probe. An oxygen titrator and stand-alone fluorometer will be used to calibrate the underway oxygen and fluorometer, respectively. All the instruments are set up along the port bulkhead and aft bench in the hydrolab.

5.1.1.3 Rationale: Current estimates of anthropogenic CO2 uptake by the oceans range from 1 to 2.8 Gigatons per year. The CO2 fluxes between air and water are poorly constrained because of lack of seasonal and geographic coverage of delta pCO2 (the air-water disequilibrium) values and incomplete understanding of factors controlling the air-sea exchange of carbon dioxide. Seasonal and temporal coverage can be increased dramatically by deploying pCO2 analyzers on ships.

The effort on RHB is expanded beyond the historical scope of the underway programs by incorporating additional sensors to improve our understanding of the factors controlling pCO2 levels.

5.1.1.4 Sensor Suite and Maintenance:

A. Underway pCO2 system

This system consists of a large (40-liter) air-water equilibrator requiring an unobstructed drain at floor level for the 15 L/min outflow, an infrared analyzer with valves and flow meters, and a computer controlling the operating sequence and which also logs the data. The underway pCO2 system is an integrated package for measurement of pCO2 in air and water and support sensors necessary to reduce the data (such as equilibrator temperature, location, salinity, sea surface temperature and barometric pressure). This system is an upgrade from the initial systems and

requires routine checks at 6-12 hour intervals, including logging of mercury thermometers in the equilibrator.

B. Oxygen sensor
This is a compact pulsed electrode unit, which also contains a temperature sensor. This is a new sensor built by Dr. Langdon at LDEO. Water requirement is 2-Liter/minute with a bench top drain. One foot of bench space is required. During this cruise the data will be validated against samples taken four time a day and analyzed by potentiometric winkler titrations

C. Turner Designs Fluorometer
This instrument, which was jointly purchased by AOML and MOC- Atlantic for BALDRIGE, requires a water throughput of about 5 L/min. Periodic cleaning of the flow through cell (2-14 days) is required. The signal of the fluorometer is logged on the shipboard SCS system or on the computer logging the underway pCO2 data. Aliquots of seawater are extracted twice per day and analyzed for chlorophyll and phaopigments on a separate fluorometer following routine procedures to calibrate the fluorometer signal. This information will be particularly useful to extrapolate the observations from the NASA SeaWiFS satellite to in situ pigment concentrations.

5.1.1.5 Summary - Ship infrastructure support:

1. Continuous seawater supply: 20 lpm minimum, 40 lpm maximum for instruments, and 75 lpm throughput to assure short residence time of water in line and minimal heating.

2. Access to TSG and SCS data: Temperature at intake, salinity from TSG, fluorometer signal, wind speed (true and relative), wind direction (true and relative), time, latitude, longitude, and ship speed.

3. Bench space, hydrolab space, access to bow water line and drains.

Specific questions should be directed to:
Robert Castle, phone 305-361-4418, castle@aoml.noaa.gov

5.2 NOAA Fleet ancillary projects:
Ancillary tasks will be accomplished in accordance with the NOAA Fleet Standing Ancillary Instructions.

6.0 Hazardous Materials

6.1 Policy/Compliance: *Ronald H. Brown* will operate in full compliance with all NOAA hazardous materials (HAZMAT) requirements. All hazardous materials and substances needed to carry out the objectives of the embarked science mission, including ancillary tasks, are the direct responsibility of the embarked designated Chief Scientist, whether or not that Chief Scientist is using them directly. The ship's Environmental Compliance Officer will work with the Chief Scientist to ensure that this management policy is properly executed.

6.1.1: All hazardous materials require a Material Safety Data Sheet (MSDS). Copies of all MSDSs shall be forwarded to the ship 60-90 days prior to sailing. The Chief Scientist shall have copies of each MSDS available when the hazardous materials are loaded aboard. HAZMAT for which the MSDS is not provided will not be loaded aboard.

6.1.2: The Chief Scientist will provide the Commanding Officer with an inventory indicating the amount of each hazardous material intended to be brought onboard, and for which the Chief Scientist will be responsible, at least 60 days prior to the cruise. This inventory shall be updated at the beginning of the cruise prior to departure of the ship. A final inventory will be conducted at the completion of the cruise accounting for the amount of material being removed, as well as the amount consumed in science operations and the amount being removed in the form of waste.

6.1.3: The ship's dedicated HAZMAT Locker contains two 45-gallon capacity flame cabinets and one 22-gallon capacity flame cabinet. All HAZMAT, except small amounts for ready use, must be stored in the HAZMAT Locker. If science party requirements exceed ship's storage capacity, excess HAZMAT must be stored in dedicated lockers meeting OSHA/NFPA standards to be provided by the science party.

6.1.4: The scientific party, under supervision of the Chief Scientist, shall be prepared to respond fully to emergencies involving spills of any mission HAZMAT. This includes providing properly trained personnel for response, as well as the necessary neutralizing chemicals and clean-up materials. Ship's personnel are not first responders and will act in a support role in the event of a spill. The Chief Scientist shall provide a list of science party members that are properly trained to respond in the event of HAZMAT spills.

6.1.5: The Chief Scientist is directly responsible for the handling, both administrative and physical, of all scientific party hazardous wastes. No liquid wastes shall be introduced into the ship's drainage system. No solid waste material shall be placed in the ship's garbage.

6.1.6: The embarking Chief Scientist will work with the departing Chief Scientist and the ship's Environmental Compliance Officer to ensure proper tracking of inherited hazardous materials. No HAZMAT will be left aboard and transferred to the embarking chief scientist without prior arrangements and the expressed consent of the commanding officer.

6.2 Inventory:

Previous Projects:	See Section 9.4.1
PMEL:	See Section 9.4.2

6.3 Material Safety Data Sheets (MSDS)
See section 9.4.2.4

7.0 Radioactive Isotopes:

7.1 Radioactive isotope policy: *Ronald H. Brown* has no specially designed lab space for working with isotopes. We will therefore require that all radioisotope work be done in a dedicated van with its own storage area and separate waste discharge. This policy is consistent with that of the UNOLS fleet. All of the waste should remain segregated from the ship's waste and be packed out by the investigator.

7.1.1: Each scientist working with these materials will be required to wear a lab coat and disposable booties to reduce the likelihood of tracking the substance out of the van and into the ship.

7.1.2: It will be the responsibility of the investigator to conduct pre-cruise (for background) and post-cruise wipe tests (regardless of whether a spill occurred or not). Wipe tests should also be conducted in the event of a spill, as well as periodically while underway.

7.1.3: A detailed procedural methodology describing the use of these materials should be provided to the Environmental Compliance Officer (ECO) for review at least one month prior to bringing them aboard. A spill contingency plan should also be provided at the same time. Please note that ship's personnel are not first responders in the event of a spill.

7.1.4: A log detailing the type and amount of materials brought aboard and removed from of the ship shall be maintained, along with a record of any spills that occurred.

7.1.5: All radioisotope work will be conducted by NRC or State licensed investigators only, and copies of these licenses shall be provided to the ECO at least one month prior to bringing any materials on board.

7.2 Inventory:

PMEL:	None
AFSC:	None

7.3 License and License Holder: Not applicable.

8.0 Miscellaneous

8.1 Scientific Berthing: The Chief Scientist is responsible for assigning berthing for the scientific party within the spaces approved as dedicated scientific berthing. The Ops Officer will send stateroom diagrams to the Chief Scientist showing authorized berthing spaces. The Chief Scientist is responsible for returning the scientific berthing spaces in the condition in which they were received; for stripping bedding and for linen return; and for the return of any room keys that were issued. Only one set of linens/towels will be provided for embarked scientific personnel. The scientific compliment is responsible for laundering their linens and towels.

8.1.1: The Chief Scientist is responsible for the cleanliness of the berthing and laboratory spaces and storage areas used by the science party, both during the cruise and at its conclusion prior to departing the ship.

8.1.2: In accordance with NC Instruction 5355.0, Controlled Substances Aboard NOAA Vessels, dated 16 August 1985, all persons boarding NOAA vessels give implied consent to conform with all safety and security policies and regulations which are administered by the Commanding Officer. All spaces and equipment on the vessel are subject to inspection or search at any time.

8.2 Medical Forms: The *NOAA Health Services Questionnaire* must be completed in advance by each participating scientist. It will be sent out by the Chief Scientist and should be returned directly to the Medical Officer on the ship in a sealed envelope marked with the participant's name, cruise number and cruise dates. It should reach the ship no later than 4 weeks prior to the cruise to allow time to medically clear the individual, to request more information if needed, and to prepare for special circumstances. All personnel are required to meet the NOAA Physical/Health Standard as specified in the NOAA Fleet Medical Policy Manual. If there are any questions about eligibility, individuals can contact RHB's medical Officer at Medical.Ronald.Brown@noaa.gov or MOC Health Services at 206-553-8704. All personnel must bring with them prescription and routine, over-the-counter medication (e.g. an aspirin a day). Supplies on board are limited, and chances to restock are few.

8.2.1 Emergency Contacts: Prior to departure, the Chief Scientist must provide a listing of emergency contacts to the Executive Officer for all members of the scientific party, with the following information: scientist's name, emergency contact's name, address, relationship to scientist, telephone number and e-mail address (if available).

8.3 Shipboard Safety: Wearing open-toed footwear (such as sandals) outside of private berthing areas is unsafe and is not permitted. Steel-toed shoes are required to participate in any work dealing with suspended loads, including CTD deployment and recovery.

8.4 Communications: The Chief Scientist or designated representative will have access to ship's telecommunications systems. Direct payment (e.g. by credit card) will be used as opposed to after-the-fact reimbursement. Specific information on how to contact *Ronald H. Brown* and all other fleet vessels can be found at http://www.moc.noaa.gov/phone.htm.

8.4.1 E-mail Policy: Standing Order 9.21-1: In recent years the proliferation of electronic mail (e-mail) and the reduction of INMARSAT costs have permitted the sending of nominal amounts of personal e-mail when transmitted with official ship's business. Accordingly, a complimentary amount of personal use will be permitted for all personnel aboard.

8.4.1.1: Each person will be allowed $45 per month for e-mail transmission costs. There is no provision for payment to a person who does not utilize the complimentary amount.

8.4.1.2: It should be understood that the cost of personal e-mail being transmitted from shore to an individual aboard ship will be charged against that individual's complimentary amount. A detailed billing statement will be issued periodically to any individual or Chief Scientist whose

costs have exceeded his or his group's monthly entitlement. All costs in excess of an individual's or group's complimentary amount must be reimbursed. When personal use cannot be easily distinguished from official business, the amount of reimbursement will equal the total cost minus the complimentary amount. Each embarked personnel will have an e-mail account/address established in his/her name by the Lead Electronic Technician (LET) at the time of arrival. The general format is:

Firstname_Lastname%BROWN@ccmail.rdc.noaa.gov

8.4.2 Satellite Communications: Standing Order 9.21-2: INMARSAT-A (voice and fax) and INMARSAT-M (voice) communications are available aboard ship and may be used for personal or business related calls so long as the caller makes arrangements to pay for the calls. Credit card calls are the preferred method of payment. INMARSAT calls can be extremely expensive and the exact cost may not be known until you receive your bill. Brevity is encouraged. See the Lead Electronic Technician (LET) for any questions regarding the use of these phones.

8.4.2.1 Ship Phone Services: Standing Order 9.21-3: Routine incoming non-emergency phone calls are discouraged. Use e-mail communications for this purpose. In an emergency, embarked personnel can be contacted by phone. Phone numbers for the Ronald H. Brown can be found at http://www.moc.noaa.gov/phone.htm#RB. The caller will make the arrangements to pay for calls via credit card.

8.4.2.2 INMARSAT-A: For high-speed data transmission, including FTP, and high quality voice telephone communications. Costs range from $5-$11 per minute for use of the service, and may be charged to credit card or called collect.

8.4.2.3 INMARSAT MINI-M: For voice telephone communications and 2400 baud data transfer. Cost is about $3 per minute to the US and may be charged to credit card or called collect. Mini-M coverage is by spot beam and may not be available in all the areas the ship may be working in.

8.4.2.3.1 Messages: can also be left with the Marine Operations Center, Pacific in Seattle, WA by calling (206) 553-4548. After hours and on weekends and holidays, an answering service will relay a message to the appropriate duty officer.

8.4.3 Ship's Mail: Standing Order 9.22: Incoming letters and packages can be sent to embarked members of the ship's operating crew and scientific complement by addressing them to:

Name
NOAA Ship RONALD H. BROWN
MOC - Pacific
1801 Fairview Ave. East
Seattle, WA. 98102

Mail received at the marine center will be periodically forwarded to the ship's next port of call. When the ship is on a foreign deployment, senders are encouraged to mail letters and packages earlier to ensure delivery. Be advised that some foreign customs authorities routinely open and

inspect incoming mail. Arrangements for ship's outgoing mail will be made on the morning of departure. In foreign ports, mail must have US postage affixed as it will be boxed and overnight-expressed to the Pacific Marine Center where it will enter the US postal system. US postage stamps are not routinely available aboard ship.

8.5 Port Agent Services/Billing: Contractual agreements exist between the port agents and the commanding officer for services provided to NOAA Ship *Ronald H. Brown*. The costs for any services arranged through the ship's agents by the scientific program, which are considered to be outside the scope of the agent/ship support agreement, will be the responsibility of that program. Direct payment shall be arranged between the science party and port agent, as opposed to after-the-fact reimbursement to the ship's accounts.

8.6 Wage Marine Dayworker Working Hours and Rest: Chief Scientist shall be cognizant of the reduced capability of *Ronald H. Brown*'s operating crew to support 24-hour mission activities with a high tempo of deck and survey operations at all hours. Wage marine employees are subject to negotiated work rules contained in the applicable collective bargaining agreement. Dayworkers' hours of duty are a continuous eight-hour period, beginning no earlier than 0600 and ending no later than 1800. It is not permissible to separate such an employee's workday into several short work periods with interspersed non-work periods. Dayworkers called out to work between the hours of 0000 and 0600 are entitled to a rest period of one hour for each such hour worked. Such rest periods begin at 0800 and will result in no dayworkers being available to support science operations until the rest period has been observed. All wage marine employees are supervised and assigned work only by the Commanding Officer or designee. The Chief Scientist and the Commanding Officer shall consult regularly to ensure that the shipboard resources available to support the embarked mission are utilized safely, efficiently and with due economy.

9.0 Appendices

9.1. Equipment Inventory
9.2. Figures
  9.2.1 Operating Area
  9.2.2 Mooring diagrams
9.3. Tables
9.4. Hazardous Materials
  9.4.1. Hazardous Material Inventory - Previous Projects
  9.4.2. Hazardous Material Inventory – Present Project
9.5 PMEL Standard Operating Procedures for the Ronald H. Brown.

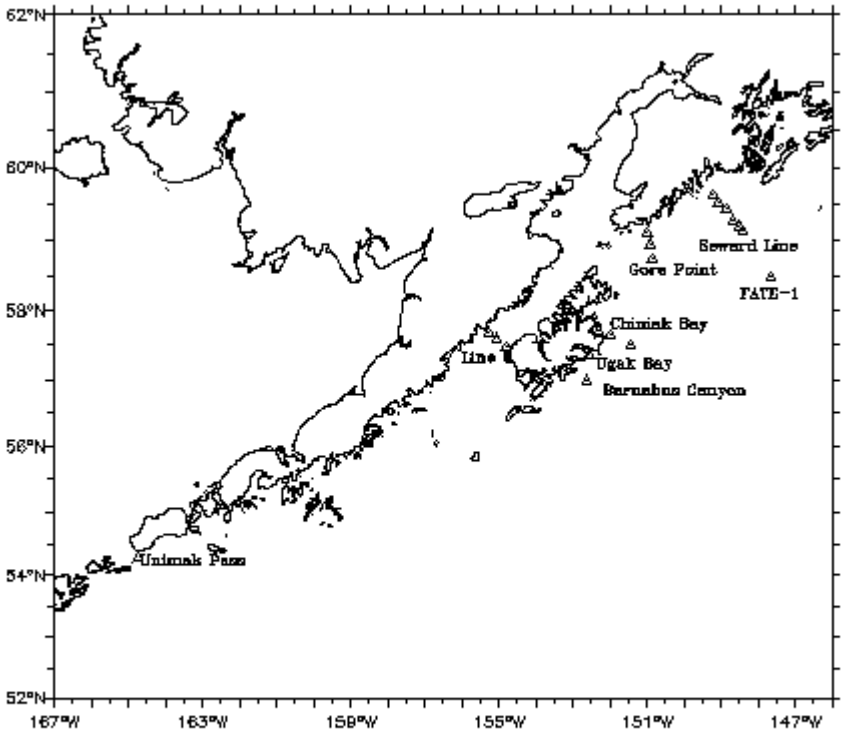
9.1 Equipment Inventory

PMEL

4 MetOcean satellite drifters
4 Seimac satellite drifters
10 bottles IAPSO Standard Seawater
Zip drive
1 Benthos CTD altimeter
Wetstar fluorometer
Biospherical PAR sensor
50 VHS tapes
Miscellaneous manuals
Sea Bird 911 plus CTD system including underwater CTD with twin temperature and conductivity sensors (plus spares), fluorometer, Benthos altimeter, 12-bottle rosette, weights, and sample bottles
Float coats
Office supplies: paper, pens, pencils, data storage disks
21 railroad wheel anchors
2 surface donut floats with weather towers
32 current meters
9 ADCP profilers
14 SeaCats
17 MicroCats
25 MTRs
26 SBE 39 Temp sensors
4 Nitrate meters
21 acoustic releases
counts on 28 to 41 inch metal floats and glass floats are not available at this time.
Misc line spools and equipment boxes of mooring parts.

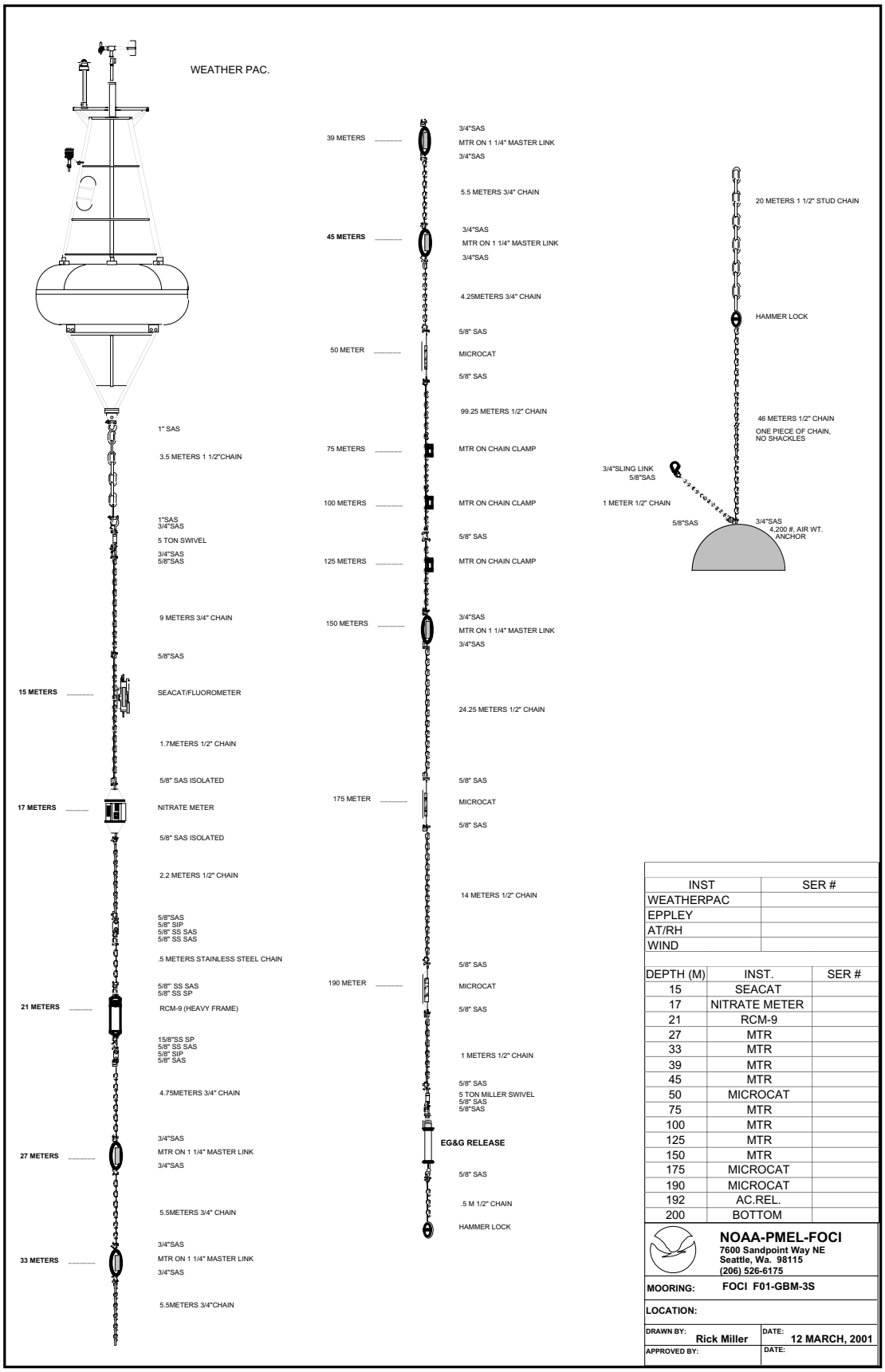
9.2 Figures

9.2.1 Operating Area



RB01–03 OPERATIONS, LEG 1

9.2.2 Mooring diagrams



INST	SER #
WEATHERPAC	
EPPLEY	
AT/RH	
WIND	

DEPTH (M)	INST.	SER #
15	SEACAT	
17	NITRATE METER	
21	RCM-9	
27	MTR	
33	MTR	
39	MTR	
45	MTR	
50	MICROCAT	
75	MTR	
100	MTR	
125	MTR	
150	MTR	
175	MICROCAT	
190	MICROCAT	
192	AC.REL.	
200	BOTTOM	

NOAA-PMEL-FOCI
7600 Sandpoint Way NE
Seattle, Wa. 98115
(206) 526-6175

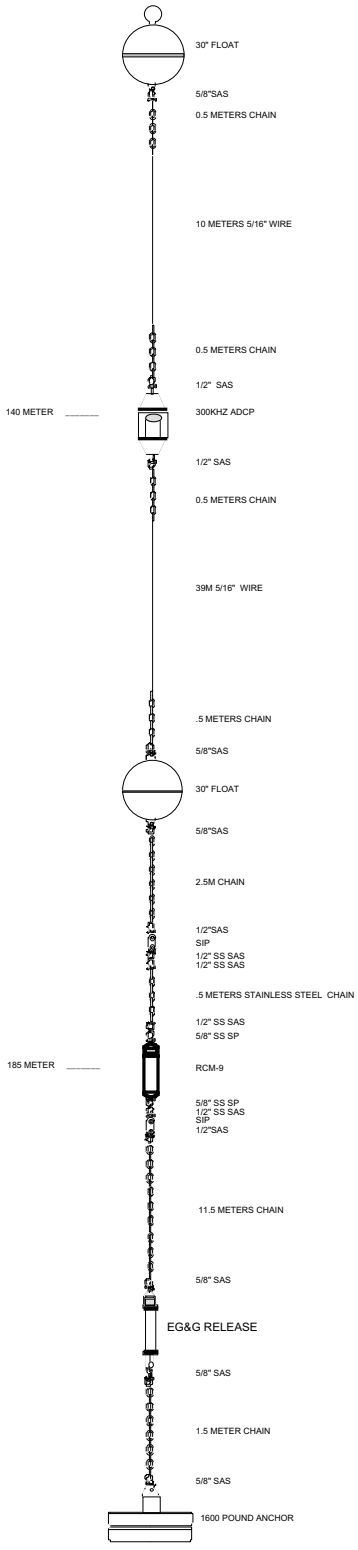
MOORING: FOCI F01-GBM-3S

LOCATION:

DRAWN BY: Rick Miller **DATE:** 12 MARCH, 2001

APPROVED BY: **DATE:**

9.2.2 Mooring diagrams



INSTRUMENT	DEPTH	SN
300KHZ ADCP	140M	
RCM-9	185M	
BOTTOM	200M	

NOAA-PMEL-FOCI
7600 Sandpoint Way NE
Seattle, Wa. 98115
(206) 526-6175

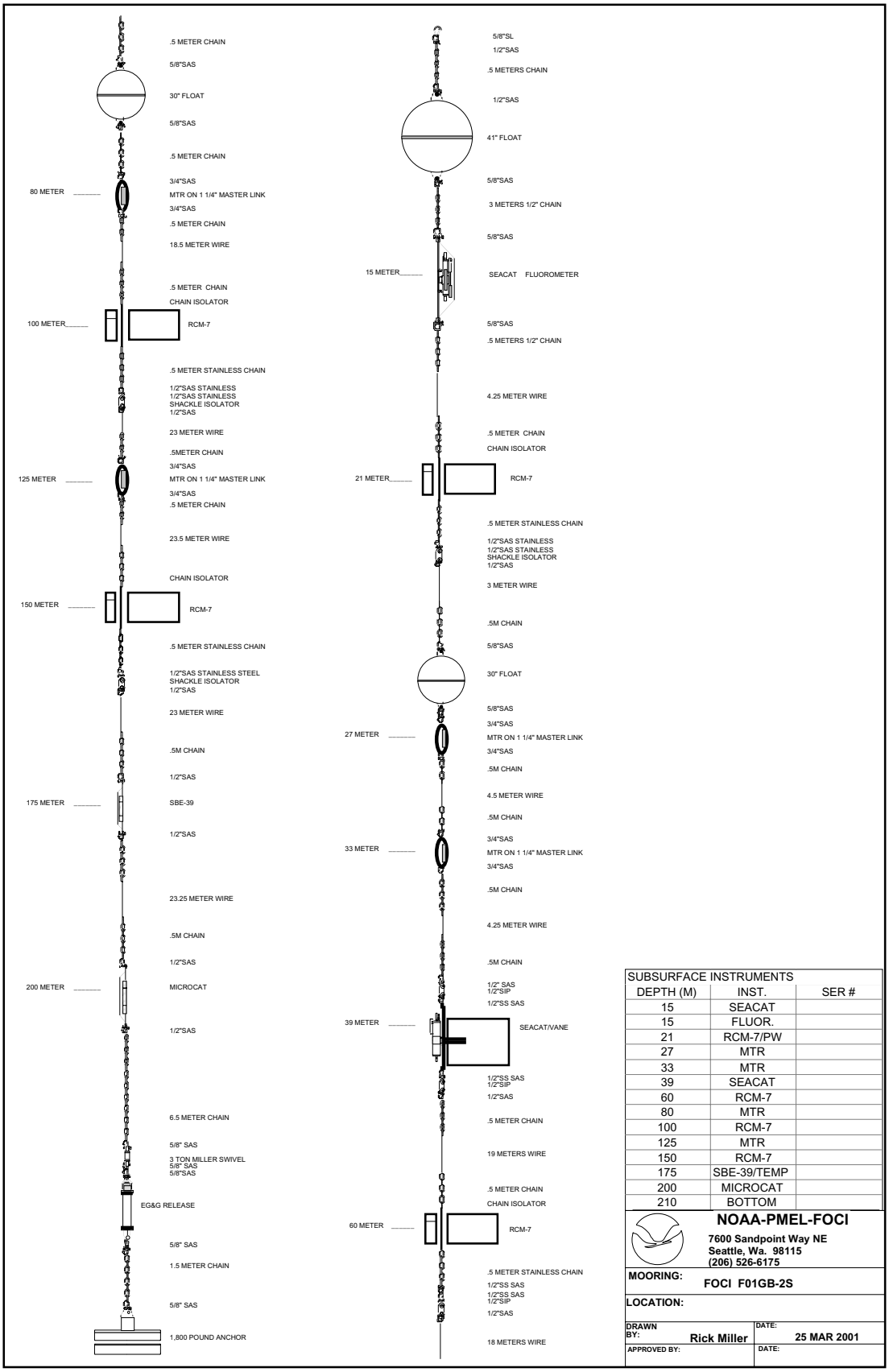
MOORING: **FOCI F-01-GBP-3S**

LOCATION:

DRAWN BY: **Rick Miller** **DATE:** **15 MAR. 2001**

APPROVED BY: **DATE:**

9.2.2 Mooring diagrams



SUBSURFACE INSTRUMENTS		
DEPTH (M)	INST.	SER #
15	SEACAT	
15	FLUOR.	
21	RCM-7/PW	
27	MTR	
33	MTR	
39	SEACAT	
60	RCM-7	
80	MTR	
100	RCM-7	
125	MTR	
150	RCM-7	
175	SBE-39/TEMP	
200	MICROCAT	
210	BOTTOM	

NOAA-PMEL-FOCI
7600 Sandpoint Way NE
Seattle, Wa. 98115
(206) 526-6175

MOORING: **FOCI F01GB-2S**

LOCATION:

DRAWN BY: **Rick Miller** **DATE:** **25 MAR 2001**

APPROVED BY: **DATE:**

9.3 Table 1:

RB01-03 CRUISE EVENTS AND TIMES WILL BE AJUSTED AS THE CRUISE PROCEEDS

							Distance	Speed	Transit time	On-sta time	Arrive	Depart
Depart Dutch Harbor	53°	55'	N	166°	31'	W						06-May 10:00
Deploy 01UP-3A/CTD (79m)	54°	18.1'	N	164°	44.6'	W	66.6	11	6.1	2.0	06-May 16:03	06-May 18:03
Deploy 01SSP-3A/CTD (204m)	57°	29.4	N	154°	48.5	W	384.5	11	35.0	3.0	08-May 05:01	08-May 08:01
Deploy 01SSP-2A/CTD (248m)	57°	37.1	N	155°	04.5	W	11.6	11	1.1	2.0	08-May 09:04	08-May 11:04
Deploy 01SSP-1A/CTD (296m)	57°	41.1	N	155°	15.2	W	7.0	11	0.6	2.0	08-May 11:42	08-May 13:42
WP	56°	15.0	N	155°	00.0	W	86.5	11	7.9	0.0	08-May 21:34	08-May 21:34
Deploy 01BCP-1A (140m)	57°	00.0	N	152°	38.0	W	90.1	11	8.2	3.0	09-May 05:46	09-May 08:46
Deploy 01UB-1A (100m)	57°	23.0	N	152°	33.0	W	23.2	11	2.1	2.0	09-May 10:52	09-May 12:52
Deploy 01CB-3A (140m)	57°	31.0	N	151°	27.0	W	36.4	11	3.3	2.0	09-May 16:10	09-May 18:10
Deploy 01CB-2A (120m)	57°	40.0	N	152°	00.0	W	19.8	11	1.8	2.0	09-May 19:59	09-May 21:59
Deploy 01CB-1B (198m)	57°	43.3	N	152°	17.6	W	10.0	11	0.9	2.0	09-May 22:53	10-May 00:53
Deploy 01GP-32A (153m)?	59°	06.3	N	150°	59.5	W	92.5	11	8.4	4.0	10-May 09:18	10-May 13:18
Deploy 01GP-34A (142m)?	58°	57.3	N	150°	55.5	W	9.2	11	0.8	3.0	10-May 14:08	10-May 17:08
Deploy 01GPP-36A (185m)?	58°	45.0	N	150°	52.0	W	12.4	11	1.1	3.0	10-May 18:16	10-May 21:16
Deploy 01FATE-M1A (2200m)	58°	29.0	N	147°	40.0	W	101.2	11	9.2	8.0	11-May 06:28	11-May 14:28
Deploy 01FATE-P1A (2200m)	58°	29.0	N	147°	40.0	W	0.0	11	0.0	4.0	11-May 14:28	11-May 18:28
Deploy 01GB-6A (300m)	59°	08.0	N	148°	25.0	W	45.4	11	4.1	2.0	11-May 22:36	12-May 00:36
Deploy 01GB-5A (250m)	59°	12.0	N	148°	30.0	W	4.8	11	0.4	2.0	12-May 01:02	12-May 03:02
Deploy 01GB-4A	59°	17.0	N	148°	41.0	W	7.5	11	0.7	4.0	12-May 03:43	12-May 07:43
Deploy 01GBM-3A	59°	26.0	N	148°	52.0	W	10.6	11	1.0	7.0	12-May 08:41	12-May 15:41
Deploy 01GBP-3A	59°	26.0	N	148°	52.0	W	0.0	11	0.0	2.0	12-May 15:41	12-May 17:41
Deploy 01GB-2A	59°	31.0	N	149°	05.0	W	8.3	11	0.8	3.0	12-May 18:26	12-May 21:26
Deploy 01GB-1A	59°	38.0	N	149°	12.0	W	7.8	11	0.7	3.0	12-May 22:09	13-May 01:09
Arrive Seward	60°	38.0	N	149°	26.0	W	64.0	11	5.8	4.0	13-May 06:58	13-May 10:58

9.4 Hazardous Materials

9.4.1 Hazardous Material Inventory - Previous Projects

The following compressed gas cylinders will remain aboard RH Brown after ACE-Asia

Compressed Gases

Currently on ship, to be off-loaded in Victoria		
He (sondes)	40 tanks	PMEL
CO2 (Neph)	2 tanks	PMEL
Helium (IC)	6 tanks	PMEL
Breathing air (DMS)	1 tanks	PMEL
H2 (OC/EC)	2 tanks	PMEL
O2 10% balance He (OC/EC)	2 tanks	PMEL
CH4 10% balance He (OC/EC)	2 tanks	PMEL
He (OC/EC)	2 tanks	PMEL
Breathing air (OC/EC)	2 tanks	PMEL
He (CO)	2 tanks	PMEL
H2 (OC/EC)	2 tanks	RU
O2 10% balance He (OC/EC)	2 tanks	RU
CH4 10% balance He (OC/EC)	2 tanks	RU
He (OC/EC)	3 tanks	RU
Breathing air (OC/EC)	8 tanks	RU
N2	2 tanks	AS
H2	2 tanks	AS
He	2 tanks	AS
N2	3 tanks	UCR
Zero Air	3 tanks	UCR
N2	5 tanks	uw pCO2
Standard air tanks	10 tanks	uw pCO2
Magnesium Perchlorate	1.5 kg	uw pCO2
Mercury thermometers	2	uw pCO2

9.4.2 Chemical Inventory — PMEL (Calvin Mordy)

MORDY-Nutrients

Nutrient chemicals left on board Ron Brown after GASEX

Acetone (1x500 ml)
Ammonium Chloride (3 x 0.2g, 0.6g)
Ammonium Molybdate (28 x 2.3g, 26 x 10.8g, 345g total)
Antimony Potassium Tartrate (0)
Ascorbic Acid (12 x 5g, 9 x 17.6, 218g total)
Brij (250 ml)
Cadmium (20g)
Copper Sulfate (20g)
Dowfax (200 ml)
Hydrochloric Acid (2 x 2.5 liter, 5 liters total)
Imidazole (15 x 13.6g, 204g total)
N-1-Naphthylethylenediamine Dihydrochloride (15 x 1g, 15 g total)
Oxalic Acid (15 x 50g, 750g total)
Phenol (18g)
Potassium Nitrate (0)
Potassium Phosphate (0)
Sodium Citrate (140g x 2, 280g total)
Sodium Fluorosilicate (4 x 0.4 g, 1.5 g total)
Sodium Hydroxide (25g)
Sodium Nitrite (2 x .1g, 0.2g)
Sodium Nitroprusside (3 x 0.5 g, 1.5 g total)
Stannous Chloride (0)
Sulfanilamide (14 x 10g, 140g)
Sulfuric Acid (2 x 500 ml, 1 liter total)
Tartaric Acid (0)

Nutrient chemicals on board Ron Brown for GLOBEC Cruise (May 6 - 23)

Acetone (2x500 ml)
Ammonium Chloride (6 x 0.2g, 0.6g)
Ammonium Molybdate (28 x 2.3g, 26 x 10.8g, 345g total)
Antimony Potassium Tartrate (1)
Ascorbic Acid (15 x 5g, 15 x 17.6, 339g total)
Brij (250 ml)
Cadmium (20g)
Copper Sulfate (40g)
Dowfax (200 ml)
Hydrochloric Acid (3 x 2.5 liter, 7.5 liters total)
Imidazole (15 x 13.6g, 204g total)
N-1-Naphthylethylenediamine Dihydrochloride (15 x 1g, 15 g total)
Oxalic Acid (15 x 50g, 750g total)
Phenol (72g)
Potassium Nitrate (6 x 3.5g, 21g total)
Potassium Phosphate (6 x 0.5g, 3g total)
Sodium Citrate (140g x 4, 560g total)
Sodium Fluorosilicate (6 x 0.4g, 2.4 g total)
Sodium Hydroxide (25g)
Sodium Nitrite (5 x .1g, 0.5g total)
Sodium Nitroprusside (8 x 0.5 g, 4 g total)

Stannous Chloride (5 x 10g, 50g total)
Sulfanilamide (14 x 10g, 140g)
Sulfuric Acid (2 x 500 ml, 1 liter total)
Tartaric Acid (150g x 6, 900g total)

Note: the chemicals listed above along with the MSD sheets, are currently aboard Ron Brown.

The only additional hazardous materials that will be loaded for this cruise are:
81 D cell lithium batteries
3 DD cell lithium batteries
21 7.5-volt lithium batteries
14 pairs of antifouling tubes for SeaCats (active ingredient tributyltin oxide)

9.4.2.2 Neutralizing Agents - PMEL

Acids: hydrochloric acid, sulfuric acid
*** Baking soda (sodium bicarbonate) is provided for neutralization.
*** Vermiculite and kitty litter are provided for absorbency material.

Bases: sodium hydroxide
*** Dilute hydrochloric acid (10%) is provided for neutralization.
*** Vermiculite and kitty litter are provided for absorbency material.

The PMEL spill response kit will be used in the event of a chemical spill.

9.4.2.3 All chemicals will be packed for shipment to Dutch Harbor under DOT rules and loaded on 4 May. Chemicals will depart ship at the end of Cruise RB-01-03 Leg 2. The principal investigator or a student will be present for both loading and offloading of chemicals.

Unused and waste chemicals will be offloaded at the end of Cruise RB-01-03 Leg 2.

All field party members will be briefed at a pre-cruise meeting on the location and quantity of hazardous chemicals. In addition, cleanup of chemical spills and use of neutralizing agents will be explained. A set of written instructions of cleanup procedures will be posted by the chemical analysis work area.

9.4.2.4 Material Safety Data Sheets (MSDS) - PMEL

MSDS Forms for PMEL/Calvin Mordy are aboard Ron Brown. A copy of the MSDS forms for the antifouling agent and lithium batteries will be forwarded with the Cruise Instructions.

9.4.2.5 The Chief Scientist has been trained to respond to a HAZMAT spill.

ALFA PRODUCTS -- 71129, BIS(TRI-N-BUTLYTIN) OXIDEALFA PRODUCTS -- 71129, BIS(TRI-N-BUTLYTIN) OXIDE
MATERIAL SAFETY DATA SHEET
ALFA PRODUCTSNSN: 681000N028519
Manufacturer's CAGE: 0HCZ6
Part No. Indicator: A
Part Number/Trade Name: 71129, BIS(TRI-N-BUTLYTIN) OXIDE

General Information

Company's Name: ALFA PRODUCTS
Company's Street: 30 BOND ST
Company's P. O. Box: 8247
Company's City: WARD HILL
Company's State: MA
Company's Country: US
Company's Zip Code: 01835
Company's Emerg Ph #: 508-521-6300
Company's Info Ph #: 508-521-6300
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 24JUL89
Safety Data Review Date: 28AUG95
MSDS Serial Number: BPCWN
Hazard Characteristic Code: F8

Ingredients/Identity Information

Proprietary: NO
Ingredient: DISTANNOXANE, HEXABUTYL-; (BIS(TRI-N-BUTYLTIN)OXIDE)
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: JN8750000
CAS Number: 56-35-9
OSHA PEL: 0.1 MG/M3 (SN), S
ACGIH TLV: 0.1 MG/M3 (SN), S

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS TO PALE YELLOW LIQUID, STRONG ODOR.
Boiling Point: 356F,180C
Melting Point: -49F,-45C
Vapor Pressure (MM Hg/70 F): SUPP DATA
Specific Gravity: 1.17 (H2O=1)
Solubility In Water: SLIGHTLY SOLUBLE
Percent Volatiles By Volume: SUPDAT

Fire and Explosion Hazard Data

Flash Point: 174F,79C
Extinguishing Media: USE WATER, CO2, DRY CHEMICAL EXTINGUISHING AGENTS, DRY SAND, OR DRY GROUND DOLOMITE.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA & FULL PROT EQUIP (FP N). IF WITHOUT RISK, REMOVE MATL FROM FIRE AREA. COOL CNTNR W/ WATER FROM MAXIMUM DISTANCE.
Unusual Fire And Expl Hazrds: NONE SPECIFIED BY MANUFACTURER.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HEAT, SPARKS, AND OPEN FLAMES.
Materials To Avoid: ACIDS, OXIDIZERS.
Hazardous Decomp Products: TIN OXIDE COMPOUNDS.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: LD50:(ORAL,RAT) 87 MG/KG
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: (ACUTE) INGEST: CAUSES LIVER & KIDNEY DMG IN LAB ANIMALS. SKIN: MAY CAUSE IRRIT/CONT DERMAT WHICH MAY BE DELAYED FOR SEVERAL HRS. MAY BE ABSORBED THRU SKIN. EYE: CAUSES SEVERE EYE IRRIT. IRRIT MAY NOT OCCUR UNTIL SEVERAL HOURS AFTER EXPOSURE. INHAL: MAY CAUSE IRRIT, NAUS, HDCH & COUGHING. (CHRONIC) NONE KNOWN.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT
Signs/Symptoms Of Overexp: SEE HEALTH HAZARDS.
Med Cond Aggravated By Exp: NONE KNOWN.
Emergency/First Aid Proc: INGEST: NO DATA AVAIL BUT ONE SHOULD OBTAIN MEDICAL ATTENTION. SKIN: REMOVE CONTAMINATED CLOTHING, FLOOD SKIN WITH IMMEDIATELY FLUSH EYES, INCLUDING UNDER EYELIDS, WITH LARGE AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. CALL MD. INHAL: NO SPECIFIED INFORMATION AVAILABLE, ONE SHOULD OBTAIN MEDICAL ATTENTION.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: WEARING FULL PROTECTIVE EQUIPMENT, COVER SPILL WITH DRY SAND OR VERMICULITE. MIX WELL AND CAREFULLY TRANSFER TO A CONTAINER.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: CONSULT STATE, LOCAL OR FEDERAL EPA REGULATIONS FOR PROPER DISPOSAL.
Precautions-Handling/Storing: KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED AREA.
Other Precautions: DANGER: POISON, IRRITATES SKIN AND EYES.

Control Measures

Respiratory Protection: NIOSH/MSHA APPROVED RESPIRATOR WITH AN ORGANIC VAPOR CARTRIDGE.
Ventilation: LABORATORY FUME HOOD.
Protective Gloves: RUBBER
Eye Protection: CHEM WORK GOG & FULL LENGTH FSHLD (FP N)
Other Protective Equipment: LAB COAT & APRON, FLAME & CHEM RESIST COVERALLS, EYEWASH CAPABLE OF SUSTAINED FLUSHING, SAFETY DRENCH SHOWER (SUPP DATA)
Work Hygienic Practices: WASH THOROUGHLY AFTER USE.
Suppl. Safety & Health Data: % VOLAT: NOT HIGHLY VOLATILE. OTHER PROT EQUIP: AND HYGIENIC FACILITIES FOR WASHING. VP: 1.1 X 10-5 @ 25C.

Transportation Data

Trans Data Review Date: 92134
DOT PSN Code: LVL
DOT Proper Shipping Name: POISONOUS SOLIDS, N.O.S.
DOT Class: 6.1
DOT ID Number: UN2811
DOT Pack Group: II
DOT Label: POISON
IMO PSN Code: LYT
IMO Proper Shipping Name: POISONOUS SOLIDS, N.O.S.
IMO Regulations Page Number: 6236
IMO UN Number: 2811
IMO UN Class: 6.1
IMO Subsidiary Risk Label: -
IATA PSN Code: UKE
IATA UN ID Number: 2811
IATA Proper Shipping Name: POISONOUS SOLID, N.O.S.
IATA UN Class: 6.1
IATA Label: POISON
AFI PSN Code: UKE
AFI Prop. Shipping Name: POISONOUS SOLIDS, N.O.S.
AFI Class: 6.1
AFI ID Number: UN2811
AFI Pack Group: II
AFI Label: POISON
AFI Basic Pac Ref: 10-12

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 19MAR92
Label Date: 19MAR92
Label Status: G
Common Name: 71129, BIS(TRI-N-BUTLYTIN) OXIDE
Chronic Hazard: NO
Signal Word: DANGER!
Acute Health Hazard-Moderate: X
Contact Hazard-Severe: X
Fire Hazard-Moderate: X
Reactivity Hazard-None: X
Special Hazard Precautions: POISON. AVOID HEAT, SPARKS AND OPEN FLAMES. ACUTE: SKIN CONTACT MAY CAUSE IRRITATION OR CONTACT DERMATITIS WHICH MAY BE DELAYED FOR SEVERAL HOURS. MAY BE ABSORBED THROUGH SKIN. EYE CONTACT MAY CAUSE SEVERE IRRITATION THAT MAY NOT OCCUR UNTIL SEVERAL HOURS AFTER EXPOSURE. INHALATION MAY CAUSE IRRITATION, NAUSEA, HEADACHE AND COUGHING. NONE LISTED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALFA PRODUCTS
Label Street: 30 BOND ST
Label P.O. Box: 8247
Label City: WARD HILL
Label State: MA

Label Zip Code: 01835
Label Country: US
Label Emergency Number: 508-521-6300

WILSON GREATBATCH LTD -- LITHIUM OXYHALIDE PRIMARY BATTERY (BCX)

==========

MSDS Safety Information

==========

FSC: 6135
NIIN: 01-218-3660
MSDS Date: 05/25/1999
MSDS Num: CKBYL
Product ID: LITHIUM OXYHALIDE PRIMARY BATTERY (BCX)
MFN: 01
Responsible Party
Cage: 2S554
Name: WILSON GREATBATCH LTD
Address: 10000 WEHRLE DR.
City: CLARENCE NY 14031-2033
Info Phone Number: 716-759-6901 FAX: 716-759-8579
Emergency Phone Number: 716-759-6901

==========

Item Description Information

==========

Item Manager: S9G
Item Name: BATTERY,NONRECHARGEABLE
Unit of Issue: EA
UI Container Qty: 1 BATTERY
Type of Container: CYLINDRICAL

==========

Ingredients

==========

Cas: 7439-93-2
RTECS #: OJ5540000
Name: LITHIUM METAL
% Wt: 0.6 G/BAT
Other REC Limits: NONE SPECIFIED
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED

Cas: 7719-09-7
RTECS #: XM5150000
Name: THIONYL CHLORIDE
% Wt: UNKNOWN
Other REC Limits: NONE SPECIFIED
OSHA PEL: C 1 PPM
ACGIH TLV: C 1 PPM; 9192

Cas: 7726-95-6
RTECS #: EF9100000
Name: BROMINE (SARA III)
% Wt: UNKNOWN
Other REC Limits: NONE SPECIFIED
OSHA PEL: 0.1 PPM/0.3 PPM STEL
ACGIH TLV: 0.1 PPM/0.3STEL;9293

Cas: 7782-50-5
RTECS #: FO2100000
Name: CHLORINE (SARA III)
% Wt: UNKNOWN
Other REC Limits: NONE SPECIFIED
OSHA PEL: (C) 1 PPM

ACGIH TLV: 0.5 PPM/1 STEL; 9293
EPA Rpt Qty: 10 LBS
DOT Rpt Qty: 10 LBS

Health Hazards Data

LD50 LC50 Mixture: ORAL LD50 (RAT) IS UNKNOWN
Route Of Entry Inds - Inhalation: NO
Skin: NO
Ingestion: NO
Carcinogenicity Inds - NTP: NO
IARC: NO
OSHA: NO
Effects of Exposure: THIS PRODUCT IS CLASSIFIED AS AN ARTICLE UNDER OSHA REGULATION 1910.1200. AS SUCH THE BATTERY IS HERMETICALLY SEALED & IS NON-HAZARDOUS. BUT THE CONTENTS ARE CORROSIVE, LITHIUM METAL REACTS VIOLENTLY WITH WATER FORMING CAUSTIC LITHIUM HYDRO XIDE. DO NOT OPEN BATTERY CONTAINER OR INCINERATE.
Explanation Of Carcinogenicity: NOT CARCINOGENIC.
Signs And Symptions Of Overexposure: BURNS TO THE SKIN MAY RESULT FROM THE HEAT GENERATED BY A SHORT-CIRCUIT. CONTENTS ARE TOXIC AND CORROSIVE AND WILL CAUSE IRRITATION AND BURNS TO BODY TISSUES. BATTERIES ARE HARMFUL IF SWALLOWED.
Medical Cond Aggravated By Exposure: NONE SPECIFIED BY MANUFACTURER.
First Aid: IN CASE OF ACCIDENTAL INGESTION OF A CELL OR ITS CONTENTS, OBTAIN PROMPT MEDICAL ADVICE OR CALL POISON CENTER.

Handling and Disposal

Spill Release Procedures: NONE SPECIFIED BY MANUFACTURER. WEAR GLOVES(NITRILE) TO HANDLE BROKEN BATTERIES. PUT THEM IN A PLASTIC BAG, SEAL IT AND SAVE FOR DISPOSAL.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Methods: DO NOT INCINERATE OR SUBJECT CELLS TO TEMPERATURES IN EXCESS OF 212F(100C). SUCH ABUSE CAN RESULT IN LOSS OF SEAL, LEAKAGE AND/OR CELL EXPLOSION. DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.
Handling And Storage Precautions: STORE IN A COOL,DRY PLACE, PREVENT CONDENSATION ON CELLS OR BATTERIES. ELEVATED TEMPERATURES CAN RESULT IN SHORTENED BATTERY LIFE.BATTERIES SHOULD ALWAYS BE PACKAGED AND TRANSPORTED IN SUCH A MANNER TO PREVENT DIRECT CONTACT WITH EACH OTHE R. SHORT-CIRCUITING WILL CAUSE HEAT & REDUCE CELL CAPACITY.
Other Precautions: IF SOLDERING OR WELDING TO THE TERMINALS OF THE CELL ISREQUIRED, EXERCISE PROPER RECAUTIONS TO PREVENT DAMAGE TO THE CELL WHICHMAY RESULT IN LOSS OF CELL CAPACITY, SEAL, LEAKAGE, AND/OR CELL EXPLOSION.DO NOT SOLDER TO THE CASE. CELLS SHO ULD NOT BE SUBJECTED TO MECHANICALSHOCK & VIBRATION.

Fire and Explosion Hazard Information

Extinguishing Media: IF CELLS ARE DIRECTLY INVOLVED IN FIRE, DO NOT USE WATER, CO2,DRYCHEMICAL OR HALOGEN EXTINGUISHERS. USE LITH-X (GRAPHITE BASE) FIRE EXTINGUISHER.
Fire Fighting Procedures: A LITH-X (GRAPHITE BASE) FIRE EXTINGUISHER OR MATERIAL IS THE ONLY RECOMMENDED EXTINGUISHING MEDIA FOR FIRES INVOLVING METAL OR CELLS. AVOID FUME INHALATION.
Unusual Fire/Explosion Hazard: IF A FIRE IS IN ADJANCENT AREA, AND CELLS ARE PACKED IN THEIR ORIGINAL CONTAINERS, THE FIRE CAN BE FOUGHT BASED ON FUELING MATERIAL, E.G.,PAPER & PLASTIC PRODUCTS. AVOID FUME INHALATION..THIS CELL

IS A PRIMARY CELL & IS NOT DESIGNED TO BE C HARGED OR RECHRGED. TO DO SO MAY CAUSE CELL TO LEAK OR EXPLODE.

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Control Measures
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Respiratory Protection: NONE SPECIFIED BY MANUFACTURER.
Ventilation: NONE SPECIFIED BY MANUFACTURER.
Protective Gloves: NONE SPECIFIED BY MANUFACTURER.
Eye Protection: NONE SPECIFIED BY MANUFACTURER.
Other Protective Equipment: JEWELRY, SHOULD BE REMOVED /INSULATED BEFORE HANDLING BATTERIES TO PREVENT ANY SHORT-CIRCUITING THROUGH CONTACT WITH BATTERY TERMINALS. BURNS TO SKIN MAY RESULT FROM HEAT GENERATED BY SHORT-CIRCUIT.
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.ICES.
Supplemental Safety and Health: MECHANICAL CONTAINMENT: ENCAPSULATION (POTTING OF THESE CELLS) WILL NOT ALLOW FOR CELL EXPANSION. SUCH ENCLOSURE CAN RESULT IN HIGH PRESSURE EXPLOSION FROM HEATING DUE TO INADVERTENT CHARGING OR HIGH TEMPERATURE ENVIRONMENTS (I.E., IN EXCES S OF 100C.)

==========
Physical/Chemical Properties
==========
HCC: Z6
Decomp Text: UNKNOWN
Appearance and Odor: CYLINDRICAL BATTERY BCX72/AA (0.538X1.921 INCH).
Corrosion Rate: UNKNOWN

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Reactivity Data
==========
Stability Indicator: YES
Stability Condition To Avoid: BATTERIES SHOULD ALWAYS BE PACKAGED & TRANSPORTED IN SUCH AS MANNER AS TO PREVENT DIRECT CONTACT WITH EACH OTHER.
Materials To Avoid: JEWLERY, SUCH AS RINGS AND BRACELETS, SHOULD BE REMOVED OR INSULATED FROM BATTERIES TO PREVENT SHORT CIRCUITING.
Hazardous Polymerization Indicator: NO

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Toxicological Information
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Ecological Information
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MSDS Transport Information
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Regulatory Information
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==========
Other Information
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Transportation Information
==========
Responsible Party Cage: 2S554
Trans ID NO: 151473
Product ID: LITHIUM OXYHALIDE PRIMARY BATTERY (BCX)
MSDS Prepared Date: 05/25/1999
Review Date: 02/12/2000
MFN: 1

Multiple KIT Number: 0
Unit Of Issue: EA
Container QTY: 1 BATTERY
Type Of Container: CYLINDRICAL
Additional Data: EACH BATTERY/CELL CONTAINS 0.66 GRAMS OF LITHIUM. PSN PER MANUFACTURER.

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Detail DOT Information

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DOT PSN Code: IJN
DOT Proper Shipping Name: LITHIUM BATTERY
Hazard Class: 9
UN ID Num: UN3090
DOT Packaging Group: II
Label: CLASS 9
Special Provision: 29
Packaging Exception: NONE
Non Bulk Pack: 185
Bulk Pack: NONE
Max Qty Pass: 5 KG
Max Qty Cargo: 35KGGROSS
Vessel Stow Req: A

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Detail IMO Information

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IMO PSN Code: JAM
IMO Proper Shipping Name: LITHIUM BATTERIES
IMDG Page Number: 9033
UN Number: 3090
UN Hazard Class: 9
IMO Packaging Group: II
Subsidiary Risk Label: -
EMS Number: 4.1-06
MED First Aid Guide NUM: NON

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Detail IATA Information

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IATA PSN Code: PFV
IATA UN ID Num: 3090
IATA Proper Shipping Name: LITHIUM BATTERIES +
IATA UN Class: 9
IATA Label: MISCELLANEOUS
UN Packing Group: II
Packing Note Passenger: 903
Max Quant Pass: 5KG G
Max Quant Cargo: 35KG G
Packaging Note Cargo: 903
Exceptions: A45

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Detail AFI Information

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AFI PSN Code: PFT
AFI Proper Shipping Name: LITHIUM BATTERIES,
AFI PSN Modifier: LIQUID OR SOLID CATHODE
AFI Hazard Class: 9
AFI UN ID NUM: UN3090
AFI Packing Group: II
Special Provisions: P5

Back Pack Reference: A13.8

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HAZCOM Label

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Product ID: LITHIUM OXYHALIDE PRIMARY BATTERY (BCX)
Cage: 2S554
Assigned IND: Y
Company Name: WILSON GREATBATCH LTD
Street: 10000 WEHRLE DR.
City: CLARENCE NY
Zipcode: 14031-2033
Health Emergency Phone: 716-759-6901
Label Required IND: Y
Date Of Label Review: 02/12/2000
Status Code: A
Origination Code: F
Signal Word: NONE
Health Hazard: None
Contact Hazard: None
Fire Hazard: None
Reactivity Hazard: None
Hazard And Precautions: THIS PRODUCT IS CLASSIFIED AS AN ARTICLE UNDER OSHA REGULATION 1910.1200. AS SUCH THE BATTERY IS HERMETICALLY SEALED & IS NON-HAZARDOUS. BUT THE CONTENTS ARE CORROSIVE, LITHIUM METAL REACTS VIOLENTLY WITH WATER FORMING CAUSTIC LITHIUM HYDRO XIDE. DO NOT OPEN BATTERY CONTAINER OR INCINERATE. FIRST AID:IN CASE OF ACCIDENTAL INGESTION OF A CELL OR ITS CONTENTS, OBTAIN PROMPT MEDICAL ADVICE OR CALL POISON CENTER. WASH THOROGHLY IF IN CONTACT WITH THE CONTENTS OF BATTERY.

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9.5 PMEL Standard Operating Procedures for the Ronald H. Brown

FOCI STANDARD OPERATING INSTRUCTIONS FOR NOAA SHIP *RONALD H. BROWN*

Date Last Modified: April 3, 2001

(Adapted from FOCI Standard Operating Instructions for NOAA Ship *Miller Freeman*)

PARTICIPATING ORGANIZATIONS:
NOAA - Alaska Fisheries Science Center (AFSC)
NOAA - Pacific Marine Environmental Laboratory (PMEL)
University of Alaska Fairbanks (UAF)
University of Washington (UW)
Southampton Oceanography Centre

PROGRAM DESCRIPTION

Fisheries-**O**ceanography **C**oordinated **I**nvestigations (FOCI) is an effort by NOAA and academic scientists. At present, FOCI consists of a Shelikof Strait (western Gulf of Alaska) walleye pollock project, and a NOAA Coastal Ocean Program project: Southeast Bering Sea Carrying Capacity. FOCI also supports associated projects, such as the Arctic Research Initiative, U.S. GLOBEC and North Pacific Marine Research Program, that address scientific issues related to FOCI's. FOCI's goal is to understand the effects of abiotic and biotic variability on ecosystems of the North Pacific Ocean and Bering Sea in order to discern the physical and biological processes that determine recruitment variability of commercially valuable finfish and shellfish stocks in Alaskan waters.

1.0 PERSONNEL

1.1 & 1.2 CHIEF SCIENTIST AND PARTICIPATING SCIENTISTS:
See specific FOCI Cruise Instructions for Chief Scientist and scientific personnel.

The Chief Scientist has the authority to revise or alter the technical portion of the instructions as work progresses provided that, after consultation with the Commanding Officer, it is ascertained that the proposed changes will not: (1) jeopardize the safety of personnel or the ship; (2) exceed the overall time allotted for the project; (3) result in undue additional expenses or (4) alter the general intent of these project instructions.

1.3 NOAA MARINE OPERATIONS CENTER-ATLANTIC CONTACTS:

CDR Jon Rix, Chief
Chief, Operations Division
Marine Operations Center-Atlantic
439 W York St
Norfolk VA 23510
Phone: (757) 441-6842
Fax: (757) 441-6495
E-mail: Jon.E.Rix@noaa.gov

LCDR Jim Meigs
Marine Operations Center-Atlantic
439 W York St
Norfolk VA 23510
Phone: (757) 441-6844

Fax: (757) 441-6495
E-mail: Jim.Meigs@noaa.gov

1.4 FOCI FIELD OPERATIONS LEADERS:

Dr. Phyllis Stabeno
PMEL
7600 Sand Point Way NE
Seattle, WA 98115-6349
Phone: (206) 526-6453
Fax: (206) 526-6485
E-mail: Phyllis.Stabeno@ noaa.gov

Dr. Jeff Napp
AFSC
7600 Sand Point Way NE
Seattle, WA 98115-6349
Phone: (206) 526-4148
Fax: (206) 526-6723
E-mail: Jeff.Napp@ noaa.gov

2.0 OPERATIONS

Scheduling of individual activities will depend upon weather conditions and progress of scientific work. Therefore, firm advance scheduling of events will not be possible, and a continual dialogue between scientific and ship's personnel will be important. To insure fulfillment of all scientific objectives, the ship is asked to steam at maximum cruising speed whenever time in transit or between stations is greater than one hour.

2.1 SUMMARY OF ACTIVITIES:
A summary of activities for each FOCI cruise is provided in the FOCI Cruise Instructions.

2.2 PROCEDURES FOR OPERATIONS:
The following is a comprehensive list of FOCI operations including gear and procedures for collecting data. A listing of specific operations to be conducted on each cruise is listed in the FOCI Cruise Instructions. Changes or alterations to these standard procedures will be noted in the Cruise Instructions.

2.2.1 CTD / Water Sample Operation
A Sea-Bird 9Plus CTD with dual thermistor and conductivity cells will be the primary system. The primary system will be provided and maintained by PMEL. A backup Sea-Bird 9Plus CTD is required and shall be maintained by the vessel. When available, and where possible, the FOCI fluorometer, light meter, and chlorophyll absorbance meter (ChlAM) should be mounted on the CTD stand for all casts. However, the ChlAM cannot exceed 300 m, the fluorometer cannot exceed 500 m, and the light meter cannot exceed 1000 m. On selected casts, biological samples will be collected. Water for microzooplankton samples will be collected using 10-l Niskin bottles. When only nutrient or chlorophyll water samples are required, smaller Niskin bottles may be used.

Once the CTD has been deployed, it should be lowered to 10 m, and then the deck unit should be turned on. If a ChlAM is attached, the CTD should remain at 10 m for three minutes; otherwise after 45 seconds the CTD can be returned to just below the surface. Then the data acquisition program and VHS cassette CTD tape backup system should be started. The CTD should descend at a rate of 30 m/min for the first 200 m and 45 m/min below that. The ascent rate should be 50 m/min. One exception to the descent rates occurs on the Bering Shelf in water less than 150 m deep. In this case, the CTD should descend at

10 m/min during the entire cast. An entry in the MOA should be made for each CTD cast at the maximum cast depth.

CTD data will be acquired using SEASOFT software on the ship's computer. The capability to display CTD data using the SCS system and monitors will be available. Survey technicians and scientists will keep the "CTD Cast Information/Rosette Log". Pressure, primary salinity, primary temperature, secondary temperature, fluorescence, ChlAM chlorophyll concentration and light levels will be recorded on the "CTD Cast Information/Rosette Log" for all water bottle samples.

CTD Calibration: Salinity samples will be taken on every cast (or as specified by the Chief Scientist). No reversing thermometers will be required. The CTD systems will be equipped with dual thermistors. A survey technician will run AutoSal analysis during the cruise and record the readings on an AutoSal log.

2.2.2 MARMAP Bongo Tow

A 60-cm bongo net with 0.505-mm nets (or 0.333-mm before mid May), hard plastic codends, and a 40-kg lead weight for a depressor will be used in standard MARMAP tows. The nets will be deployed at a constant wire speed of 40 m/min to a maximum depth of 100 m (or 200 m before mid May) or 10 m off bottom in shallower waters. However, at stations on Lines 8, 16 and 17 in Shelikof Strait, nets will be towed from 10 m off bottom to the surface. In addition, one side of the 60-cm bongo will be changed to 0.333-mm mesh. Furthermore the 20-cm bongo with 0.150-mm mesh nets will be attached to the wire 1 m above the 60-cm bongo frame at Line 8, and at selected other stations. A CTD (SeaCat) or electronic BKG will be attached to the wire to provide real-time tow data. The scientists will monitor the depth of the nets, and issue commands to stop the winch. The winch will be stopped and the nets allowed to stabilize for up to 30 sec. The nets are then retrieved at a wire speed of 20 m/min. The ship speed is adjusted to maintain a wire angle of 45 degrees during the entire tow. When the nets reach the surface they are brought aboard and hosed to wash the sample into the codend. The sample is preserved appropriately. In some cases, larvae are sorted and preserved separately. Flow meters in the nets record the amount of water filtered and an electronic CTD or bathykymograph records the depth history of the tow. The Scientists on watch are responsible for recording times and maximum depth obtained in the SeaCat logbook. Tows not meeting specifications may be repeated at the discretion of the scientific watch.

The PMEL SeaCat data will be acquired on the ship’s computer using SEASOFT software. The option to display SeaCat data using the SCS system and monitors will be available.

2.2.3 Bongo Larval Condition Tow

A live tow for larval pollock uses the 60-cm bongo with 0.333-mm or 0.505-mm net mesh with taped codends. The selection of the mesh size will depend on the time of field collections, larval size, amount of algae, etc. This is a vertical tow with the ship's speed used only to maintain a zero wire angle. The SeaCat is on the wire and data is saved for each haul. The bongo is lowered at 25-30 m/min to a gear depth of 70 meters. The wire-in speed should be 10 m/min. Begin timing the tow when the net starts up. Do not rinse down the nets when they return to the deck, but do open the codends immediately into clean (live) 5-gallon buckets. The samples are carefully transferred into a bowl over ice and are sorted quickly for live larvae. Preserve larvae immediately, as specified in FOCI field manual or sample collection request forms. Rinse the net between tows.

2.2.4 Live Zooplankton Ring Net Tow

Tows to collect experimental animals for secondary productivity experiments will be taken during large-scale surveys and patch studies. These collections use a special net that minimizes damage to the organisms. The net will be deployed using the same CTD winch used for bongo tows. The ship will be asked to keep station for this vertical tow. A 0.8-m ring net with a large polycarbonate codend and the SeaCat will be "book clamped" to the wire. The net will be lowered at a rate of 20 m/min to near the bottom, and then retrieved at a rate of 10-20 m/min.

2.2.5 MOCNESS Tow

Deck Machinery -- The Multiple Opening/Closing Net and Environmental Sensing System (MOCNESS) is deployed whenever possible using the Traction winch and the A-frame. The instrument will require 600-1500 m of single conductor wire. In addition, a set of slip rings is requested for the winch. The manufacturer states that the maximum drag observed on a 1-m^2 MOCNESS system was 3,000 pounds. If we include a 2-3X safety factor, the conducting cable should have a minimum breaking strength of 6,000-9,000 pounds.

Electronics -- The MOCNESS telemeters, in real time, conductivity, temperature, depth, and flow meter data to the surface. FOCI owns two, separate electronic systems for the MOCNESS frame. The older system consists of two 6" OD pressure cases that sit in separate cradles on the net frame and telemeter data to the ship at 1 frame every four seconds. The signal is received on a MOCNESS PC computer by a data acquisition deck box and simultaneously routed to an old 286 Compaq luggable computer and a VCR for analog signal backup. A dot matrix printer is used to print data from every other scan. Serial input (RS-232) from the ship's scientific GPS unit is required to obtain continuous position data for the data stream. The data acquisition system (DAS) software requires a single NMEA-0183 string ($GPGGA) for input to COM2. All acquisition programs are written in TurboPascal 5.0 and exist as both source code and compiled executable code. All DAS hardware components sit in the electronics rack.

The newer system consists of two 4" OD pressure cases that sit in the same cradle on the MOCNESS frame and telemeter data to the ship as fast as 1 frame per second. The signal is received by a serial modem and is routed to a PC Pentium computer under the bench on the starboard bulkhead. The analog signal is not recorded. The MOCNESS acquisition station shares a monitor with the CTD/SeaCat data acquisition system. Serial input of GPS data is required as for the older system. The data acquisition software is written in Visual Basic running under Windows 3.1, and we only have the compiled executable file.

Launch, Fishing, & Recovery -- The movable MOCNESS support frame will be used. The MOCNESS is launched and recovered from the stern. For safe, efficient launch and recovery of the MOCNESS, the survey technician is asked to lead those procedures, giving orders to the trawl house while the scientific watch handles the tag lines. When the weather is rough, a member of the deck dept may be requested to assist in the deployment and recovery.

The MOCNESS pilot will relay instructions to the winch operator and the bridge to control the descent/ascent of the net system. It is essential that the ship maintain a constant speed through the water during the tow. Wire-in/out rates must be available to the winch operator and should be available to the MOCNESS pilot as well. The MOCNESS is deployed and recovered while under way (1.5 knots). Wire is paid out at a rate of 5-25 m/min and is retrieved at 5-20 m/min under the direction of the pilot. The MOCNESS pilot will inform the bridge as each net is closed and request that the bridge record the position in the MOA. After recovery, the MOCNESS nets are washed down on the aft deck.

2.2.6 CalCOFI Vertical Egg Tow (CalVET)

Vertical tows to collect microzooplankton and free-floating copepod eggs will be conducted, sometimes in conjunction with CTD/bottle casts. When done in conjunction with a CTD cast, the CTD will be stopped at 15 m during its descent, and the net frame's top and bottom will be attached to the wire so that the net flushes during its descent while the ship stands hove to. After descent to desired depth (usually 60 m), the net will then be retrieved at a rate of 60 m/min. The samples will be washed into the codends, and then preserved in 32-oz jars with formalin for later analysis. Once the net frame has been removed from the wire, then the CTD/bottle cast can begin. The CalVET net can also be deployed from the starboard quarterdeck. When done without the CTD, the SeaCat should be attached below the net.

2.2.7 Chlorophyll Sample

Chlorophyll samples will be taken from the 10-l Niskin bottles. Sampling depths depend on the fluorescence or ChlAM profile. A typical strategy would be samples at 0, 10, 20, 30, 40, and 50 or 60 m, depending upon which is closest to the fluorescence or chlorophyll maximum. If the maximum is deeper than 60 m, sampling should be moved deeper with fewer samples in the mixed layer.

When microzooplankton samples are to be collected from the same Niskin bottle, 500 ml of water is first removed from the water bottle using a graduated cylinder. Chlorophyll and nutrient samples are obtained from the 500 ml in the graduated cylinder. See the FOCI Field manual for sampling collection, filtration and preserving details. Chlorophyll and nutrient samples will be stored in conventional freezers.

2.2.8 Satellite-Tracked Drifter Buoy

Two to three working days before deployment, the Chief Scientist or designated person will secure the drifter on the back deck, turn it on (usually by removing the magnet), and send an e-mail message to Dr. Phyllis Stabeno (stabeno@pmel.noaa.gov) stating the serial number that is stamped on the drifter and the time that it was turned on. The method of deployment of the drifter is dependent upon the particular make of drifter and is to be directed by the Chief Scientist or designated person.

2.2.9 ADCP Operation

ADCP Observations: The purpose of the Vessel-Mounted Acoustic Doppler Current Profiler (VM-ADCP) is to measure the ocean current velocity continuously over the upper 300 m of the water column, usually in 8-m depth increments. Current velocities relative to the earth at this spatial and temporal resolution cannot be measured by CTD sections, current meter moorings, or drifting buoys. ADCP data is also used to estimate the abundance and distribution of biological scatterers over the same depth range and in the same depth increments.

ADCP Data Collection: ADCP measurement requires four instruments working in concert: the ADCP, the ship's gyrocompass, a GPS receiver, and a GPS Attitude Determination Unit (ADU), such as the Seapath 200. The ADCP is connected to a dedicated PC and controlled by RD Instruments' Data Acquisition System (DAS) software. Version 2.48 of DAS software will be used as the controlling software. The DAS software shall be configured to use the user-exit programs AGCAVE.COM and UE4.EXE. Separate written instructions detailing the ADCP setup and configuration files are kept in the ADCP notebook in the Computer lab.

The ADCP PC is interfaced to the ship's gyrocompass, to the primary scientific GPS receiver, and to the GPS Attitude Determination Unit. The navigation GPS shall be configured to send only NMEA-0183 messages $GPGGA and $GPVTG at the maximum fix update rate for the receiver (usually a 1- or 2-second rate), and with the maximum number of digits of precision (optimally 4). The Attitude Determination Unit shall be configured to send the $PASHR message at least once, preferably twice per second, and the NMEA-0183 message $GPGGA once each second. The user-exit program UE4.EXE shall be configured to control acquisition and processing of GPS and ADU messages, and to synchronize the PC clock with the time reported by the primary GPS.

The ADCP PC logs data from the profiler to Iomega Zip disks. PMEL supplies the Iomega Zip drives for FOCI projects. No more than one Iomega Zip disk will be required for the cruise. At the end of the cruise, a backup of the Iomega Zip disks should be made to a unique subdirectory of another disk maintained by the ship for this purpose until the original data is certified "error free" at PMEL.

Detailed, post-cruise processing of ADCP data is designed to take advantage of a higher quantity of navigation data than is retained by the ADCP acquisition software. Thus, the ship's SCS is relied on to log GPS navigation data at maximum available rates. The SCS system shall log output from the best two navigation receivers at all times during a cruise. For the purpose of designating a primary and secondary GPS system, precedence shall be assigned according to the following list of GPS receivers available on *Ron Brown*:

1. P-code GPS receiver
2. Differential GPS receiver (DGPS)
3. P-code GPS receiver operating without encryption key (SPS-GPS)
4. Differential GPS receiver without differential corrections (SPS-GPS)

Changes in the availability of GPS equipment shall be communicated to PMEL to allow the above list to remain current. It is the responsibility of the ship to install and enable the appropriate encryption key for use of a PPS-GPS receiver.

The SCS file SENSOR.DAT should be configured to enable logging only of the NMEA-0183 format messages $GPGGA and $GPVTG from navigation sources; derived sensor messages are not desirable for post-cruise processing. Similarly, only raw messages from the gyrocompass ($HEHDT) are desirable for logging. SCS should log the primary GPS data at 1-second intervals, the secondary GPS data at 10-second intervals, and gyro data at 10-second intervals. The latter are used for adjusting the acoustic backscattered signal strength to absolute levels and relating the signal to biological scatterers.

ADCP Underway Operations: The ADCP operates continuously during the entire cruise. At the start of a cruise, the system shall be configured and started according to the provided checklists "Before Leaving Port" and "Underway to Operations Area". The ADCP and its interface to the gyro and navigation must be checked daily by completing the "ADCP Daily Log" and also at the end of the cruise with the ship tied to the pier.

In case of problems please describe the problem, error message numbers, flashing lights, etc. on the log sheets. Also contact Ned Cokelet (206-526-6820, e-mail cokelet@pmel.noaa.gov) at PMEL as soon as possible.

Dedicated ADCP transects should be run at constant heading (not constant course-over-ground) if practical, thus minimizing gyro lag. However, transects along lines of current-meter moorings should remain on the line with the ship's heading gradually adjusted to accomplish this. Sharp turns should be avoided. The ship's speed should be constant. Twelve knots is often satisfactory, but the ship may have to slow down if the ADCP's "percent good pings" decreases below 75% in the upper 200-250 m due to sea state.

The ADCP should operate in bottom-track mode when the water depth is less than about 500 m for more than a few hours. This gives currents that are better compensated for transducer misalignment but somewhat lower in statistical significance because the number of pings is reduced. For extended periods in deeper water, an ADCP configuration without bottom tracking should be used.

ADCP Backtrack-L Calibration: One backtrack-L calibration maneuver per cruise may be executed to test the instruments and to calibrate the transducer misalignment angle for which a 0.5° error can seriously bias the measurements. The "misalignment angle" may change with the ship's trim as well as with remounting the ADCP transducers. The basic idea is to measure the current twice on closely spaced parallel tracks of opposite heading when the ADCP and GPS are working well. The maneuver consists of 4 legs (N, S, E and W headings) connected by simple U-turns forming an L shape. Each leg should be 30 minutes long. The first 10 minutes are to allow the ship and instruments to stabilize on the new heading. The entire calibration should require about 2 1/2 hours with 5 minutes allowed for each turn. The following should be considered:

1. Negligible currents are best, but stronger currents are acceptable as long as they are reasonably uniform and steady. Avoid regions of strong horizontal shear due to topography, flow through passes, eddies and current boundaries. In tidal currents, measure when the current is steadiest often at maximum flood and ebb rather than at slack water.

2. Calibration legs can be done in any order provided opposite-headed legs are sequential.
3. Opposite-headed legs should be parallel and closely spaced, but not retraced. Use U-turns to minimize gyro oscillations. Avoid Williamson and hairpin turns.
4. The ADCP's PC screen should show at least 75%-good pings down to 250 m.
5. The ship should go fast enough to detect a misalignment error (over 5 kts), but slow enough to satisfy condition 4. This depends on sea conditions. Ten to twelve knots is often satisfactory.
6. Choose a time when GPS is navigating and is expected to remain so over the next 2 hours.

2.2.10 Radiometer

Ron Brown will provide a radiometer to measure solar energy. The data stream should be logged by the SCS.