UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NOAA Marine and Aviation Operations
Marine Operations Center
439 W. York Street
Norfolk, VA 23510-1114

MEMORANDUM FOR: Captain Mark Pickett, NOAA
Commanding Officer, NOAA Ship *Ronald H. Brown*

FROM: Captain Anita L. Lopez, NOAA
Commanding Officer, NOAA Marine Operations Center-Atlantic

SUBJECT: Project Instruction for RB-13-02
Western Boundary Time Series (WBTS)

Attached is the final Project Instruction for RB-13-02, WBTS, which is scheduled aboard NOAA Ship *Ronald H. Brown* during the period of 19 February – 5 March, 2013. Acknowledge receipt of these instructions via e-mail to **OpsMgr.MOA@noaa.gov** at Marine Operations Center-Atlantic.

Attachment

cc:
MOA1

Project Instructions

Date Submitted:	January 24, 2013
Platform:	NOAA Ship *Ronald H. Brown*
Project Number:	RB-13-02
Project Title:	Western Boundary Time Series
Project Dates:	19 February 2013 to 5 March 2013

Prepared by: M. O'Neil Baringer Dated: 2/6/2013
Dr. Molly Baringer
Chief Scientist
NOAA/AOML

Approved by: Robert Atlas Dated: 6 Feb. 2013
Dr. Robert Atlas
Director
NOAA/AOML

Approved by: ______________ Dated: 15 Feb 2013
Captain Anita L. Lopez, NOAA
Commanding Officer
Marine Operations Center - Atlantic

PROJECT OVERVIEW

A. Summary

The Abaco time series began in earnest in August 1984 when NOAA extended its Straits of Florida program to include measurements of western boundary current transports and water mass properties east of Abaco, the Bahamas. The Western Boundary Time Series project is now one of the longest-lived components of the NOAA Global Ocean Observing System program. Since 1986, over 20 hydrographic sections have been completed east of Abaco, most including direct velocity observations by Pegasus and/or Lowered Acoustic Doppler Current Profiler (LADCP). Transient tracer (CFC) measurements have been made on 7 of these sections, at roughly 2-year intervals. Current meter arrays were also maintained from April 1986 to April 1997. A related international program funded by the United Kingdom's Rapid Climate Change Program and the United States National Science Foundation began in March 2004 and is scheduled to end in Spring 2014. Included in this program is a new deployment of current meter moorings along the Abaco section (the UK segment of the program continues with moorings across to the east edge of the Atlantic basin). Independently, the National Oceanic and Atmospheric Administration began a monitoring program in September 2004 utilizing inverted echo sounder moorings (some including bottom pressure measurements and near-bottom current meters) along the Abaco section. All of these programs are collaborating on scientific analysis and on logistics. The repeated hydrographic and tracer sampling at Abaco has established a high-resolution record of water mass properties in the Deep Water Boundary Current (DWBC) at 26ºN, which for temperature and salinity can be reasonably constructed back to about 1985 (Vaughan and Molinari, 1997; Molinari et al., 1998). Events such as the intense convection period in the Labrador Sea and renewal of classical Labrador Sea Water in the 1980's are clearly reflected in the cooling and freshening of the DWBC waters off Abaco, and the arrival of a strong CFC pulse, approximately 10 years later. This program is unique in that it is not just a single time series site but instead is a section from which transport can be directly calculated, of which very few are available in the ocean that approach a decade or more in length.

To achieve the goals of NOAA's strategic plan in terms of understanding the Atlantic Ocean's role in decadal and longer time scale climate variability, these continued time series observations at Abaco are seen as serving three main purposes:

1. Monitoring of the DWBC for water mass and transport signatures related to changes in the strengths and regions of high latitude water mass formation in the North Atlantic. Monitoring water mass properties in the DWBC at key locations is one part of an effort to track decadal changes in large-scale water mass properties.
2. Serving as a western boundary endpoint of a subtropical Meridional Overturning Circulation (MOC)/heat flux monitoring system designed to measure the interior dynamic height difference across the Atlantic basin and the associated baroclinic heat transport.

3. Monitoring the intensity of the Antilles current as an index (together with the Florida Current) of inter-annual variability in the strength of the subtropical gyre. Variation in the strength of the subtropical gyre in relation to the North Atlantic Oscillation (NAO) has been proposed as an important mechanism in the atmosphere-ocean feedback within coupled models (e.g., Latif and Barnett, 1996).

During the 2013 survey, full water column hydrographic and CTD observations are to be taken in the Florida Straits and East of Abaco Island, Bahamas. Acoustic telemetry will be employed at a total of five locations where Inverted Echo Sounder mooring have previously been deployed in order to retrieve data without recovery of the instruments themselves. One inverted echo sounder mooring will be deployed at the far eastern site "E". Please see attached station locations.

B. Operating Area

The operating area is in the Florida Straits and East of Abaco, Bahamas at 26.5ºN. See Figure 1.

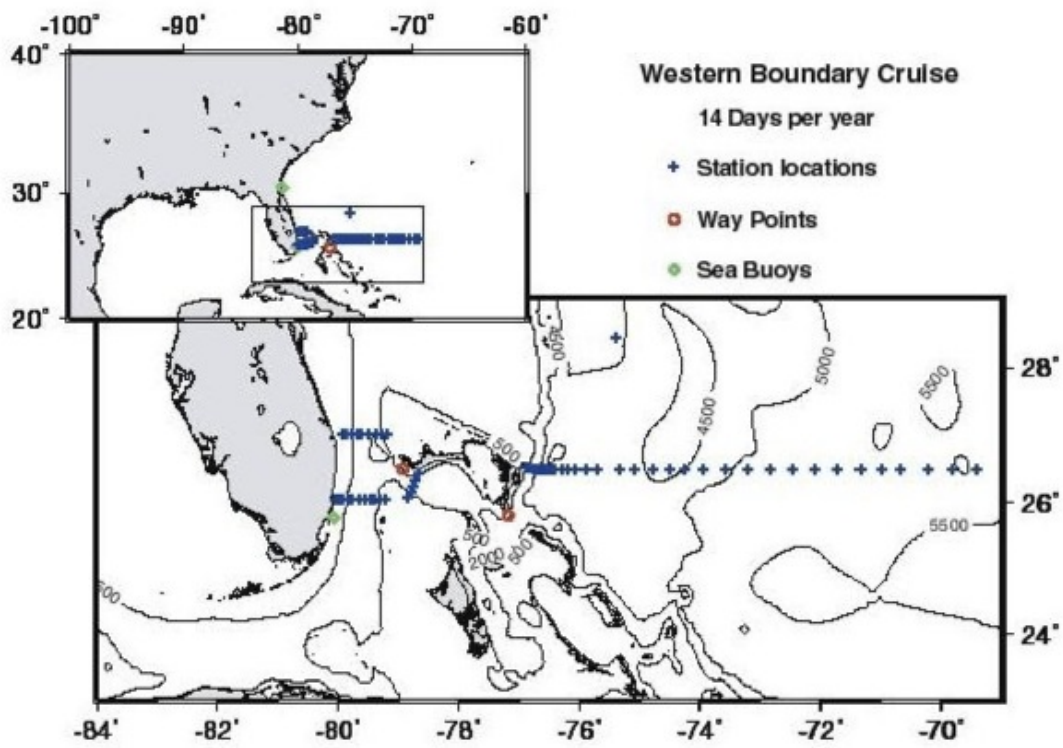

Figure 1: Typical CTD locations for the Western Boundary Time Series cruise. Note during the February 2013 cruise, the ship will depart Puerto Rico and return to Charleston and not Jacksonville/Miami as shown above.

C. Participating Institutions

United States Department of Commerce
National Oceanic and Atmospheric Administration
Atlantic Oceanographic and Meteorological Laboratory (NOAA/AOML)
Physical Oceanography Division
4301 Rickenbacker Causeway
Miami, FL 33149 USA
Telephone: 001 305 361 4430
Facsimile: 001 305 361 4392

University of Miami
Rosenstiel School for Marine and Atmospheric Science (RSMAS)
4600 Rickenbacker Causeway
Miami, FL 33149

D. Data to be collected: Lead PI (in order of priority)

CTD:	Molly Baringer - AOML
Salinity:	Molly Baringer - AOML
PIES:	Chris Meinen - AOML
Dynamic height mooring:	Stuart Cunningham – NOCS, UK
ADCP/LADCP:	Chris Meinen - AOML
Oxygen:	Molly Baringer - AOML

Personnel on RB 13-02: (Charleston, SC to Charleston, SC)

Name	Sex	Nationality	Affiliation
Molly Baringer	M	USA	NOAA/AOML
Andrew Stefanick	M	USA	NOAA/AOML
James Hooper	M	USA	UM/CIMAS
Kyle Seaton	M	USA	UM/CIMAS
Pedro Pena	M	USA	NOAA/AOML
Ed Hunt	M	TBD	Volunteer
Kristene Mastropole	F	USA	Student/RSMAS
Dave Ortiz-Suslow	M	USA	Student/RSMAS

E. Administrative

Chief Scientist

Dr. Molly Baringer
Atlantic Oceanographic and Meteorological Laboratory
4301 Rickenbacker Causeway
Miami, FL 33149 USA

Telephone: 305-361-4345, Facsimile: 305-361-4412
Molly.Baringer@noaa.gov

Alternate Project Lead — Dr. Christopher Meinen
Atlantic Oceanographic and Meteorological Laboratory
4301 Rickenbacker Causeway
Miami, FL 33149 USA
Telephone: 305-361-4355, Facsimile: 305-361-4412
Christopher.Meinen@noaa.gov

Alternate Point of Contact — CDR Steve Meador
Atlantic Oceanographic and Meteorological Laboratory
4301 Rickenbacker Causeway
Miami, FL 33149 USA
Telephone: 305-361-4544 Facsimile: 305-361-4449
AOML.Associate.Director@noaa.gov

RB Operations Officer — LT Paul Chamberlain, NOAA
OPS.Ronald.Brown@noaa.gov

Clearances:

Research clearance has been received for The Bahamas.

F. Foreign National Access and Deemed Export Controls

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 foreign national's sponsor is responsible for obtaining clearances and export licenses required and for providing for required escorts by the NAO. Programs sponsoring foreign nationals should consult with their designated line office personnel 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:

Ensure the following is provided to the Commanding Officer before any foreign national will be allowed on board for any reason:

1. Written notification identifying the NOAA Program individual who is responsible for ensuring compliance with NOAA and export regulations for the foreign national (see Foreign National Sponsor responsibilities below).
2. A copy of the DOC/OSY clearance authorization for access by the foreign national.
3. A copy of Appendix B of NAO 207-12 with NOAA Chief Administrative Officer concurrence endorsement.
4. Written notification that the foreign national has been cleared against the State, Commerce and Treasury departments' Lists to Check. http://www.bis.doc.gov/ComplianceAndEnforcement/ListsToCheck.htm
5. Provide the NOAA Foreign National List spreadsheet for each foreign national in the scientific party.

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.

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.

Export Control - The Chief Scientist is responsible for complying with NAO 207-12 and the development of Technology Access Control Plans for items they bring aboard. The Chief Scientist must notify the Commanding Officer of any export controlled items they bring aboard and any access restrictions associated with these items.

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:

Ensure only those foreign nationals with DOC/OSY clearance are granted access.

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.

Ensure foreign national access is permitted only if unlicensed deemed export is not likely to occur.

Ensure receipt from the Chief Scientist of the NOAA Foreign National List spreadsheet for each foreign national in the scientific party.

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.

Export Control - 8 weeks in advance of the Project, 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.

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

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.

The Departmental Sponsor/NOAA 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.

Ensure completion and submission of Appendix C (Certification of Conditions and Responsibilities for a Foreign National Guest) as required by NAO 207-12 Section 5.03.h.

OPERATIONS

A. Data to be collected

1. CTD profiles of depth along hydrographic transects in the Florida Straits and East of Abaco Island, Bahamas. Approximately 55 stations will be completed to full water depth, estimated maximum near 6000 meters.
2. Profiles of northward and eastward velocity from the LADCP.
3. Salinity of the water samples collected.
4. Dissolved oxygen concentration in the water samples collected.
5. Continuous recording of ship mounted ADCP data.
6. Heading data from the MAHRS gyro system, the Seapath GPS system, the POSMV GPS system or any equivalent system for correction and processing of shipboard ADCP data.
7. Continuous recording of Thermosalinograph (TSG).

8. Continuous recording of multibeam bathymetry requested (with help from ship science technician)
9. Inverted Echo Sounder telemetry data recovery (requires transducer over the side).
10. Inverted Echo Sounder deployment (one mooring, requires the help from ship deck crew).

B. Staging Plan

Preliminary staging of the US equipment for the cruise has already been conducted in Charleston, SC for CTD/IES instrumentation. We sent to the ship a twenty-foot container storing CTD/IES equipment with an additional CTD frame. This container has already been secured on the ship and the equipment is currently being used for the PNE cruise.

The bulk of the science party will arrive in Puerto Rico on February 17 two days prior to sailing for final staging prior to the cruise. Despite *Ronald H. Brown* policy that typically does not allow science personnel to stay onboard until one night before sailing, the command has graciously allowed the science party to move on board February 17th. We understand the galley may not be available for science party meals before sailing and will make every effort to minimize our impact on the crew. However, we will require the assistance of the shipboard ET and Survey Technician for 8 hours on the day two-days prior to sailing and 8 hours the day before sailing to help non-NOAA personnel to take the NOAA IT security course, to scan, update and install computer systems, and to make terminations for the CTD as well as to aid in the setup of other science equipment.

C. Project Plan

NOAA Ship *Ronald H. Brown* (RHB) will depart San Juan, on February 19, 2013, to begin scientific operations. The primary goals of the cruise are to sample along previously occupied hydrographic sections (see Table 1 for station locations) and to deploy one AOML inverted echo sounder mooring. All attempts will be made to reoccupy the CTD stations as closely as possible; however, prevailing weather conditions as well as changes in scheduling and scientific objectives make the exact determination of the station coordinates impossible at this time. The actual hydrographic stations sampling plan may deviate from this proposed plan in both number of stations and their locations.

The cruise will proceed from San Juan to 69.5°W, performing one or more test CTD casts in route. The exact location of the test station(s) will be determined in consultation with the Commanding Officer. We will then begin the CTD section along 26.5°N working from east to west. Acoustic communication with the NOAA PIES & CPIES moorings will also be done during the CTD section and the one mooring deployment will occur at approximately 72W, with perhaps as much as four hours for deployment time. Upon completion of the main CTD line, we will complete three short CTD sections in the Northwest Providence Channel, 26°N and 27°N in the Straits of Florida.

One IES deployment and no recoveries are planned for this cruise. We will also be stopping over the IES mooring sites to telemeter the data to the ship via acoustic telemetry using an over-the-side transducer. We require that the ship suspend maintenance operations (for example needle gunning) for the duration of the IES telemetry in order to maintain as acoustically quiet environment as possible. The ship will be notified ahead of time whenever IES telemetry is planned (see Table 1 below for projected station locations highlighted in green). We will be bringing one spare IES to be used for emergency deployment in case one of the IES moorings does not respond to our telemetry request. See Table 3 for a complete list of IES locations and operations.

We require that the ship suspend pumping and dumping for, at minimum, the last 500 m of the CTD upcasts. The ship should also suspend any operations (e.g., incineration, paint chipping, deck washing, etc.) during this period as these activities can lead to release of quantities of material into the surface water in the area where the rosette is recovered.

A map of the station locations is shown in Figure 1.

D. Station Locations

Station Locations and waypoints are listed in Table 1. These are subject to change.

Sta #	Lat (dec)			Lon (dec)			Comments
San Juan	18	30.0	N	66	10.0	W	Port
1	26	30.00	N	69	30.00	W	Note Test Cast "0" will preceed Station 1, location TBD
2	26	30.00	N	70	0.00	W	
3	26	30.00	N	70	30.00	W	
4	26	30.00	N	71	0.00	W	
5	26	30.00	N	71	30.00	W	
6	26	30.00	N	72	0.00	W	PIES E – Deployment
7	26	30.00	N	72	23.00	W	
8	26	30.00	N	72	46.00	W	
9	26	30.00	N	73	8.00	W	
10	26	30.00	N	73	30.00	W	
11	26	30	N	73	52	W	
12	26	30	N	74	14	W	
13	26	30	N	74	31	W	
14	26	30	N	74	48	W	
15	26	30	N	75	5	W	
16	26	30	N	75	18	W	
17	26	30	N	75	30	W	
18	26	30.00	N	75	42.20	W	PIES D - Telemetry
19	26	30.2	N	75	54.00	W	

20	26	30.0	N	76	5.20	W	PIES C - Telemetry
21	26	30.03	N	76	13.00	W	
22	26	30.03	N	76	20.80	W	
23	26	30.00	N	76	28.50	W	PIES B - Telemetry
24	26	30.00	N	76	33.90	W	
25	26	30.45	N	76	39.30	W	
26	26	30.0	N	76	44.60	W	PIES A2 - Telemetry
27	26	31.00	N	76	49.9	W	PIES A - Telemetry
28	26	31.50	N	76	53.50	W	
29	26	31.00	N	76	49.9	W	
Marsh Harbor	26	38.05	N	77	0.31	W	Customs possible
Hole-in-the-wall	25	48.00	N	77	11.0	W	WayPoint
N End NWPC	26	28.8	N	78	40.1	W	SADCP waypoint
30	26	26.00	N	78	40.00	W	
31	26	20.00	N	78	43.00	W	
32	26	15.00	N	78	46.00	W	
33	26	10.00	N	78	48.00	W	
34	26	4.00	N	78	51.00	W	
S End NWPC	26	1.90	N	78	51.90	W	SADCP waypoint
Waypoint	26	15.00	N	79	6.40	W	Waypoint
E End 26N	26	3.5	N	79	9.9	W	SADCP waypoint
35	26	3.00	N	79	13.98	W	
36	26	3.00	N	79	18.78	W	
37	26	3.00	N	79	23.94	W	
38	26	3.00	N	79	28.86	W	
39	26	3.00	N	79	34.02	W	
40	26	3.00	N	79	39.90	W	
41	26	3.00	N	79	45.96	W	
42	26	3.00	N	79	51.00	W	
43	26	3.00	N	79	55.98	W	
44	26	3.00	N	79	59.94	W	
45	26	3.00	N	80	3.90	W	
W End 26N	26	3.00	N	80	5	W	SADCP waypoint
west end 27N	27	0.00	N	79	59.2	W	SADCP Waypoint
46	27	0.00	N	79	56.00	W	
47	27	0.00	N	79	52.00	W	
48	27	0.00	N	79	47.00	W	
49	27	0.00	N	79	41.00	W	
50	27	0.00	N	79	37.00	W	
51	27	0.00	N	79	30.00	W	
52	27	0.00	N	79	23.00	W	
53	27	0.00	N	79	17.00	W	
54	27	0.00	N	79	12.00	W	
east end 27N	27	0	N	79	10.5	W	SADCP waypoint
Seabuoy	32.0	39.7	N	79.0	40.9	W	Waypoint
	32.0	47.8	N	79.0	52.9	W	Waypoint
Charleston	32.0	49.8	N	79.0	55.9	W	Port

Table 1: Planned station locations. *PLEASE NOTE: Yellow Highlighted lines are waypoints at the ship and Commanding Officers discretion, listed here only for estimating the total time for the cruise. Waypoints highlighted in orange and requested waypoints from the science party where we wish to start/end the lines in order to capture complete SADCP sections – see the notes in the Comments column. No other scientific operations are planned at the yellow or orange highlighted lines except underway data (and possible port clearances). Green highlighted lines indicate that IES operations are planned simultaneous with the CTD cast; these sites are where we request an acoustically quiet ship. Blue highlighted lines indicate mooring operation locations. Please keep in mind that the mooring operations and CTD scheduled in between mooring operations will change in order and sometimes location in order to maximize daylight as needed for mooring operations. The actual number of dip casts may be larger or smaller than what is listed here.*

Mooring	Lat °N	Lon °W	type
WB6	26° 29.58'	70° 31.53'	ctd/cm
WB4L6	26° 21.78'	75° 42.42'	Bottom lander
WB4	26° 29.21'	75° 48.56'	ctd/cm
WBH2	26° 28.61'	76° 37.32'	ctd/cm
WB2	26° 30.92'	76° 44.57'	ctd/cm
WB2L6	26° 30.52'	76° 44.70'	Bottom lander
WB1	26° 30.19'	76° 48.91'	ctd/cm
WBADCP	26° 31.497'	76° 52.080'	adcp
WBAL1	26° 31.50'	76° 52.563'	Bottom lander

Table 2: *Western boundary mooring array with nominal depths, and positions. Note no mooring operations will be conducted, but all CTD operations should be aware that a 1 nm watch circle should be maintained around the moorings.*

Mooring name	Mooring type	Longitude	Latitude	Activity
A	PIES	76º 50.0’ W	26º 30.9’ N	Telemetry
A2	CPIES	76º 44.6’ W	26º 30.0’ N	Telemetry
B	PIES	76º 28.2’ W	26º 29.5’ N	Telemetry
C	PIES	76º 05.3’ W	26º 30.1’ N	No activities
D	PIES	75º 42.3’ W	26º 30.2’ N	Telemetry

E	PIES	72º 00.0' W	26º 30.0' N	Deployment

Table 3: *Inverted Echo Sounder locations and planned activities*.

E. Station Operations

The preliminary personnel task assignments are indicated with each operation. The chief scientists and the Commanding Officer will determine final responsibilities.

a.) **Full water column CTD/Rosette Casts** (Ship and scientific personnel)

CTD casts will include the user supplied CTD/O2 unit, a Lowered ADCP unit and a 24-position 11-liter bottle Rosette sampler. Approximately 62 casts will be conducted to full water column depth, maximum estimated at 5500 meters. We will require a package tracking system and display for the CTD operations (Knudsen/Bathy2000/Bathy2010). We request that the ship provide an 8000 + m back-up CTD conducting capable wire for this project.

It is of utmost importance to the success of the expedition that the ship be able to hold position at all times during the CTD casts, and that the CTD winch, meter wheel, hydraulic frame, conducting cable and backups function properly during this expedition. Both primary and secondary winches must contain full lengths of CTD conducting cable in good condition and be outfitted to deploy the primary or secondary CTD. That is both should be fully rigged. Skilled ship personnel and adequate spare parts must be available to assure that this equipment is maintained in good working order. The ship's personnel must be skilled in CTD wire re-terminations, and adequate ship's supplies of materials for CTD wire re-terminations must be available. Since typical steaming time between stations is much less than 3 hours, re-terminations of the conducting cable (when required) must be completed within 23 hours.

The CTD/rosette system will be deployed off the starboard side. The size and weight of the package and frequent deployment is such that all mechanical components of winch and wire must be in excellent operating condition including optimal fleet angle, wire wrapping, and sheave diameter. In addition to this primary system, at least one other scientific party supplied 24-postion 11-liter water bottle package will serve as back-up. A pinger and altimeter will be mounted on the rosette systems and used during casts to monitor distance from the bottom. We anticipate that during most casts, the CTD/rosette will be lowered within about 20 meters of the bottom. The ship should have the ability to acoustically track the decent of the CTD.

The winch, wire and meter wheel must be capable of routinely making casts up to 5500-m with these rosette systems. During the casts, if needed and available, ship's personnel will assist the CTD operators monitoring of the bathymetric recorder and pinger signal and to properly assess the distance of the rosette package off the bottom. The ship's electronics technician will share responsibility with the scientific party for maintaining good electrical and mechanical connections between the CTD/rosette system, the conducting cable and winch slip-rings, and to the deck unit for the CTD/rosette system.

Ship and scientific personnel will mutually assist in the deployment and recovery of the CTD/rosette. A number of members of the scientific party have experience with CTD deployments. Members of the scientific party will be responsible for collecting the water samples from the rosette. Members of the scientific party will also be responsible to collect oxygen and salinity samples and recording sample ID's. Particular care will be taken in the collection and analysis of water samples to assure that all properties are measured with the greatest accuracy possible. Some of the chemical measurements are sensitive to contamination from soot, oils, solvents, spray cleaners, lubricants, paints, hydraulic fluid, and other substances. The chief scientists and watch stander should be notified prior to the use of these substances. Care must be taken to avoid contamination of the rosette system with these substances. Smoking is prohibited in the area around the rosettes and at all times in the laboratories.

A designated member of the scientific party will be on deck during deployment and recovery to watch wire operations until the CTD/rosette system passes 200-m on the way down and starting when it reaches 200-m on the way up to assure smooth operations. The designee will communicate immediately with survey technician or watch lead who has radio contact with winch operator and bridge if something is amiss. The recovery team consisting of the chief survey technician from the ship's crew and qualified rope and hook handlers from the scientific party will be assembled on deck by the time the package is 40-m from the surface. Discharges from holding tanks must be secured 20 minutes prior to the projected time of deployment of the CTD and again 20 minutes prior to recovery of the CTD to the surface layer. The tanks may be pumped when the cast is at depth (>200 meters) but it is preferred that discharge occurs while underway between stations. The bridge must inform the ship's engineers in advance when discharges are to be secured.

b.) **Sampling the rosette bottles** (Scientific personnel):
The usual order for drawing seawater samples on deck will be: oxygen then salinity. Scientific personnel will analyze salinity samples. Two salinity samples may be drawn from the deepest (or next to deepest) bottle at each station to monitor the precision of the sampling/analysis procedures. Salinity samples will be run using *Ronald H. Brown's* Guild line 8600B Autosal instrument, complete with computer interface and laptop computer. The ship must provide a backup salinometer. The salinometers must be checked for accuracy and precision during the last US in-port before the start of the expedition. Salinity samples will be analyzed in the salinity lab off the hydrolab, and variations in laboratory temperature must not exceed 1°C during a 24-hour period. The salinity samples will also be stored in this temperature controlled area for at least 8 hours to allow them to come to ambient temperature. The Autosal will be standardized at least once each station with new vials of standard seawater. Standard seawater will be provided by the scientific personnel for use on this project. To maintain the required accuracy, it is advisable to have only 1-2 persons run all salinity samples. We anticipate ~125 samples/day.

An accuracy of 0.003 PSS-78 or better is required, and will be monitored by scientific personnel by comparison with CTD and historical data.

Oxygen sampling and analysis (Scientific personnel):
Samples will be collected for oxygen analysis from each sample bottle at all stations. Dissolved oxygen samples will be "pickled" immediately after drawing using reagents in dispensing bottles located at a strategic location near the rosette. The samples will be run by members of the scientific party.

c.) Lowered ADCP (Ship and Scientific personnel):
The lowered ADCP (LADCP) will be used on all CTD/rosette casts. The instrument is a dual broadband, self-contained, 300 kHz ADCP, which is to be mounted to the 24-position rosette system. The instrument can be used to a depth of 6000 m. The instrument is turned on about 15 minutes prior to the launch of the CTD/rosette package using a removable cable connection to a deck box and PC computer. The deck box should be in a dry area within 10 m of the rosette. After the CTD station, about 30 minutes are required to transfer the data from the instrument and to turn it off. The LADCP may have to be removed from the rosette for repair and possible battery changes.

d.) ***Argo Float and surface drifter deployment*** (Ship and scientific personnel):
A TBD number of Argo floats and drifters may be released during this expedition. The chief scientist will coordinate this program. These floats require about an hour of preparation prior to deployment. Preparations will be completed while the CTD is in the water. Floats will be deployed at stations immediately following recovery of the CTD and before the ship gets underway. Deployment involves lowering the ~30 kg float by hand into the water from the stern of the ship. One or two persons from the ship and scientific party will be required for preparation and deployment.

e.) ***PIES deployment and/or recovery*** (Ship and scientific personnel):
One PIES deployment operation is presently planned for this cruise, however if one of the other existing instruments is determined to have a problem, we will evaluate the need for an unplanned PIES deployment and/or recovery. The PIES mooring (with anchor) weighs approximately 100-200 lbs., and consists of a roughly 1 meter tall instrument with a 1 meter anchor line and an anchor. Deployment for the PIES can be done onsite, and can be done via the A-frame or via a crane using a quick-release line. The mooring should sink at roughly 60 meters/minute once deployed. If problems occur during deployment and the PIES must be recovered, a grappling hook and line will be required. PIES deployment can be done day or night. The CPIES mooring (with anchor) weighs approximately 250-350 lbs., and consists of a PIES mooring that sits in a metal frame with a 50 meter cable stretching up to a current meter and a set of flotation balls. After the PIES and CPIES mooring deployments, a standard over-the-side transducer will be lowered into the water to test communications with the moorings. While the communications tests are being done, a CTD cast will be done at the site of the moorings. The PIES recovery will

involve a standard over-the-side transducer that will send down acoustic signals initiating a release. Once released, the PIES will rise at roughly 60 meters/minute. At the surface the PIES have both a strobe light and a radio transmitter to aid in recovery. The PIES moorings to be recovered will consist of a roughly 1 meter tall instrument package along with a ten meter long line with a small float at the end. Recovery is done via a grappling hook, which is thrown across the ten-meter line and the package is pulled onboard by hand or via a small winch. The package weight will be roughly 100 lbs. The CPIES recovery will be essentially the same as the PIES, however the instrument to be recovered will have a 50 meter data cable connected to a current meter and flotation; approximate package weight will be 150-200 lbs., and recovery can be done via grappling hook and crane/A-frame. We will require the use of a Knudsen or the Bathy2010 to receive communications from the PIES moorings. We may need the spar transducer for the PIES recovery and deployment operations.

f.) ***PIES telemetry*** (Scientific personnel):
The PIES Telemetry operations will involve an over-the-side transducer that will be in the water for several hours maintaining communications via a deck-box and computer. Some telemetry operations will be completed during CTD casts at the site.

g.) ***Mooring deployment and recovery*** (Ship and scientific personnel):
The are no tall mooring delpoyments or recoveries planned. However, CTD operations should be conducted no closer than 1 nm from any tall subsurface mooring. A table of current mooring positions is provided above.

Tall mooring deployments typically include identifying and checking the site, streaming the mooring, dropping the anchor, listening to the mooring down to and on the seabed and then a triangulation survey (triangulation survey for WB1, WB2, WBH2, WB4 only). There are four quick simple moorings labeled WBADCP, WB4L6, WB2L6 and WBAL1. These are deployed by lifting overboard in one unit then released on position. There is no need for a CTD watch circle for these short moorings.

h.) ***Navigation*** (Ship personnel):
Navigation shall be based on the best available information including GPS, radar and visual. When GPS control is available, it is the preferred navigation method. Several GPS units must be integrated with the ship's SCS system for ADCP and LADCP measurements.

The CTD/rosette station locations listed in the table 1are nominal positions. Starting station positions along the section need only be within ~0.1 nautical mile of the listed position and no adjustments need to be made to the ship’s position upon approach to the station to bring the starting position closer than ~ 0.1 nautical mile to the nominal position. Some drift during CTD/rosette casts is acceptable to maintain favorable wire angle. Exceptions will be made to these general guidelines when sampling in regions of rapidly changing bathymetry, when more precise positioning (including on site adjustments to station locations) and more precise station keeping will be required.

Navigation information will be recorded, including satellite fixes and other events as they occur. Entries should be made at least once every four hours, and at the time of each course and speed change when the ship is en route between stations (including slowdowns on arrival at the station and speedups on departure). Since copies of this information will be made and used by various project participants, it is important that the entries be checked and made clearly and dark enough for reproduction. In addition, weather observations recorded on NOAA Form 77-13d shall be made available for reproduction by the scientific party.

F. Underway Operations:

Where research clearances and conditions permit, underway measurements will be made along the entire project track, including the inland waters. The uncontaminated seawater system will normally not be operated in harbors or other polluted areas.
-Underway measurement of sea surface temperature and salinity (Ship personnel)
-ADCP (Scientific and ship personnel)
-Routine weather observations (Ship personnel).
-Center-beam multi-beam bathymetric data logging (Ship personnel).
Sea surface temperature and salinity will be recorded continuously with a system accurate to within 0.05°C and 0.1 PSS-78. A copy of the calibration data will be provided to the chief scientists.

Underway sea surface measurements and sampling (Ship personnel):
Continuous water sampling will be made from the ship's bow intake system. Ship's personnel will maintain this pump and provide adequate spare parts. This system must be capable of delivering 120 liters/minute of seawater. The system should be cleaned with bleach and flushed thoroughly at all taps prior to the project following the procedures established by the chief survey technician. Seawater will be drawn off this line to a sea/air equilibrator. Care must be taken to prevent contamination from smoke, solvent fumes, cleaning solutions, etc. Continuous underway measurements of pCO_2 will be made from one of the headspace equilibrators utilizing a LICOR NDIR Analyzer. Continuous measurements of chlorophyll will also be made using an in-line fluorometer.

ADCP underway operations (Ship and scientific personnel):
Data from the ADCP system will be logged continuously while underway.

Weather observations (Ship personnel):
Observations must be done at each station, and at regular intervals while underway.

Multibeam bathymetry (Ship personnel):
While underway, we request that the multibeam will be operated to obtain a continuous record of time, position and bottom depth. During CTD stations, the Bathy2000 system will be required for bottom detection. Multibeam and other acoustic measurement systems may need to be

secured during telemetry operations with the IES instruments and during acoustic communication with the mooring releases.

Event files

The ship shall collect 1-second heading information from the POS MV and MAHRS GPS system for comparison and testing. We request one file with
1-second data with the following:

GPS time, lat, lon, cog and sog
POS MV heading, pitch and roll
MAHRS heading (and pitch and roll if available)
Gyro heading

We request one file with
1-second data with the following:

GPS time, lat, lon, bathy depth

We also request that the chief survey technician in consultation with the chief scientist sets up special event files for the groups requesting them.

G. Small Boat Operations

Small boat operations will be required for this project for customs/immigration clearance in the Bahamas.

H. De-staging Plan

De-staging will occur in Charleston, SC immediately after conclusion of the expedition. Assistance from the deck department will be appreciated to unload mooring gear and AOML's small container.

I. Meals and Berthing Plan

Meals are required for up to 20 scientists, 3 times daily beginning one hour before scheduled departure, extending throughout the Project, and ending two hours after the termination of the Project. All NOAA Scientists will have proper travel orders when assigned to NOAA Ship *Ronald H. Brown*. 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. Scientists may stay on the ship from the day before the Project until the day after the end of the Project.

FACILITIES

A. Equipment and Capabilities Provided by the Ship

1. Echo Sounder (Ocean Data Equipment Corporation (ODEC) Bathy 2010 or the Knudsen system) used in 12 kHz mode (to track CTD package to within 20 meters of the bottom) to be used while on CTD station.
2. Kongsberg EM122 Multibeam Mapping System (12 kHz) swath bathymetric sonar system sampling while conducting mooring operations.
3. Barometer with calibration files
4. WOCE IMET sensors with calibration files
5. Hydrographic Winch system and readouts (using 0.322 in conducting cable for CTD operations).
5. Hull mounted acoustic Doppler current profiler (RD Instruments (RDI), 75 kHz Ocean Surveyor acoustic Doppler current profiler) with gyro input.
6. MAHRS gyro system for acquisition of heading data used by acoustic Doppler current profiler.
7. POS MV system for acquisition of heading data for testing the new MAHRS system.
8. Winch and A-frame for mooring deployment and recovery.
9. Two Guildline 8400B Autosals for processing salinity bottle samples. Also need a temperature controlled room stable to within one degree C.
10. A photocopier (in good working order) with ink and paper
11. A color printer (in good working order) with ink and paper

The above listed scientific equipment provided by the ship is all critical for meeting the objectives of this Project. However, the winch and A-frame, hull-mounted transducer, Kongsberg EM122 Multibeam Mapping System and shipboard ADCP are particularly important for satisfying the objectives of this Project.

B.) Equipment, capabilities and supplies provided by scientific party:

One or two 20’ container vans may be loaded aboard *Ronald H. Brown* for this project.

1. Two Seabird 911+ CTDs to collect profiles of depth. An altimeter will be installed, but it is considered a backup to the shipboard 12kHz tracking of the CTD package.
2. Two General Oceanics 24 bottle rosette wheel to collect water samples for comparison with the CTD profiles.

3. Two RDI 300 kHz and one or two 150 KHz lowered acoustic Doppler current profilers (LADCP) to measure profiles of northward and eastward velocity.
4. Salinity sample bottles and standard seawater.
5. Two automated oxygen titration system built by NOAA to measure the dissolved oxygen concentration in the water samples, including sample bottles.
6. Several computers for data acquisition and processing.
7. Equipment to support PIES mooring recovery, deployment and telemetry, including emergency PIES moorings that may be deployed.
8. One PC/Laptop running Windows NT/2000/XP for SCS feed into wet lab.
9. One PC/Laptop with autosal interface for connection to Autosal in temperature controlled salinity room.
10. Computers and mooring equipment (microcats, releases, etc.) for the moorings illustrated in the appendix.

DISPOSITION OF DATA AND REPORTS

A. Data Responsibilities

The Chief Scientists 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. As representative of the program manager (Director, Climate Observation Division of the Climate Program Office), the Chief Scientist will also be responsible for the dissemination of copies of these data to participants in the project, to any other requesters, and to NESDIS in accordance with NDM 16-11 (ROSCOP within 3 months of project completion). The ship may assist in copying data and reports insofar as facilities allow.

The Chief Scientists 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.

Individuals in charge of piggyback projects conducted during the project 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.

The Commanding Officer is responsible for all data collected for 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 ancillary project data will be provided to the Chief Scientists when requested. Reporting and sending copies of ancillary project data to NESDIS (ROSCOP) is the responsibility of the program office sponsoring those projects.

The ship shall record ADCP raw data continuously during the project.

The following data products will be produced by the ship and, if requested, will be given to the Chief Scientist at the end of each leg:

a. navigational log sheets (MOAs);
b. salinity determinations;
c. calibration data for Autosals;
d. copy of SEAS data on CD or DVD;
e. CDs or DVDs of Sea Beam and navigational data, including location and depths of acoustic profile locations;
f. SCS data on CD or DVD disk;
g. ADCP raw data on CD or DVD
h. CD of two event files: summary data above, and ADCP event files

B. Pre- and Post-Project Meetings

A pre-Project meeting between the Commanding Officer, Operations Officer, Department Heads and the Chief Scientist will be conducted either the day before or the day of departure, with the express purpose of identifying day-to-day project requirements, in order to best use shipboard resources and identify overtime needs. A brief post-Project meeting will be held when convenient.

C. Reporting requirements

Within seven days of the completion of the Project, a Ship Operation Evaluation form found at www.omao.noaa.gov/pdffiles/ship_eval.pdf 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

If need be, upon completion of the Project, a post-Project meeting will be held and attended by the ship's officers, the Chief Scientist and members of the scientific party, the Vessel Coordinator and the Port Captain to review the Project. Concerns regarding safety, efficiency, and suggestions for improvements for future Projects should be discussed.

The Ship Operations Evaluation Report will be completed by the Chief Scientist and given to the Director, AOML, for review and then forwarded to OMAO.

ADDITIONAL PROJECTS

A. MOC Directives

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.

The following projects will be conducted by ship's personnel in accordance with the general instructions contained in the MOC Directives, and conducted on a not-to-interfere basis with the primary project:

a. SEAS Data Collection and Transmission
b. Marine Mammal Reporting
c. Bathymetric Trackline
d. Weather Forecast Monitoring
e. Sea Turtle Observations

B. Underway Measurements in support of Global Carbon Cycle Research

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

The semi-automated instruments are installed on a permanent basis in the hydrolab of RHB. 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. The chief scientist assumes responsibility of the hazardous materials aboard RHB for this project. A list of the HAZMAT associated with this project is provided in Appendix A.

C. Underway Measurements for Ship-borne Lightning

Deployment of a new low-frequency ship borne receiver will be installed on the Ronald H. Brown in a location agreed to by the ships crew and science party that is designed to estimate the intensity of lightning currents. Oceanic lightning is poorly understood, but appears to be much more powerful than previously thought. This project will measure oceanic lightning including distinguishing the fast current rise from the high peak current and remove the uncertainty of propagation effects. The is a collaboration between the DARPA Nimbus lightning research program, Stanford University and the GOES-R Program

Geostationary Lightning Mapper (GLM) Science Team. Receiver operates autonomously, unattended, however requires access to indoor laboratory space for a computer and cabling to the receiver.

Principal investigations:
Steven Goodman GOES-R Program Chief Scientist
Morris Cohen – Stanford University

HAZARDOUS MATERIALS

A. Policy and Compliance

The Chief Scientist is responsible for complying with MOCDOC 15, Fleet Environmental Compliance #07, Hazardous Material and Hazardous Waste Management Requirements for Visiting Scientists, released July 2002. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

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, and/or absorbents in amounts adequate to address spills of a size equal to the amount of chemical brought aboard. The amount of hazardous material arriving and leaving the vessel shall be accounted for by the Chief Scientist.

B. Inventory

The Chief Scientist will provide the Commanding Officer with an inventory indicating the amount, concentrations, and intended storage area of each hazardous material brought onboard, and for which the Chief Scientist is responsible (see Appendix A). This inventory shall be updated at time of offload, 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.

The ship's dedicated HAZMAT Locker contains two 45-gallon capacity flammable storage cabinets and one 22-gallon capacity flammable storage cabinet. Unless there are dedicated storage lockers (meeting OSHA/NFPA standards) in each van, all HAZMAT, except small amounts for ready use, must be stored in the HAZMAT Locker.

C. MSDS

All hazardous materials require a Material Safety Data Sheet (MSDS). Copies of all MSDSs shall be delivered to the ship at least two weeks prior to sailing. The Chief Scientist shall have copies of each MSDS available when the hazardous materials are loaded aboard. Hazardous material for which the MSDS is not provided will not be loaded aboard.

RADIOACTIVE ISOTOPES

No radioactive chemicals will be used during the cruise.

MISCELLANEOUS

A. Meals and Berthing Plan

The Chief Scientist is responsible for assigning berthing for scientific party within the spaces designated as scientific berthing. The ship will send current stateroom diagrams to the Chief Scientist showing authorized berthing spaces. 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 Project and its conclusion prior to departing the ship.

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, which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels

B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, Revised: 02JAN2012) must be completed in advance by each participating scientist. The NHSQ can be obtained from the Chief Scientist or the NOAA website at 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 project 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.

C. Shipboard Safety

A discussion of shipboard safety policies is in the "Science User's Guide" which is available on *Ronald H. Brown* and is the responsibility of the scientific party to read. This information is also available on the ship's web page (http://www.moc.noaa.gov/rb). A meeting with the Operations Officer and Safety Officer will be held for the scientific party at the beginning of the project which will include a safety briefing. All members of the scientific party are expected to be aware of shipboard safety regulations and to comply with them.

Wearing open-toed footwear or shoes that do not completely enclose the foot (such as sandals or clogs) 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. The ship when required will provide hard hats and work vests.

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.

Contacts

Important phone numbers, fax numbers and e-mail addresses: (Up-to-date phone numbers can be found on the MOC web site at www.moc.noaa.gov/phone.htm#RB)

NOAA Ship *Ronald H. Brown* (to call from US)

- INMARSAT-B VOICE:	011-874-336-899-620	(approx $2.60/min)
- INMARSAT-B FAX:	011-874-336-899-621	
- INMARSAT "M" VOICE:	011-874-761-831-360	(approx $2.99/min)
- CELLULAR:	843-693-2082	(not while outside USA)
- OOD CELLULAR:	843-297-1835	

Note: Both the Cellular and OOD phones will work in San Juan.

- Iridium:	001-8816-7631-5690
	808-659-5690
	001-8816-7633-2352
	808-684-2352
-E-Fax:	757-299-8455

Program contacts

Christopher Meinen	Christopher.Meinen@noaa.gov	305-361-4355

E-mail addresses:

MOP radio room:	Radio.Room@noaa.gov
Commanding Officer, RHB	CO.Ronald.Brown@noaa.gov
Executive Officer, RHB	XO.Ronald.Brown@noaa.gov
Field Operations Officer, RHB	OPS.Ronald.Brown@noaa.gov
Medical Officer, RHB	Medical.Ronald.Brown@noaa.gov

E. IT Security

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. 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.

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.

G. 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, in consultation with the Executive Officer , which are considered to be outside the scope of the agent/ship support agreement, will be the responsibility of that program. Where possible, it is requested that direct payment be arranged between the science party and port agent, as opposed to after-the-fact reimbursement to the ship's accounts.

H. Wage Marine Working Hours and Rest Periods

The Chief Scientist shall be cognizant of the reduced capability of *Ronald H. Brown's* operating crew to support 24-hour mission activities. 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 day, 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 such a dayworker being unavailable to support science operations until the rest period has ended. All wage marine employees are supervised and assigned work only by the Commanding Officer or his/her designee. The Chief Scientist and the Commanding Officer shall consult regularly to ensure the shipboard resources available to support the science mission are utilized safely, efficiently, and in accordance with the above policies.

Appendix A. List of Hazardous Materials

Location on ship: HAZMAT locker

Contact: Andrew Stefanick, NOAA/AOML

DETERMINATION OF DISSOLVED OXYGEN IN SEA WATER

NAME OF CHEMICAL	AMOUNT OF CHEMICAL	COMMENTS
Manganese Chloride	2 Liters, (600gr/Liter)	Solution
Alkaline Sodium Iodide	2 Liters, (320gr. Sodium Hy-droxide + 600gr. Sodium Iodide,	Solution

	in each liter).	
Sulfuric Acid	2 Liters, 280ml/liter	Dilute Solution
Sodium Thiosulfate	3 Liters, 10gr/Liter 3 vials of 10gr. Thiosulfate	Very Dilute Solution Granular Salt
Potassium Iodate	1 Liter, (0.3567gr/Liter) Std.	Very Dilute Solution Primary Standard
Triton(R) X-100	1 Liter (Polyethylene Glycol Octylphenyl Ether)	Solution

Appendix B. Equipment/Van List

1) **AOML General Scientific Equipment**

WT: 0.75 ton
SIZE: Small miscellaneous equipment tools, & laptops
SITE: Either bioanalytical laboratory or Hydro Lab near a sink

Oxygen Equipment:
1. Sample bottles- 10 green plastic cases, 24 x 16 x 12, 20 lb each.
2. Reagents- 2 green plastic cases, 24 x 18 x 14, 50 lbs each.
3. Titration Equipment- 1 aluminum box, 24 x 24 x 16, 70 lbs.
4. Misc. supplies- 2 cardboard boxes, 16 x 15 x 14, 30 lbs each.

Misc. Equipment
1. 5 boxes standard water, 6x6x16, 30 lbs total
2. 2 computers, 16x16x10, 20 lbs total
3. 2 laptops, 14x2x9, 10 lbs total
4. 2 LCD monitors, 16x12x2, 4 lbs total
5. 2 tool boxes, 30”x16”x30”, 200 lbs total
6. 2 boxes misc. supplies, 16”x16”x36”, 150 lbs total
7. 10 boxes XBTs
8. Two XBT computers plus hand launchers.

2) **AOML CTD Rosette with LADCP (2 located starboard side outside forward of CTD staging area.**

WT: 1 ton (each)
SIZE: 4'L x 4'W x 6'H
SITE: Standard CTD Location

1. 3- Seabird 9 CTDs, 8”x8”x36”, 90 lbs total
2. 1 – “AOML” LADCP 150 kHz system plus batteries, 24”x24”x6’400 lbs
3. 2 – “AOML” 300 kHz ADCP workhorses, 12”x16”x20”, 80 lbs total
4. 2 – CTD frames, underwater sampling package, 6.5’x48”diameter, 1300 lbs/each

5. 4 boxes CTD sensors, 16”x18”16, 30 lbs total

3) **AOML PIES (1 for Possible Deployment)**

Total weight approx. 200 lbs

SITE: Fantail

1. IES: SIZE: 24X24X48, WT=100 LBS
2. 90 LB ANCHORS: 2 Total
3. MISC SUPPLIES 1 BOX: 24X48X24, 100 LBS
4. DECK UNIT, TRANSDUCER
5. RADIO DIRECTION FINDER