WOODS HOLE OCEANOGRAPHIC INSTITUTION

Project Instruction

Date Submitted:	23 August 2012
Platform:	NOAA Ship *Ronald H. Brown*
Project Number:	RB-13-05
Project Title:	NTAS/MOVE
Project Dates:	7 October – 27 October 2013

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Commanding Officer
Marine Operations Center - Atlantic

Project Instruction

NTAS-13
Northwest Tropical Atlantic Station (NTAS): Thirteenth Setting with Meridional Overturning Variability Experiment (MOVE)

Project RB-13-05

NOAA Ship *Ronald H. Brown*
Chief Scientist: Albert J Plueddemann

I. OVERVIEW

NOAA Ship *Ronald H. Brown* (RHB) will participate in mooring operations associated with the Northwest Tropical Atlantic Station (NTAS) and the Meridional Overturning Variability Experiment (MOVE) projects. There are multiple primary objectives for the projects (see Sec. I.D) associated with recovery and re-deployment of the NTAS mooring and servicing of MOVE moorings and Pressure Inverted Echo Sounder (PIES) bottom landers. Other operations include CTD casts and data collection from shipboard sensors. There are also supplemental objectives (Sec. I.D).

I.A. Project Period

The NTAS-13 project is currently scheduled for 19 DAS from 7 October to 27 October 2013 on NOAA Ship *Ronald H. Brown*. This includes a transit leg (departing Natal, Brazil 10/7 and arriving Bridgetown Barbados 10/14) a round-trip Bridgetown to Bridgetown (10/17 – 10/27). The cruise schedule assumes an 11 kt average transit speed.

I.B. Service Level Agreements

Of the 19 DAS scheduled for this project 19 DAS are funded by OMAO and 0 are funded by the Program.

I.C. Operating Area

The NTAS-13 operating area is the Northwest tropical Atlantic within the region bounded by approximately 15° – 27° N and 50° – 77° W. NTAS operations are centered near 15°N, 51°W,

MOVE operations are approximately along an East-West line at 16°N from 52°W to 61°W. Mooring locations and maps are provided in Appendix D.

I.D. Summary of Objectives

Following the Natal to Bridgetown transit leg, RHB will depart from Bridgetown and transit to the NTAS mooring site near 15° N, 51° W (Fig. D.1). At a convenient time during transit, a station stop will be made for a CTD test cast and acoustic release tests. A self-contained CTD supplied by the NTAS Project will be used with the RHB CTD boom and winch. Upon arrival at the site, the NTAS-13 mooring will be deployed, and the anchor position determined by acoustic ranging. A "sensor intercomparison" period will follow deployment, during which RHB will alternately stand off at close range from the newly deployed NTAS-13 buoy and the NTAS-12 buoy (separated by ~5 nm, Fig. D.2). Data from shipboard meteorological and hull sensors will be logged and evaluated during this period. A sequence of CTD casts will be performed near the moorings using instrumentation supplied by the science party. At the end of the intercomparison period, the NTAS-12 mooring will be recovered. The buoy will be inspected and mooring instrumentation will be cleaned and transferred to the lab.

After completing work at the NTAS site, RHB will transit to the eastern MOVE site (MOVE-1, near 15° 30' N, 51° 30' W; Fig. D.1). Data will be retrieved acoustically from Pressure Inverted Echo Sounder (PIES) instruments and from a subsurface mooring. When activities are complete at the MOVE-1 site, RHB will transit to the western MOVE sites (MOVE-3/4, near 16° 30' N, 60° 30' W; Fig. D.1). Data will be retrieved acoustically from PIES instruments and from subsurface moorings. When MOVE operations are complete, RHB will return to Bridgetown.

The primary objectives (in expected chronological order) are listed below. Nominal times for these activities are given in the cruise timeline (Appendix C). Site locations are listed in Appendix D.

Objective 1. To deploy the NTAS-13 mooring.

Objective 2. To log data from the NTAS-12 buoy, the NTAS-13 buoy and RHB shipboard meteorological system during an intercomparison period during which a sequence of CTD casts will also be made.

Objective 3. To recover the NTAS-12 mooring.

Objective 4. To retrieve data via acoustic link from two PIES and a subsurface mooring at the MOVE-1 site.

Objective 5. To retrieve data via acoustic link from two PIES and a subsurface mooring at the MOVE-3 site.

Objective 6. To retrieve data via acoustic link from a subsurface mooring at the MOVE-4 site.

There are also supplemental program objectives that would be desirable to accomplish on the cruise. These objectives will be completed only if time and conditions permit.

The Chief Scientist has been asked to deploy Argo floats at several locations along the RHB transit route. Desirable locations will be suggested by the Argo float group based on the

proposed cruise track. Deployments will be made as close to the desired locations as is feasible without compromising the primary cruise objectives.

The specific supplemental objective is:

Objective S1. To deploy Argo floats at pre-determined locations along the cruise track.

I.E. Participating Institutions:

Woods Hole Oceanographic Institution (WHOI)
Scripps Institution of Oceanography (SIO)

I.F. Personnel

The Chief Scientist is Dr. Albert J. Plueddemann, who is affiliated with the Woods Hole Oceanographic Institution (WHOI). There will be 5 participants in the science party; a list is given in the table below. All participants will submit a medical history form and be medically approved before embarking. An asterisk (*) designates Foreign Nationals.

Participating Scientists

Name	Gender	Nationality	Affiliation
1. Al Plueddemann	M	USA	WHOI
2. Ben Pietro	M	USA	WHOI
3. Sebastian Bigorre	M	France*	WHOI
4. Nan Galbraith	F	USA	WHOI
5. Ethan Morris	M	USA	SIO

*Permanent Lawful Resident of the USA (Green Card)

I.G. Administrative

The Chief Scientist is authorized to revise or alter the scientific portion of the project plan 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; (4) alter the general intent of these instructions.

I.G.1 Points of Contact
Scientists and other cruise participants should check with the Marine Operations Center - Atlantic (MOC-A) Chief of Operations in Norfolk, VA (http://www.moc.noaa.gov/MOC-A/moa.html , Tel. 757-441-6842) or the ship's homepage (http://www.moc.noaa.gov/rb) for updates on planned arrival and departure times of *Ronald H. Brown*. Travelers should allow for possible flight delays due to weather, holidays, or other considerations. The ship's e-mail address is NOAA.Ship.Ronald.Brown@noaa.gov.

Ship Operations:
Marine Operations Center, Atlantic
CDR Nancy Hann, Executive Officer

439 West York St.
Norfolk, VA 23510-1114
757-441-6842 (voice), 757-441-6495 (fax)
XO.MOC.Atlantic@noaa.gov

Science Operations: NTAS
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202A Clark Lab, MS-29
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Woods Hole, MA 02543-1541
508-289-2789 (voice), 508-457-2181 (fax)
aplueddemann@whoi.edu

Logistics, NTAS and overall coordination:
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Woods Hole, MA 02543-1541
508-289-2732 (voice), 508-457-2181 (fax)
bpietro@whoi.edu

Science Operations: MOVE
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La Jolla CA, 92093
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usend@ucsd.edu

Logistics, MOVE
Gabriela Chavez
Scripps Institution of Oceanography, UCSD
9500 Gilman Drive, Mail Code: 0230
La Jolla CA, 92093
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gchavez@ucsd.edu

Ronald H. Brown

In Charleston:	USCG Vessel Support Facility, Pier P and Hobson Ave (fax) 757 299 8455	
Cellular:	843 297 1875 (CO) (OOD: 843-297-1835)	
CO:	CAPT Mark Pickett	co.ronald.brown@noaa.gov
XO:	LCDR Jason Appler	xo.ronald.brown@noaa.gov
Ops:	LT Paul Chamberlain	ops.ronald.brown@noaa.gov

Additional phone numbers can be found on the MOC web page at:
http://www.moc.noaa.gov/MOC/phone.html#RB .

Details on operations, safety, facilities, etc on RHB can be found at:
http://www.moc.noaa.gov/rb .

I.G.2 Diplomatic Clearances
The project involves Marine Scientific Research in waters under the jurisdiction of France (MOVE sites 3 and 4 offshore of Guadeloupe) and Barbados (underway measurements from shipboard systems to be made while transiting). Diplomatic clearance requests for the coastal areas of Guadeloupe and Barbados were submitted on 1 April 2013 in coordination with NOAA OMAO. Approval has not yet been received.

I.G.3 Licenses and Permits
Not applicable.

II. OPERATIONS

II.A. Project plan itinerary

A project plan itinerary is provided in Appendix C. A speed of 11 knots has been assumed for transit.

A list of principal waypoints and selected details of the project track are included in Appendix D.

II.B. Staging and destaging

No staging or loading of scientific equipment or embarkation of scientific personnel will take place in Natal, Brazil. Staging, loading and other preparation of scientific equipment for this project will take place in Bridgetown, Barbados on 12 October 2013. At the discretion of RHB, partial loading and access to the ship may be possible before this date. This will set up in the main lab and efficient completion of pre-cruise preparation. It is also possible that the buoy and a few ancillary items may not be ready for loading until 13 October, although efforts will be made to avoid this. As part of the staging operation, it will be necessary to mount several antennas and run cables from these antennas to the main lab. Antenna mount locations and cable runs will be determined by consultation with the Operations Officer and ET.

Copies of equipment lists, including serial numbers and country of origin, will be provided to the Executive Officer (XO) by the Chief Scientist if needed for foreign clearance purposes. It will be the responsibility of each project (NTAS, MOVE) to arrange for shipping their equipment to RHB, including all customs requirements, documentation, and transfers between the receiving dock and the ship. The ship's crane will be suitable for loading all science gear associated with the NTAS/MOVE Project. All loading will be done coordination with the Operations Officer, recognizing that a shoreside crane will be needed for shifting of containers associated with other Projects while in port. A drawing of the proposed deck layout is provided in Appendix A along with a list of the major items of scientific equipment that will be used on deck and in the main lab. All HAZMATs will be declared and handled according to NOAA regulations as required (see Appendix B).

Destaging and offloading of scientific equipment, including recovered mooring components, will be conducted in Bridgetown, Barbados on 24 – 24 October, 2013. Copies of equipment lists, including serial numbers and country of origin, will be provided to the Operations Officer and Executive Officer (XO) as needed for foreign clearance purposes. It is the responsibility of each project to arrange for shipping their equipment from RHB, including all customs requirements, documentation, and transfers between the receiving dock and the ship. It is anticipated that the ship's crane will be suitable for offloading all science gear. The project, in coordination with the Operations Officer, will make arrangements for a shoreside crane if needed for offloading or shifting gear in port.

II.C. Operations to be conducted

A proposed timeline for principal operations during the project is provided in Appendix C. Selected project track details are shown along with a list of principal way points in Appendix D.

II.C.1. Release Tests and CTD trials

At a convenient time during transit, prior to deployment of the NTAS-13 mooring, RHB will stop and hold station to allow the science party to perform release tests and a trial CTD cast. The release tests involve attaching multiple acoustic releases to the CTD wire (or alternate winch wire; an electrical connection is not needed). The releases will be lowered to one or more depths between 2500 m and 500 m and held at that depth while being interrogated acoustically. The science party will bring an acoustic transceiver than can be lowered over the rail with a cable run to the main lab and connected to a transceiver controller. Alternatively, the controller can be connected directly to the RHB 12 kHz hull transducer. After successful completion of the interrogations the releases will be raised to the surface and brought aboard. When the CTD winch is used for the release tests, it is typically possible to conduct a trial CTD cast at the same time.

II.C.2. NTAS Mooring Deployment

The NTAS mooring is an inverse catenary design utilizing wire rope, chain, nylon and polypropylene line. The surface element is a 2.7-meter diameter Surlyn foam buoy with a watertight electronics well and aluminum instrument tower. Meteorological sensors are attached to the upper section of the two-part aluminum tower at a height of about 3 m above the water line. A mooring drawing, specifying the mooring components and location of the attached instrumentation, is provided in Appendix E. Note that the standard mooring design has been modified to accommodate inductive telemetry, affecting the mooring components and instrumentation in the upper 80 m.

The mooring is deployed in several stages. The first stage is the lowering of the upper 40 meters of the mooring over the port side of the ship. Instruments and chain shots from 40 meters to the surface are deployed off the port side using the crane to lift them into the water. Wire is paid out from the winch and passed through the A-frame and around the aft port quarter, as instruments are lowered into the water. Once the upper 40 m of the mooring is in the water, the upper chain shot is secured to a cleat until the buoy goes over the side.

The next stage of the operation is the launching of the surface buoy. Slip lines are rigged on the buoy and the ship's crane is attached to the quick release hook. The slack chain from the upper section of mooring line is connected to the buoy bridle and the slip line is eased off to transfer

the load to the buoy. The buoy is then raised up, swung outboard and lowered to the water. Once the buoy settles into the water and the crane line goes slack, the quick-release hook is tripped. The ship then maneuvers slowly ahead to allow the buoy to pass around the stern.

The remainder of the mooring is deployed over the stern. Once the buoy is behind the ship the hauling wire is pulled up on the winch. Instruments and mooring components are added to the 40 meters previously deployed. Ship speed is increased to about 1 knot and the winch and stopper lines on cleats are used to parcel out shots of wire, chain, and instruments. The long lengths of wire and nylon are then paid out. An H-bit cleat can be used to slip out the remaining synthetic line (nylon and Colmega) stowed in three wire baskets. While the synthetic line is being paid out, the glass balls are staged for deployment. With approximately 30 meters of synthetic line remaining, the mooring is stopped off using a Yale Grip. The glass balls are then shackled into the mooring line and eased over the transom with the winch, followed by the releases, trawler chain, and anchor pennant. The crane typically used to lift a tip plate, causing the anchor to slide over board.

II.C.3. NTAS Buoy Tracking and Anchor Survey

RHB will hold station approximately 0.25 nm away from the anchor drop point immediately following release of the anchor from the fantail. In consultation with the Bridge, the science party will observe the movement of the buoy towards the anchor drop point on the ship's radar. It is expected to take about 50 min for the anchor to reach the bottom, after which the buoy position will settle-out within the watch circle.

Once the anchor has settled on the bottom, RHB will occupy three stations approximately 1.5 nm from the anchor drop point in a triangular pattern. At each station the slant range to the acoustic release will be determined. Ranging from three stations will allow the release position, and thus the mooring anchor position, to be determined by triangulation.

II.C.4. NTAS Sensor Inter-comparison

Intercomparison operations will be conducted with two NTAS buoys (newly deployed and to be recovered) in the water simultaneously. RHB will establish and hold a position, with bow into the wind, approximately 0.10 nm downwind of one of the buoys. This station will be held, and adjusted if necessary, while the science party confirms data reception from Argos uplink receivers that will acquire, decode, and record the meteorological data transmitted by the buoy. RHB will continue to hold station while the data stream from the buoy is recorded. During the intercomparison period, the RHB SCS data will be continuously recorded and the science party may make periodic observations with hand-held meteorological sensors. The intercomparison period will include CTD casts which require the ship to maneuver to a position approximately 0.25 nm from the buoy.

If possible during daylight hours of the inter-comparison period, RHB will make a close approach to the NTAS buoys to allow visual inspection of buoy and sensor condition, determination of the water line, and photographs. A typical scheme includes an initial, upwind pass with the buoy along the starboard rail followed by a slow circle around the buoy.

II.C.5. NTAS Mooring recovery

Recovery is initiated with the ship positioned downwind of the surface mooring while the acoustic release is fired. When the glass-ball floatation surfaces and is sighted, the ship begins its

approach. If weather conditions permit, the small boat is launched to attach a recovery line to the balls. Otherwise, they are grabbed using a hook or grapnel. The flotation cluster is secured to the mooring winch line, the ship steams upwind of the cluster and the floats are pulled up on the A-frame. Using available capstans, tuggers and stopper lines, the entire cluster is pulled on deck through the A-frame. The mooring line above the floats is stopped off and secured and the acoustic release is pulled up the transom and removed from the mooring. Once the glass balls are secured, the mooring line is transferred to the winch and recovery of line begins. The ship steams ahead at approximately 0.5 knots while the winch hauls in the mooring. The hauling operation is stopped periodically to offload mooring line and wire that has accumulated on the winch drum. As instruments surface and are pulled up through the a-frame, loads are transferred to stopper lines and the instruments are removed from the mooring line.

When there is only about 40 meters remaining in the mooring line, the buoy is cast adrift for recovery over the side. In most cases, a section of the bulwark is removed to ease recovery, and a small boat is deployed to attach a lifting pennant to the buoy lifting eye (note that it is often possible to use a single small boat deployment to connect to the glass balls and attach a pennant to the buoy). The lifting line is transferred from the buoy to the winch. With minimal weight and drag under the hull, the buoy is easily lifted over the side of the ship using the crane. Air tuggers and capstan are used to steady the buoy as it is brought on deck. Once the buoy has been secured on the deck, the remaining instruments are recovered using short picks with the crane. Stopper lines are used to transfer the load as instruments are pulled from the mooring line.

II.C.6. MOVE Operations

MOVE data readout: PIES and subsurface moorings are equipped with acoustic telemetry to allow readout of daily averaged data without recovering the instrument, using pulse delay telemetry (PDT). Data readout will be done at the three MOVE sites from up to seven devices (3 moorings and 4 PIES). A portable deck box (Benthos DS7000 acoustic transceiver 9-14 kHz) is used with an appropriate hydrophone. The science party will have a hand-deployable over-the-side hydrophone, but generally obtains better results by connecting the deck box directly to the ship's 12 kHz hull transducer. A minimum 4 hours on station is required to retrieve a year's worth of data. Depending on the time since deployment, it may take up to 8-10 hours to retrieve the full dataset. RHB will hold position around the PIES or mooring location within a radius of 2.5 nm during data offload while the hydrophone remains in the water. Maneuvers to adjust the ships position should be made as delicately as possible to avoid impacts on the acoustic transmission. Experiences on other vessels have shown that a constant usage of the bow thruster will degrade the quality of the acoustic communication.

In the event that acoustic communications from RHB are unsuccessful, the science party requests that operations be conducted from the work boat as a means of reducing acoustic noise. If conditions permit, a member of the science party would board the work boat with the portable deck box and over-the-side hydrophone. The work boat would establish position at distance of 0.5 to 1.0 nm from the RHB and establish acoustic communication. The workboat would remain on station with the hydrophone in the water while data readout is monitored.

II.C.7. Argo Float Deployments

ARGO floats will be deployed along the cruise track as directed by the Argo Science Team upon approval of the OOD. Floats and drifters will not be deployed within any EEZ areas for which

clearance has not been obtained. The floats and drifters can be deployed at full speed and will not require the ship to slow or turn from its course.

II.C.8. Shipboard underway data

IMET: The ship's meteorological system will be used to continuously monitor weather conditions while underway in international waters and in waters where foreign clearance has been obtained, and for evaluation of buoy meteorology during the intercomparison period (Sec. II.C.4). Data from the IMET sensors will be recorded to SCS and made available in an "event" file. The CST is responsible for checking the logging status, ensuring the instruments are functioning properly, and producing data plots as requested. It is the vessel's responsibility to ensure that the instruments are calibrated, at a minimum, annually.

ADCP: The ship-mounted ADCP system will be used to continuously measure the currents in the upper ocean while underway in international waters and in waters where foreign clearance has been obtained. The ADCP will be interfaced to the ship's GPS receiver and will receive data at one-second intervals. The ADCP will be interfaced with the ship's gyro so that accurate heading information is available to the ADCP. For calibration purposes, "Bottom Tracking" should be activated whenever the ship is transiting water shallower than 500m.

SST/SSS: Sea surface temperature and salinity will be recorded continuously, using the installed SEABIRD SBE-21. Data from the TSG will be recorded to SCS and made available in an "event" file. The CST is responsible for checking the logging status, ensuring the instrument is functioning properly, and producing data plots as requested. It is the vessel's responsibility to ensure that the thermosalinograph is calibrated, at a minimum, annually.

II.C.10. Shipboard Multi-beam bathymetry

Because the NTAS and MOVE mooring sites have been surveyed previously, we do not anticipate the need for multi-beam operations. However, in the event that a new, unsurveyed deployment location is required, a bottom survey will be performed using multi-beam to map an area of approximately 14 x 16 nm centered on the anchor drop location. This can be done by means of steaming an S-shape pattern with east-west legs of about 8 nm, and north-south separation between legs of about 5 nm. Cruising speed, leg length, and leg spacing can be adjusted as needed to ensure adequate data overlap and good system performance. The results of the bottom survey will be displayed and interpreted immediately after the survey in order to confirm the suitability of the deployment site.

II.C.11. Small Boat Operations

The use of a work boat is requested for two operations during NTAS mooring recovery: attaching a hauling line to the glass ball cluster and attaching a lifting pennant to the buoy, as described in Sec II.C.5. Expected duration of use is approximately 30 min for each operation if done separately, or 1-2 h if the two operations are combined. The use of a work boat is also requested as an alternative to RHB for acoustic data readout from PIES and subsurface moorings (see Sec II.C.6). The expected duration of each data readout operation is 2-4 h. Work boat operations would be within 0.5-2.0 nm of the ship.

II.D. Dive Plan

Should instrumentation fail following deployment, but prior to RHB departing the vicinity of the mooring, dive operations for evaluation and repair may be warranted. This is an unlikely event, and would be considered only after consultation with, and upon approval of, the ship's Officers.

II.E. Applicable Restrictions

Small boat activities may be restricted by weather. In this case, the ship will maneuver to the item to be retrieved and grappling lines and/or pick up poles will be used. Mooring activities may be restricted by severe weather or equipment failure. Severe weather would result in postponement until conditions eased. Failure of a given piece of Project equipment (e.g. TSE winch, capstan, air tugger) can be compensated by use of an alternative approach. Failure of ship's equipment (e.g. electrical or hydraulic system) would result in postponement of operations until the failure was addressed.

III. Equipment

III.A. Equipment and Capabilities Provided by the Ship

III.A.1. Communications, including INMARSAT link for data, facsimile, and e-mail messages.

III.A.2. GPS Navigation
Navigation information will be recorded in the Marine Operations Abstract (MOA - OSC Worksheet 001). All entry will be recorded as significant operations occur, at the time the ship changes course or speed while underway in open water, and at least once every 4-hour watch. In the event of SCS failure, the bridge will record hourly GPS positions in the MOA. GPS position and time-base will be made available in real-time to the science workstations over the ship computer network.

III.A.3. Scientific Computer System (SCS)
The ship's Scientific Computer System (SCS) shall operate throughout the cruise, acquiring and logging data from navigation, meteorological and oceanographic sensors. SCS data will be logged and archived once the ship reaches international waters, and as permitted by research clearances in foreign jurisdictional waters. The SCS data display nodes will provide scientists with the capability of monitoring sensor acquisition via text and graphic displays. Data will be archived to CDs and provided to the Chief Scientist at the end of the cruise. Additional recording of processed data may be requested of the ship's CST. These requirements will be identified at the beginning of the cruise.

III.A.4. Laboratory/work space
Space will be required in the main lab, wet lab and staging bay. It is recognized that science gear from prior and subsequent legs will occupy some areas of the main lab and wet lab, a joint use of space that has been discussed and agreed to by the respective Project PIs. The science party will set up work stations primarily in the main lab. Intermittent use of the electronics/computer lab and hydro lab may be required. Some instrumentation and deck equipment will be staged in the wet lab. The staging bay will be used for large or heavy equipment that cannot be stored unprotected on the deck.

III.A.5. Power:
The following power outputs are available from the ship, all at 60 Hz: 1) 440 VAC, 3 phase, 2) 220 VAC, 1 or 3 phase, and 3) 120 VAC, single phase. Transformers or motor-generators for other power requirements will not be provided by the ship and must be provided by the participants. The ship will provide only U.S. standard power plugs and jacks.

III.A.6. SCS Data Streams:
Data from an SCS Event file or files (details to be negotiated with the Chief Scientist) will be needed in real-time during the cruise. The preference of the science party is to access the Events directory on the ship's server using Windows networking from a laptop. In addition, archived data will be delivered to Chief Scientist at the end of the cruise.

III.A.7. The ship's SCS data, including the IMET sensor data, will be available for viewing by the science party via the ship's SCS system and computer network.

III.A.8. Network connections
The science party will require connections to the ship's Science computer network. Approximately 10 connections are anticipated via laptop computers (WHOI: 6 computers, SIO, 4 computers).

<u>IT Security</u>: Any computer that will be hooked into the ship's network must comply with the *NMAO Fleet IT Security Policy* prior to establishing a direct connection to the NOAA WAN. See Sec. VII.E. IT Security, below.

III.A.9. Deck equipment:
Ship's equipment for mooring work, including two air-tuggers and a power washer, are requested for use by the science party.

III.A.10. Storage Requirements:
The science party will require storage space for science gear of various types. The main lab, wet lab, and forward storage area are expected to house approximately 20 boxes and containers from WHOI and 10 boxes and containers from SIO.

III.A11. Freezer Usage
Freezer storage will not be required.

III.A.12. Refrigerator Usage
Refrigerator storage will not be required.

III.A.13. CTD winch and cable
A participant supplied, self-contained CTD on a strongback will be deployed using the ship's CTD winch and wire. Electrical connection to the CTD through the cable will not be required.

III.B. Equipment and Capabilities to be Provided by the Scientists

A listing of the major items of science equipment is provided in Appendix A along with a proposed deck layout. The majority of equipment and instrumentation, including all components of the moorings to be deployed, deck gear (TSI winch, winding and tension carts, blocks, lines,

launch and recovery gear) and scientific equipment for the main lab (computers, RF and acoustic receivers, consumable supplies) will be provided by the program. Exceptions are the work boat and other facilities as noted in Sec. III.A. Science party personnel will be familiar with mooring deployment and recovery and will be capable of directing operations in cooperation with the ship's crew during all phases of mooring operations. Additional science personnel will assist with mooring operations, met watches, and other observation and data collection activities. WHOI will provide a SeaBird self-contained CTD that records internally and can be deployed from either hydro wire or CTD wire.

IV. HAZARDOUS MATERIALS

IV.A. Policy and compliance

The Chief Scientist is responsible for complying with FEC 07 Hazardous Materials and Hazardous Waste Management Requirements for Visiting Scientific Parties (or the OMAO procedure that supersedes it). By Federal regulations and NOAA Marine and Aviation Operations policy, the ship may not sail without a complete inventory of all hazardous materials by name and the anticipated quantity brought aboard, MSDS and appropriate neutralizing agents, buffers,/or absorbents in amounts adequate to address spills of a size equal to the amount of chemical brought aboard, and a chemical hygiene plan. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

Per FEC 07, the scientific party will include with their project instructions and provide to the CO of the respective ship 60 to 90 days before departure:

- A list of hazardous materials by name and anticipated quantity
- Include a chemical spill plan the addresses all of the chemicals the program is bringing aboard. This shall include:
    - Procedures on how the spilled chemicals will be contained and cleaned up.
    - A complete inventory (including volumes/amounts) of the chemical spill supplies and equipment brought aboard by the program. This must be sufficient to clean and neutralize all of the chemicals brought aboard by the program.
    - A list of the trained personnel that will be accompanying the project and the training they've completed.

Upon embarkation and prior to loading hazardous materials aboard the vessel, the scientific party will provide to the CO or their designee:

- An inventory list showing actual amount of hazardous material brought aboard
- An MSDS for each material
- Confirmation that neutralizing agents and spill equipment were brought aboard sufficient to contain and cleanup all of the hazardous material brought aboard by the program.

Upon departure from the ship, scientific parties will provide the CO or their designee an inventory of hazardous material indicating all materials have been used or removed from the vessel. The CO's designee will maintain a log to track scientific party hazardous materials.

MSDS will be made available to the ship's complement, in compliance with Hazard Communication Laws.

Scientific parties are expected to manage and respond to spills of scientific hazardous materials. Overboard discharge of scientific chemicals is not permitted during projects aboard NOAA ships.

IV.B. Radioactive isotopes

N/A

IV.C. Inventory

See Appendix B for HAZMAT inventory and spill plan. An updated inventory, if necessary, will be sent to the ship at least two weeks prior to sailing. Material Safety Data Sheets will be organized in a notebook and delivered to the Operations Officer before loading commences.

V. 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, on a not-to-interfere basis with the programs described in these instructions.

A. Supplementary ("Piggyback") projects:

No supplementary projects are known.

B. NOAA Fleet ancillary projects:

Ancillary tasks will be accomplished in accordance with the NOAA Fleet Standing Ancillary Instructions. Synoptic weather reports will be handled in accordance with NC Instruction 3142D, SEAS Data Collection and Transmission Procedures.

VI. DISPOSITION OF DATA AND REPORTS

VI.A. Data Responsibilities

The Chief Scientist is responsible for the disposition, feedback on data quality, and archiving of data and specimens collected on board the ship for the primary project. As the representative of the Director, WHOI, the Chief Scientist is also responsible for the dissemination of copies of these data to participants in the cruise, to any other requesters, and to NESDIS (ROSCOP form completed within three months of cruise completion). The ship may assist in copying data and reports insofar as facilities allow.

The Chief Scientist is responsible for dissemination of data to nations in whose EEZ data are acquired and requested. The Chief Scientist will furnish the ship a complete listing of all data gathered by the primary scientific party, detailing types and quantities of data.

The Chief Scientist will receive all original data gathered by the ship for the primary project. This data transfer will be documented on NOAA form 61-29 "Letter Transmitting Data."

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

VI.B. Pre and Post Project Meeting

Pre-Project Meeting: Prior to departure, the Chief Scientist will conduct a meeting of the scientific party to train them in sample collection and inform them of cruise objectives. Some vessel protocols, e.g., meals, watches, etiquette, etc. will be presented by the ship's Operations Officer.

Post-Project Meeting: Upon completion of the project, a meeting will normally be held at 0830 (unless prior alternate arrangements are made) and attended by the ship's officers, the Chief Scientist and members of the scientific party to review the project. Concerns regarding safety, efficiency, and suggestions for improvements for future projects should be discussed. Minutes of the post-cruise meeting will be distributed to all participants by email, and to the Commanding Officer and Chief of Operations, Marine Operations Center.

VI.C. Ship Operation Evaluation Report

Within seven days of the completion of the cruise, a Ship Operation Evaluation form is to be completed by the Chief Scientist. The preferred method of transmittal of this form is via email to OMAO.Customer.Satisfation@noaa.gov. If email is not an option, a hard copy may be forwarded to:

Director, NOAA Marine and Aviation Operations
NOAA Office of Marine and Aviation Operations
8403 Colesville Road, Suite 500
Silver Spring, MD 20910

VII. MISCELLANEOUS

VII.A. Meals and Berthing

Meals and berthing are required for up to 5 scientists. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the cruise, and ending two hours after the termination of the cruise. Since the watch schedule is split between day and night, the night watch may often miss daytime meals and will require adequate food and beverages (for example a variety of sandwich items, cheeses, fruit, milk, juices) during what are not typically meal hours. Special dietary requirements for scientific participants will be made available to the ship's command at least seven days prior to the survey (e.g., Chief Scientist is allergic to fin fish).

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Chief Scientist. The Chief Scientist and Commanding Officer will work together on a detailed berthing plan to accommodate the gender mix of the scientific party taking into consideration the current make-up of the ship's complement. The Chief Scientist is responsible for
ensuring the scientific berthing spaces are left in the condition in which they were received; for stripping bedding and linen return; and for the return of any room keys which were issued. The Chief Scientist is also responsible for the cleanliness of the laboratory spaces and the storage areas utilized by the scientific party, both during the cruise and at its conclusion prior to departing the ship.

All NOAA scientists will have proper travel orders when assigned to any NOAA ship. The Chief Scientist will ensure that all non NOAA or non Federal scientists aboard also have proper orders. It is the responsibility of the Chief Scientist to ensure that the entire scientific party has a mechanism in place to provide lodging and food and to be reimbursed for these costs in the event that the ship becomes uninhabitable and/or the galley is closed during any part of the scheduled project.

All persons boarding NOAA vessels give implied consent to comply 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. All personnel must comply with OMAO's Drug and Alcohol Policy dated May 7, 1999 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

VII.B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, Revised: 02 JAN 2012) must be completed in advance by each participating scientist. The NHSQ can be obtained from the Chief Scientist or the NOAA website http://www.corporateservices.noaa.gov/~noaaforms/eforms/nf57-10-01.pdf. The completed form should be sent to the Regional Director of Health Services at Marine Operations Center. The participant can mail, fax, or scan the form into an email using the contact information below. The NHSQ should reach the Health Services Office no later than 4 weeks prior to the cruise to allow time for the participant to obtain and submit additional information that health services might require before clearance to sail can be granted. Please contact MOC Health Services with any questions regarding eligibility or completion of the NHSQ. Be sure to include proof of tuberculosis (TB) testing, sign and date the form, and indicate the ship or ships the participant will be sailing on. The participant will receive an email notice when medically cleared to sail if a legible email address is provided on the NHSQ.

Contact information:

Regional Director of Health Services
Marine Operations Center – Atlantic
439 W. York Street
Norfolk, VA 23510
Telephone 757.441.6320
Fax 757.441.3760
E-mail: MOA.Health.Services@noaa.gov

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: name, address, relationship to member, and telephone number.

VII.C. Shipboard Safety

Wearing open-toed footwear or shoes that do not completely enclose the foot (such as sandals, clogs or crocs) outside of private berthing areas is not permitted. Steel-toed shoes are required to participate in any work dealing with suspended loads, including CTD deployments and recovery. The ship does not provide steel-toed boots. Hard hats are also required when working with suspended loads. Work vests are required when working near open railings and during small boat launch and recovery operations. Hard hats and work vests will be provided by the ship when required.

VII.D. Communications

A progress report on operations prepared by the Chief Scientist may be relayed to the program office. Sometimes it is necessary for the Chief Scientist to communicate with another vessel, aircraft, or shore facility. Through various means of communications, the ship can usually accommodate the Chief Scientist. Special radio voice communications requirements should be listed in the project instructions. The ship's primary means of communication with the Marine Operations Center is via e-mail and the Very Small Aperture Terminal (VSAT) link. Standard VSAT bandwidth at 128kbs is shared by all vessels staff and the science team at no charge. Increased bandwidth in 30 day increments is available on the VSAT systems at increased cost to the scientific party. If increased bandwidth is being considered, program accounting is required it must be arranged at least 30 days in advance.

VII.E. IT Security

Any computer that will be hooked into the ship's network must comply with the NMAO Fleet IT Security Policy 1.1 (November 4, 2005) prior to establishing a direct connection to the NOAA WAN. Requirements include, but are not limited to:

(1) Installation of the latest virus definition (.DAT) file on all systems and performance of a virus scan on each system.
(2) Installation of the latest critical operating system security patches.
(3) No external public Internet Service Provider (ISP) connections.

(4) The Chief Scientist will provide the ET with a spreadsheet with the following information:

Device Name	Operating System	LAN MAC Address	WAN MAC Address
example	*MAC OS*	*21:34:6K:P8:W6:77*	*21:34:6K:P8:W6:78*

Completion of these requirements prior to boarding the ship is required.
Non-NOAA personnel using the ship's computers or connecting their own computers to the ship's network must complete NOAA's IT Security Awareness Course within 3 days of embarking.

VII.F. Foreign National Access Guests

All foreign national access to the vessel shall be in accordance with NAO 207-12 and RADM De Bow's March 16, 2006 memo (http://deemedexports.noaa.gov). The Departmental Sponsor/NOAA (DSN) is responsible for obtaining clearances and export licenses and for providing escorts required by the NAO. DSNs should consult with their designated OAR Deemed Exports point of contact to assist with the process (http://deemedexports.noaa.gov/contacts.html).

The following are basic requirements. Full compliance with NAO 207-12 is required.

Responsibilities of the Chief Scientist:

1. Provide the Commanding Officer with the e-mail granting approval for the foreign national guest's visit. This e-mail will identify the guest's DSN and will serve as evidence that the requirements of NAO 207-12 have been complied with.
2. Escorts – The Chief Scientist is responsible to provide escorts to comply with NAO 207-12 Section 5.10, or as required by the vessel's DOC/OSY Regional Security Officer.
3. Ensure all non-foreign national members of the scientific party receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the servicing Regional Security Officer.
4. Export Control - The Chief Scientist will inform the Commanding Officer of any program technology controlled under Export Administration Regulations (EAR) being brought aboard and required controls.

The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.

Responsibilities of the Commanding Officer:

1. Ensure only those foreign nationals with DOC/OSY clearance are granted access.
2. Deny access to OMAO platforms and facilities by foreign nationals from countries controlled for anti-terrorism (AT) reasons and individuals from Cuba or Iran without written NMAO approval and compliance with export and sanction regulations.
3. Ensure foreign national access is permitted only if unlicensed deemed export is not likely

to occur.

4. Ensure receipt from the Chief Scientist or the DSN of the OSY e-mail granting approval for the foreign national guest's visit.
5. Ensure Foreign Port Officials, e.g., Pilots, immigration officials, receive escorted access in accordance with maritime custom to facilitate the vessel's visit to foreign ports.
6. Export Control - 8 weeks in advance of the cruise, provide the Chief Scientist with a current inventory of OMAO controlled technology onboard the vessel and a copy of the vessel Technology Access Control Plan (TACP). Also notify the Chief Scientist of any OMAO-sponsored foreign nationals that will be onboard while program equipment is aboard so that the Chief Scientist can take steps to prevent unlicensed export of Program controlled technology. The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.
7. Ensure all OMAO personnel onboard receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the servicing Regional Security Officer.

Responsibilities of the Foreign National Sponsor:

1. Export Control - The foreign national's sponsor is responsible for obtaining any required export licenses and complying with any conditions of those licenses prior to the foreign national being provided access to the controlled technology onboard regardless of the technology's ownership.
2. The DSN of the foreign national shall assign an on-board Program individual, who will be responsible for the foreign national while on board. The identified individual must be a U.S. citizen, NOAA (or DOC) employee. According to DOC/OSY, this requirement cannot be altered.
3. Ensure completion and submission of Appendix C (Certification of Conditions and Responsibilities for a Foreign National

APPENDICES

Appendix A: Equipment Inventory and Deck Plan

Figure A-1 shows a nominal deck layout for the major components associated with NTAS/MOVE operations. Estimated weights of major deck components are documented in Table A-1.

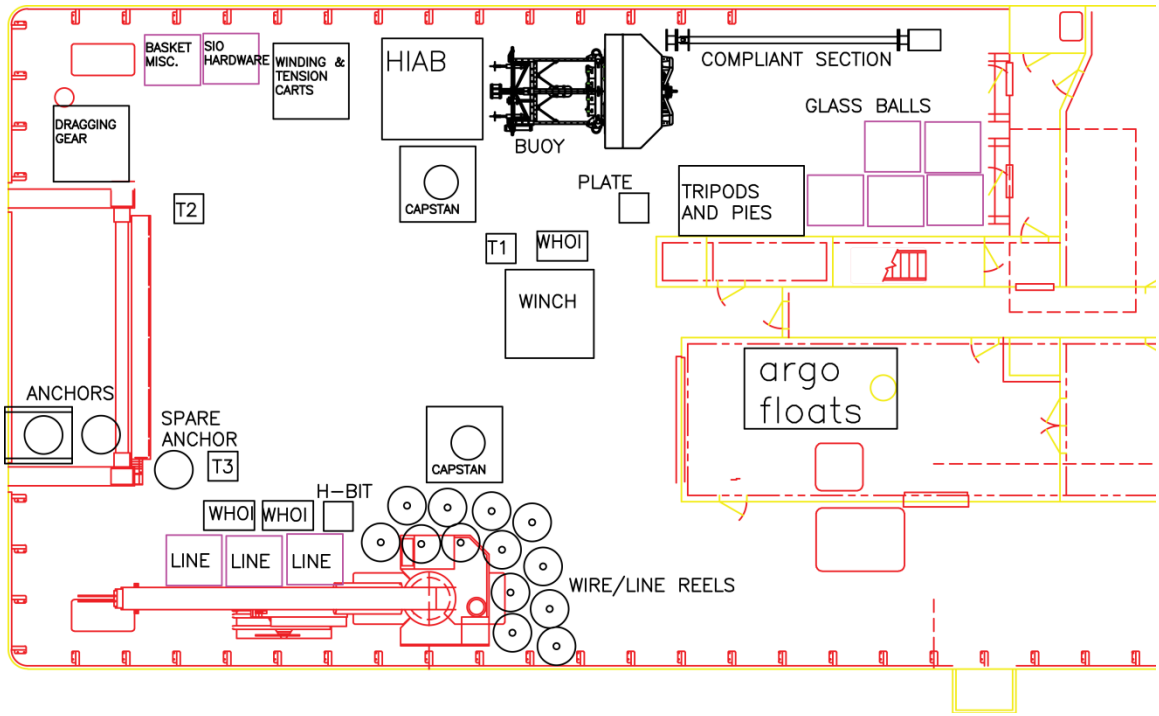


Figure A-1. NTAS/MOVE deck plan for *Ronald H. Brown*. Proposed location of major deck elements are shown. The approximate deck load is 52,000 lb and the lab gear is estimated to be an additional 2,000 lb. Note that the final deck plan will include a science van port-side inboard where glass balls, tripods and PIES are shown above. These items will be re-positioned to alternate locations on the main deck.

NTAS/MOVE DECK LOAD		
	DESCRIPTION	WEIGHT
DECK	ANCHOR	7000
	ANCHOR (SPARE)	7000
	BUOY ASSEMBLY	4500
	EM CHAIN AND COMPONENTS	600
	WIRE BASKET W/LINE	1200
	WIRE BASKET W/LINE	1200
	WIRE BASKET W/LINE	1200
	WIRE/SYNTHETIC TERMINATION	500
	2 REELS SPARE LINE	800
	HARDWARE BOX	1200
	DECK GEAR BOX	800
	BLOCKS	200
	GLASS BALLS, 6 WIRE BASKETS	5600
	TSE WINCH	7000
	WINDING CART	700
	TENSION CART	500
	4 REELS WIRE AT 400 EA	1600
	7 REELS WIRE AT 500 EA	3500
	FAIRLEAD & ANCHOR PLATE, H-BIT	1100
	LASHING GEAR	300
	DRAGGING GEAR	2500
	BASKET MISC. EQUIP	600
	LARGE AIR TUGGER W/STAND	600
	SMALL AIR TUGGERS (2)	400
	MOVE/PIES DECK EQUIPMENT	1000
	Total deck load	51600
LAB	INSTRUMENTS	500
	RELEASES	300
	TEST EQUIPMENT	200
	COMPUTERS	100
	SUPPORT GEAR	400
	MOVE LAB GEAR	500
	Total lab gear	2000
	TOTAL	53600

Table A-1. Deck load for NTAS/MOVE

Appendix B: HAZMAT Inventory and Spill Plan

B.1. WHOI HAZMAT inventory and spill plan – NTAS-13, Ronald H. Brown

Common Name of Material	Qty.	Notes	Trained Individual	Spill Control
BioGrease – Dichloronoctylisothiazolin. *DCOIT	1- 8 oz. can	Anti fouling coating. Viscous, not spillable	Ben Pietro	A
Contact Cleaner – LPS CFC Free Nu	1- 11 oz. can	Aerosol – UN 1950 AEROSOLS flammable	Ben Pietro	A
ScotchKote – Electrical Coating	1 – 15 oz. can	UN1866, RESIN SOLUTION, 3, II	Ben Pietro	A
Silicone Spray- NAPA – Mac's 8300	2 – 11 oz can	Aerosols – UN 1950 limited quantity	Ben Pietro	A
Silikroil- Penetrating Solvent	2 – 10 oz. can	Aerosol – UN 1993 Flammable liquid n.o.s.	Ben Pietro	A
Triton – Octyl Phenol Ethoxylate Not regulated for transportation	1- 50 ml (2 oz)	Detergent - For cleaning conductivity cells	Ben Pietro	A

*Small quantities of DCOIT may be released into the environment if products that contain it are spilled or discarded. In the event of a spill, the focus is on containing the spill to prevent contamination of soil, surface water, or groundwater. Small spills should be absorbed with sand or soil. If released to the environment, DCOIT will biodegrade in water or soil and photodegrade in air. DCOIT has a low risk to accumulate in the food chain and is highly toxic to fish and aquatic organisms on an acute basis.

Spill Control:

A: Triton, CFC Free Nu, SiliKroil, Silicone Spray, 3 M Scotchkote

- For small spills, wipe with absorbent cloth and dispose in trash. Clean surface thoroughly to remove residual contamination.
- In general, dilution Ventilation is a satisfactory health hazard control for this substance.
- Wear protective gloves and safety glasses where splashing is possible.

For larger spills (not applicable for these quantities):

- Wear appropriate personal protective gear
- Stop the flow of material, if this is without risk.
- Leaking containers should be removed to an isolated, well-ventilated area and transferred to other suitable containers.
- Dike spilled material
- Ventilate area of leak or spill
- Remove all sources of ignition
- Contain and recover liquid when possible
- Use non-sparking tools and equipment

- Collect liquid in an appropriate container or absorb with an inert material (vermiculite, dry sand, earth) and place in a chemical waste container.
- Following product recovery, flush area with water.

Inventory of Spill Kit supplies:

Name	Amount (Qty.)	Useful for:	Absorbs
3” x 4’ sock	2 ea.	Liquid -universal	1 gal.
16” x 20” pad	10 ea.	Liquid- universal	23 oz. each
Eco Absorb	4 qt. bag	Liquid - universal	1 gal.
Goggles	2	Eye protection	
Gloves	100	Hand protection	

Liquid universal spill kit includes: 2 – 3" x 4' socks, 10 – 16" x 20" pads, 1 pair nitrile gloves, 1 disposal bag, instruction sheet, 1 – 20" x 16" x 4" PVC bag. Each kit is filled with universal, oil–only or hazardous liquid absorbents that will handle most water, oil and chemical–based spills.

Four quart bag Eco Absorb description: EcoAbsorb™ completely cleans any spill, leaving no residue, stain or odor behind. EcoAbsorb™ can absorb all paints, gas, motor oils, automotive fluids, body fluids including vomit or blood, grease and all chemicals except hydrofluoric acid. This lightweight superabsorbent cuts down on clean up time, disposal fees and leaves no residue behind. This OMRI listed and NSF Certified absorbent is safe in the home and workplace. EcoAbsorb™ is non–toxic and tested by EPA standards for landfill safety.

- Absorbs up to 6x its own weight and 15x more than clay absorbents
- Light weight powder; convenient size for moderate spills at work or home
- Absorbs instantly and leaves no slippery residue; minimizes slip & fall accidents
- Extremely efficient and effective

The Chief Scientist will, as necessary, assume responsibility for HAZMAT associated with science operations from prior or subsequent cruise legs that may be onboard.

Appendix C: Cruise Plan

Start Date, Time	End Date, Time	Operation
14 Oct 0900		Depart Barbados to NTAS-13 site
15 Oct 0900	15 Oct 1100	CTD cast and release tests
16 Oct 1100	16 Oct 1200	Set and drift, establish NTAS-13 deploy start position,
		prep instruments and deck for deployment
16 Oct 1200	16 Oct 1800	NTAS-13 mooring deployment
16 Oct 1800	16 Oct 1900	Wait for anchor drop, set up for intercomparison
16 Oct 1900	16 Oct 2200	NTAS-13 Anchor survey (+ check of release disable)
16 Oct 2200	17 Oct 0000	Maneuver to NTAS-13 buoy
17 Oct 0000		Begin met intercomparison period ~54 hours total
		Initially, stand-off ~0.2 nmi downwind of NTAS-13
17 Oct 0600	17 Oct 0700	NTAS CTD #1 (500 m, ~1 hr duration)
17 Oct 1000	17 Oct 1100	Close approach to NTAS-13 buoy, visual observation
17 Oct 1200	17 Oct 1300	NTAS CTD #2 (500 m, ~1 hr duration)
17 Oct 1800	17 Oct 1900	NTAS CTD #3 (500 m, ~1 hr duration)
18 Oct 0000		Establish position 0.2 nmi downwind of NTAS-12
18 Oct 0800	18 Oct 0900	NTAS CTD #4 (500 m)
18 Oct 1000	18 Oct 1100	Close approach to NTAS-10 buoy, visual observation
18 Oct 1200	18 Oct 1300	Attach tag line to buoy using small boat
18 Oct 1400	18 Oct 1500	NTAS CTD #5 (500 m)
18 Oct 2000	18 Oct 2100	NTAS CTD #6 (500 m)
	19 Oct 0600	End sensor intercomparison period
19 Oct 0600	19 Oct 0700	Maneuver to position, fire NTAS-12 release, wait
19 Oct 0700	19 Oct 0900	Begin prep for NTAS-12 mooring recovery
		Small boat connects to glass balls
19 Oct 0900	19 Oct 1500	NTAS-12 mooring recovery
19 Oct 1500	19 Oct 1600	Instrument and deck cleanup
19 Oct 1600	19 Oct 2100	Transit to MOVE-1 site
19 Oct 2100	20 Oct 0500	MOVE-1 mooring data offload
20 Oct 0500	20 Oct 1000	MOVE-1 PIES-226 data offload
20 Oct 1000	20 Oct 1500	MOVE-1 PIES-237 data offload
20 Oct 1500	22 Oct 1400	Transit to MOVE-3 site
22 Oct 1400	22 Oct 1900	MOVE-3 PIES-228 data offload
22 Oct 1900	23 Oct 0000	MOVE-3 PIES-238 data offload
23 Oct 0000	23 Oct 0800	MOVE-3 mooring data offload
23 Oct 0800	23 Oct 1000	Transit to MOVE-4 site
23 Oct 1000	23 Oct 1800	MOVE-4 mooring data offload
23 Oct 1800		Begin transit MOVE-4 to Barbados
	24 Oct 1200	Arrive Bridgetown

Appendix D: Selected Waypoints and Maps

Selected Waypoints NTAS-13				
Way-point	Latitude	Longitude	Expected Date, Time	Description
1	TBD	TBD	15 Oct 0900	Release tests and CTD test cast
	TBD	TBD	16 Oct 1100	NTAS-13 deployment start site
2	14° 49.50' N	51° 01.00' W	16 Oct 1800	NTAS-13 anchor drop site
3	14° 42.00' N	51° 00.00' W	various	NTAS CTD site (nominal location)
4	14° 44.95' N	50° 56.98' W	19 Oct 0600	NTAS-12 anchor location
5	15° 27.00' N	51° 30.50' W	19 Oct 2100	MOVE-1 mooring data offload
6	15° 28.00' N	51° 31.00' W	20 Oct 0500	MOVE-1 PIES-226 data offload
7	15° 27.00' N	51° 31.65' W	20 Oct 1000	MOVE-1 PIES-237 data offload
8	16° 21.50' N	60° 30.00' W	22 Oct 1400	MOVE-3 PIES-228 data offload
9	16° 20.30' N	60° 29.33' W	22 Oct 1900	MOVE-3 PIES-238 data offload
10	16° 20.30' N	60° 30.30' W	23 Oct 0000	MOVE-3 mooring data offload
11	16° 20.00' N	60° 36.45' W	23 Oct 1000	MOVE-4 mooring data offload

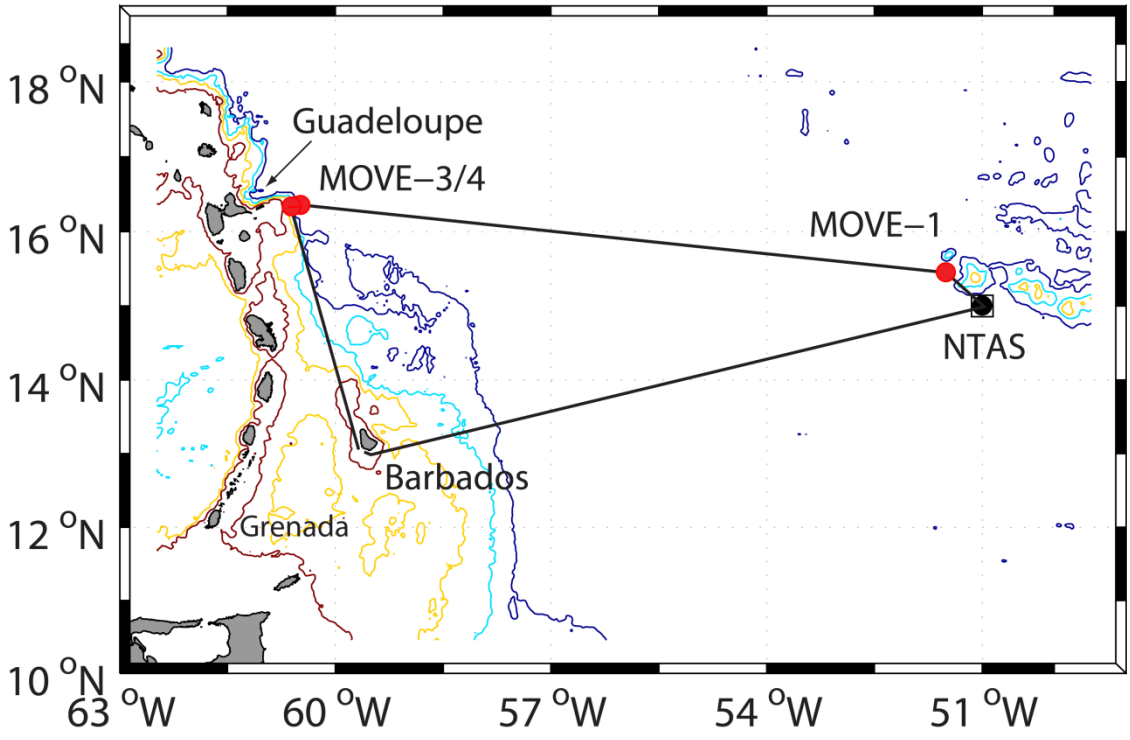


Figure D-1. Proposed NTAS-13 cruise track. The NTAS mooring site (black square), and the three MOVE sites (red circles) are shown.

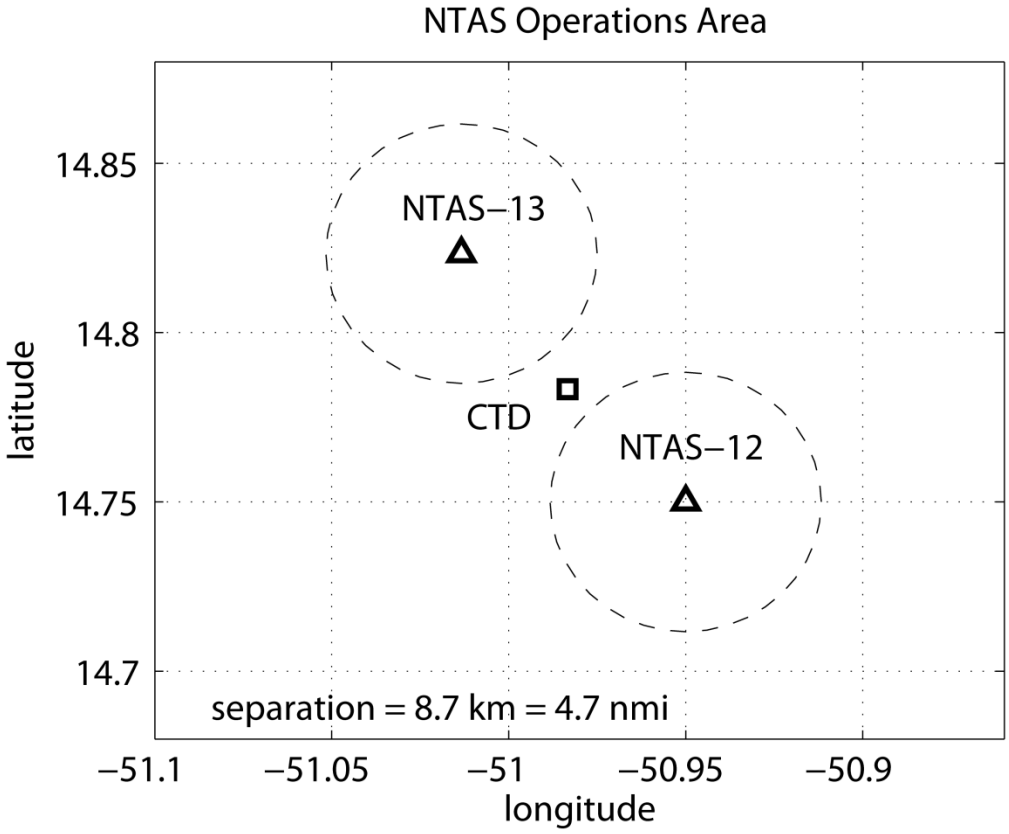
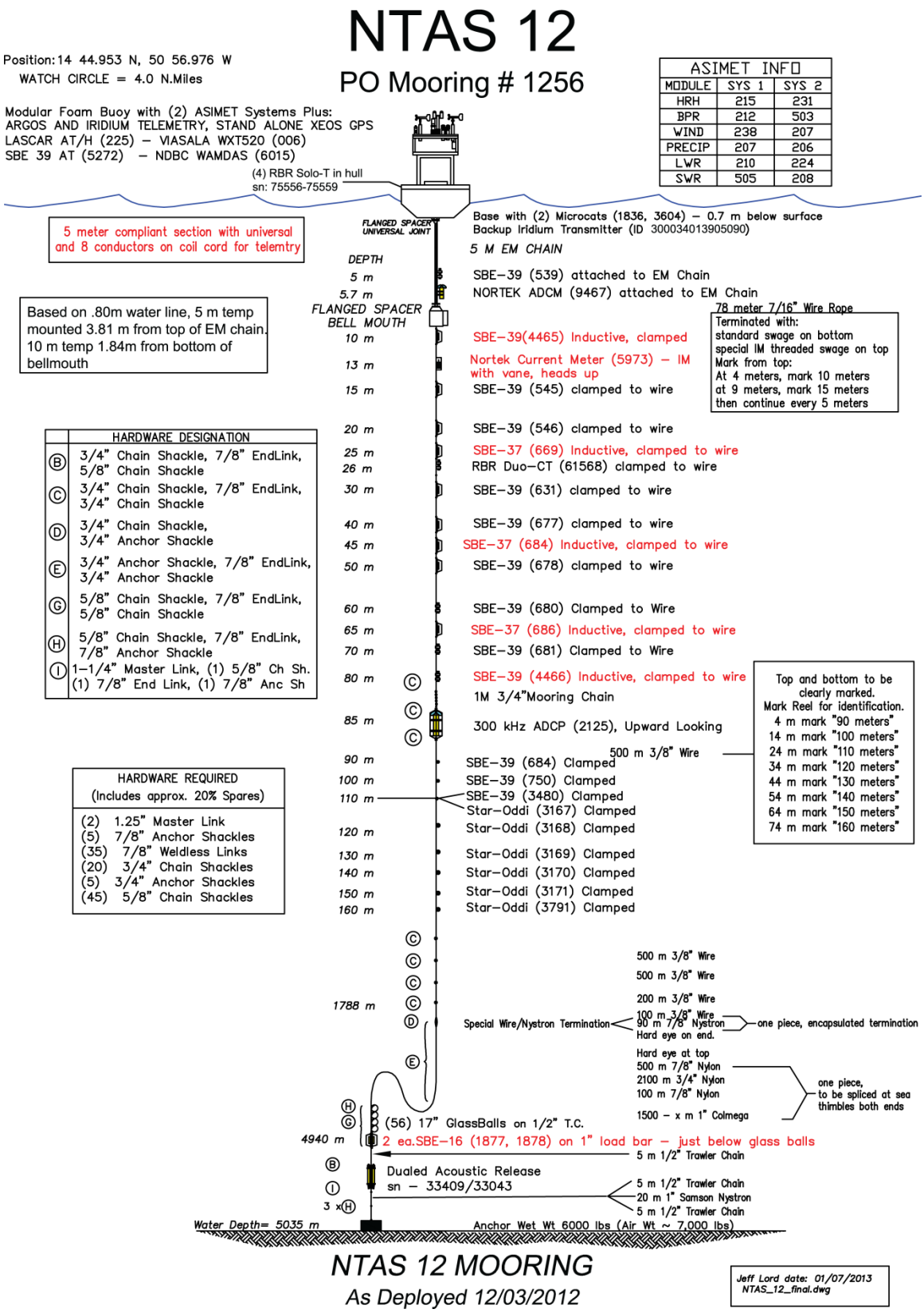


Figure D-2. Schematic map of NTAS operations area. Locations of the NTAS-12 mooring (to be recovered) and NTAS-13 mooring (to be deployed) are shown as triangles. Mooring watch circles are shown as dashed lines. Nominal CTD station, approximately 0.25 nm from the NTAS-12 buoy, is shown as a square.

Appendix E: Mooring Drawings



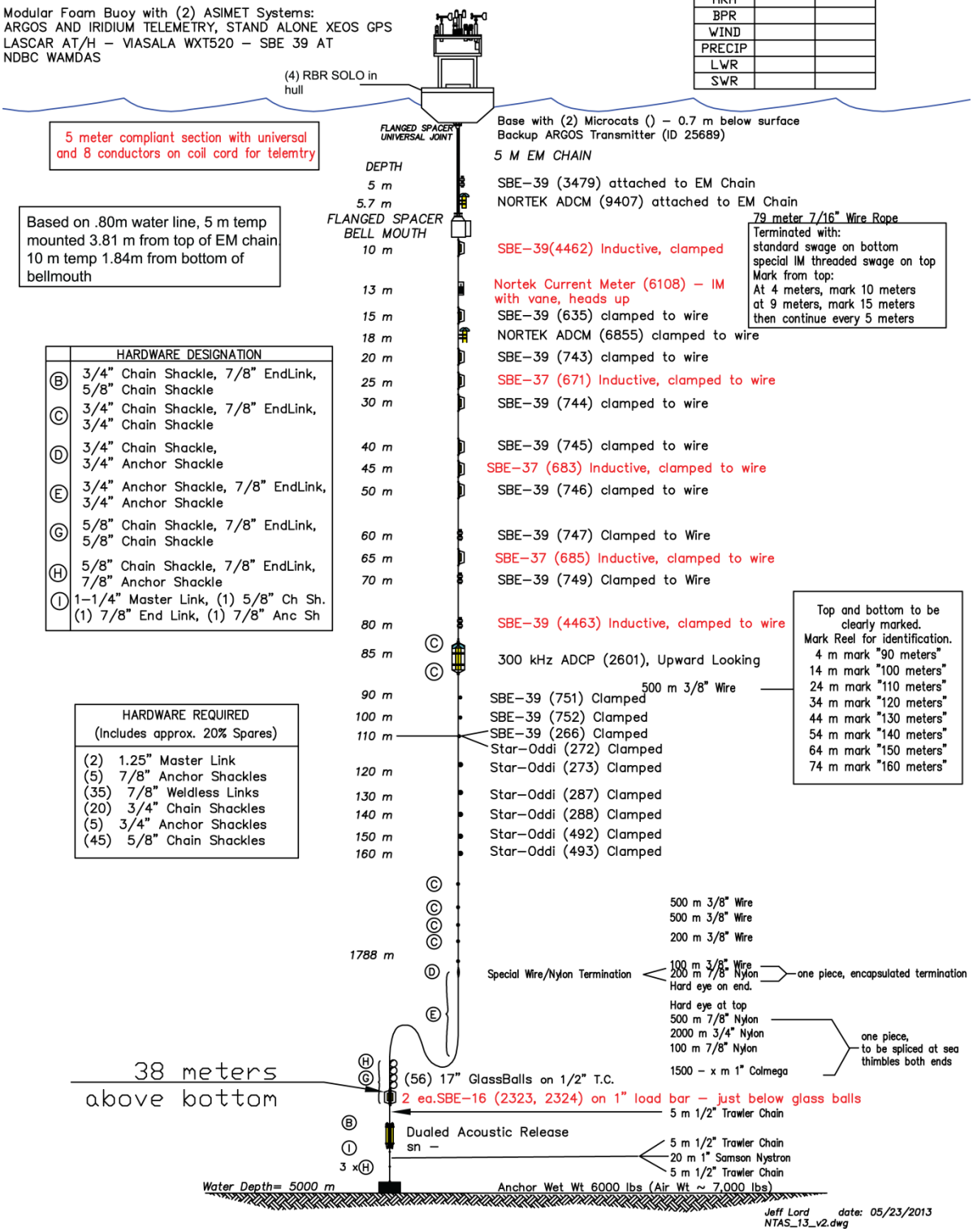
NTAS 13

PO Mooring # 1266

Position: 14° xxxx' N, xxxx W
WATCH CIRCLE = 4.0 N.Miles

Modular Foam Buoy with (2) ASIMET Systems:
ARGOS AND IRIDIUM TELEMETRY, STAND ALONE XEOS GPS
LASCAR AT/H – VIASALA WXT520 – SBE 39 AT
NDBC WAMDAS

ASIMET INFO		
MODULE	SYS 1	SYS 2
HRH		
BPR		
WIND		
PRECIP		
LWR		
SWR		



	HARDWARE DESIGNATION
B	3/4" Chain Shackle, 7/8" EndLink, 5/8" Chain Shackle
C	3/4" Chain Shackle, 7/8" EndLink, 3/4" Chain Shackle
D	3/4" Chain Shackle, 3/4" Anchor Shackle
E	3/4" Anchor Shackle, 7/8" EndLink, 3/4" Anchor Shackle
G	5/8" Chain Shackle, 7/8" EndLink, 5/8" Chain Shackle
H	5/8" Chain Shackle, 7/8" EndLink, 7/8" Anchor Shackle
I	1–1/4" Master Link, (1) 5/8" Ch Sh. (1) 7/8" End Link, (1) 7/8" Anc Sh

HARDWARE REQUIRED (Includes approx. 20% Spares)
(2) 1.25" Master Link
(5) 7/8" Anchor Shackles
(35) 7/8" Weldless Links
(20) 3/4" Chain Shackles
(5) 3/4" Anchor Shackles
(45) 5/8" Chain Shackles