R/V *Roger Revelle*
Ship's Handbook

SECTION 1: WELCOME ABOARD

In order to make your stay aboard more enjoyable and productive scientifically, you are requested to observe the following guidelines:

1. The Coast Guard requires that Fire and Abandon Ship drills be conducted every week at sea. During these drills and in the event of an actual emergency you are to wear your life jacket, hard-soled shoes, long-sleeved shirt, long pants, and some form of head covering. This is for your protection. Your muster and duty stations are found on the station card attached to your bunk. Drills are taken seriously. Listen carefully to the deck officers' instructions.
2. Safety is of the utmost importance. Please wear a work vest, hard hat and work suit as appropriate when working on deck with gear over the side. Wear adequate foot protection on deck. The deck officer will point out any unsafe practices, but don't hesitate to act if you see an unsafe condition. Do not go out on deck at night alone, or in bad weather, without first notifying the bridge. Request permission from the bridge before turning on deck lights.
3. The possession of drugs or alcohol is strictly forbidden by all persons on board.
4. Conserve fresh water at all times; we do not have a limitless supply. Do a full load of laundry rather than a partial one. Take short showers.
5. Meals are cafeteria style. Watch standers have priority in line. Bus your dishes and silverware to the scullery. Cups and glasses are numbered and correspond to your bunk number. There will usually be more than one sitting to feed all aboard; please vacate the mess hall once you have finished to make room for others. Meal times and other information are posted. Shirt and shoes are required at meals.
6. Clean linen is issued once a week generally following the emergency drills.
7. If you wish to visit the bridge or engine room, please request permission from the watch officer. These are busy places, so you may be asked to come back another time, depending on the current operation.

If you have any questions, please don't hesitate to ask. We are here solely for the purpose of accomplishing the scientific mission. This requires the cooperation of all personnel aboard.

Thank you.

T.J. Desjardins, Captain R/V *Roger Revelle*

HISTORY OF R/V *ROGER REVELLE*

R/V *Roger Revelle* (AGOR 24) is the second of three new-generation AGOR oceanographic ships built by the U.S. Navy for operation by American oceanographic institutions. The first vessel, R/V *Thomas Thompson* (AGOR 23) was delivered to the University of Washington in 1991. Institutions wishing to operate AGOR 24 or 25 submitted competitive proposals to the Office of Naval Research in early 1991. These proposals were rated based on scientific merit, ship operating expertise, institutional cost sharing, and other measures of merit. The Scripps Institution of Oceanography of UCSD, in collaboration with the Marine Science Institute at UCSB and the Institute of Marine Sciences at UCSC, won this competition, with SIO as the designated operating institution. The announcement of the award was made by the Navy on the very day (July 19, 1991) of the SIO memorial service for Dr. Roger Revelle, at which event SIO stated its desire to have the vessel named for him. That request was subsequently approved by the Secretary of the Navy. The third vessel (*Atlantis,* AGOR 25) was awarded to the Woods Hole Oceanographic Institution in the same competition. R/V *Roger Revelle* began construction at Halter Marine, Inc. in Moss Point, Mississippi, in early 1993, was launched in April of 1995, and sailed on her maiden voyage from Mississippi to San Diego in July, 1996.

Roger R. D. Revelle (1909-1991) was one of the twentieth century's most eminent statesmen of science. He was a distinguished university researcher and professor, the officer in charge of the oceanographic section of the Bureau of Ships (now Naval Sea Systems Command), a creator of the Office of Naval Research and head of its Geophysics Section, director of the Scripps Institution of Oceanography, founder of the University of California at San Diego, a leader of international science organizations and research programs, a high-level advisor to governments, initiator and director of the Center for Population Studies at Harvard, and one of the first persons to recognize, study, and interpret to the public the issues of carbon dioxide emissions, the greenhouse effect and global warming. His major awards and prizes were numerous. One of them, his Agassiz Medal from the National Academy of Sciences, is displayed in the ship's conference room, along with his naval

officer's dress sword. Both are gifts to the ship from Mrs. Rollin P. Eckis, Dr. Revelle's wife from 1931 until his death, and the christening sponsor of the ship.

Dr. Roger Revelle made landmark scientific contributions to subjects ranging from sea floor heat flow to the capacity of the ocean to absorb atmospheric carbon dioxide. In the words of a colleague, he recognized "no seams" or arbitrary disciplinary boundaries in his thinking. He had an extraordinary breadth of imagination and inquiry, coupled with a deep conviction that science at its best was science in the service of humankind.

Of seagoing research and his years at Scripps he once said, "What I did was to send the institution out to sea, to make it a worldwide institution instead of just a local California institution. The farthest we ever went before the war was the Gulf of California....By the time I left we had a Navy that ranked with that of Costa Rica and had sailed literally millions of miles everywhere in the world." R/V *Roger Revelle* continues this legacy of voyaging to observe our watery planet, so that people may comprehend how it works and how best to live in harmony with it.

PREFACE

INTRODUCTION - The purpose of this handbook is to acquaint personnel with the characteristics and capabilities of R/V *Roger Revelle*. It provides a good review of what can and cannot be done on the ship, and lists sources of more detailed information. It directs your attention to a number of important safety matters. We hope that by reading it well in advance of your cruise you will spot problems in time to seek out satisfactory solutions, see how to prepare more smoothly and efficiently, and perhaps discover new or better ways to accomplish a certain task.

REVISIONS - The handbook is subject to ongoing revisions. We want it to represent the best information available from the experience of personnel at sea, and so we comments or corrections, suggestions for better arrangement of material, additions, etc. Please send any such input directly to the Ship Scheduling Office.

A CAUTIONARY NOTE ON ACCURACY - While reasonable efforts are made to update the handbook as needed and to issue new versions in the wake of significant changes on the ship, it is impossible to assure complete accuracy at all times. In all cases, make your particular research equipment needs known on the Ship Time Request Form and contact relevant technical support groups to ensure that critical gear is ready for your work.

OTHER SOURCES OF INFORMATION - Several resources aboard the ship and online are available to scientists regarding safe practices at sea. All scientific staterooms contain a hard copy of the UNOLS *Safety Training Manual, Research Party Supplement,* and the ship's library contains the UNOLS *Research Vessel Safety Standards*.

UNOLS RVOC Safety Training Manual, Research Party Supplement

Schedules, ship layouts and other ship-related information
scripps.ucsd.edu/ships

Shipping scientific equipment to Scripps-operated ships
scripps.ucsd.edu/ships/scientific-shipments-scripps-vessels

Scripps policies and procedures regarding ship operations
scripps.ucsd.edu/ships/policies-and-procedures

SECTION 2: SPECIFICATIONS

NAVIGATION CAPABILITIES: Furuno GP-170 x 2, DGPS as primary navigation and inputs to dynamic positioning, Furuno Doppler speed log. Furuno 3 and 10 cm radars, Kongsberg dynamic positioning system, Ashtech ADU GPS attitude-sensing system, Simrad Taiyo ADF, Portable Kongsberg HIPAP Ultra Short Base Line Underwater Navigation, and 2 Sperry gyros.

WINCHES: Markey DUTW-9-11 traction-drum winch with dual storage drums. Normally 15,000 m of 9/16" 3 x 19 trawl wire is on one storage drum and 10,000 m of 0.680" electromechanical cable on the other. Wires over the side lead to A-frame or main deck crane. Capable of fiber optic cable through A-frame.

(One) Markey DESH 5 hydrographic winch, with 10,000 m of 1/4" 3 x 19 hydrographic wire OR 10,000 m of 0.322" three-conductor electromechanical CTD cable on Lebus grooving. Wire drums are interchangeable; one is stowed while the other is in use. Wires lead over starboard side via retractable hydroboom.

CAST-6/Allied Crane CTD Handling System with 10,000 m of 0.322” three-conductor electromechanical CTD cable on Lebus grooving. Wire leads over starboard side via Allied crane articulating boom.

Assorted portable winch and wire combinations available for cruise-specific requirements.

SUPPORT EQUIPMENT: Main cranes (North Pacific) on starboard quarter, main deck, and on port side, 02 level. Smaller Morgan (HIAB), Marine cranes (2) normally carried on foredeck and fantail. Other locations possible to suit mission. Fritz-Culver A-frame at stern, retractable hydroboom on starboard side forward of staging bay door. DMG 1200 Extension crane on starboard 01 level aft of rescue boat davit.

Extensive (~3,000) bolt-down fittings for securing removable equipment on all decks and inside laboratories (2' X 2' pattern). 1” sockets outside, 1/2” sockets inside.

Uncontaminated seawater supply to all labs.

Through-hull instrument well in staging bay, nominal 24" diam. tube.

PERMANENT AND REMOVABLE SCIENTIFIC EQUIPMENT: 12 kHz Kongsberg EM124 multibeam echosounder that can record depths up to 12,000 meters; providing bathymetry, and sidescan imagery. Kongsberg EM712 multibeam echosounder that can record depths up to 2000m; providing bathymetery, and sidescan imagery. Knudsen Engineering 3260 3.5/12 kHz singlebeam echosounder sub-bottom profiler. Turo Quoll XBT system used with Sippican Fast Deep XBTs. Currents are measured by RDI 75 and 150 kHz broadband/narrowband ADCP, and 50 and 140 kHz HDSS (High resolution Doppler Sonar System). A comprehensive MET system has several sensors on the forward and main masts for meteorological data, and sensors in the bow thruster room and hydro lab for underway seawater data. (See more in the COMPUTER SYSTEMS section.)

Wired and wireless ethernet as well as a point-to-point serial network (SIS - Science Information System) exists. Ethernet and serial feeds are available in the science laboratory spaces.

For computer capabilities, see COMPUTER SYSTEMS.

The ship has a fine-adjust temperature-controlled laboratory to facilitate chemical analyses, also two temperature-controlled walk-in chambers for sample storage/preparation.

Use of isotopes is prohibited in ship's laboratories. Isotope isolation vans are available by request.

An extensive inventory of instrumentation and technical services is available, e.g., dredges, coring equipment, plankton nets, trawls, CTD/rosette systems, MOCNESS systems, single and multichannel seismic systems, submersible strobes, and transmitters, etc. Specific equipment and services can be requested through the MFP.us cruise planning workflow.

VANS: Numerous vans can be carried, on main deck (with access to hydro lab), 01 level port side, forward on 02 deck (for storage).

COMMUNICATIONS: Sealink C/Ku-band satellite system, Fleet Xpress back-up system, VHF, HF radio, SSB voice, teletype, GMDSS. Please see our contacts web page for current phone numbers.

Sealink and Fleet Xpress systems provide limited internet access to the ship. Everyone has Internet access, but bandwidth use is managed through onboard systems. Satellite phone calls are available as needed.

SECTION 3: VESSEL LAYOUT DESCRIPTION

VESSEL LAYOUT DESCRIPTION
This section is intended as an abbreviated tour of important spaces and equipment, in conjunction with ship arrangement diagrams. Most spaces and equipment of interest to scientists have fuller descriptions in Sections 4 and 5.

04 DECK (BRIDGE)

BRIDGE OR PILOTHOUSE - This is the nerve center of a ship. From this area, the ship is navigated, conned, maneuvered, and otherwise operated in such a manner as to accomplish the goals of the cruise safely and effectively. Additionally, operational aspects of the engineering department and the scientific party are monitored by the bridge watch officer. The watch officer maintains a log which records the date, time, and position of all scientific events. A copy of this log is given to chief scientists and others who request it at the end of the cruise. Visitors to the bridge are generally welcome. There will be times, though, such as when entering or leaving a harbor, when visitors are not permitted, check with the officer of the watch. Equipment, controls, and instruments on the bridge are operated only by the crew. Communication

with the bridge is by ship's interior-dial sound-power telephone systems and airphone intercom.

CHART/RADIO ROOM - The chart room is located aft of the pilot house. The progress of the ship is plotted on charts in this room. It is also where the ship's inventory of charts and navigational publications are stowed and maintained. Some important texts on navigation, seamanship, meteorology, and nautical information in general are stowed here. Check with the mate on watch before borrowing any of these items. (See also LABORATORY SPACES in Section 4.)

AFT CONTROL STATION - A secondary control station with winch controls and ship maneuvering controls is located aft on this level. The usual site for ship control is in the pilot house, and the usual sites for control of the winches are on the 03 level for the hydrographic and CTD winches, and above the fantail for the trawl winch.

03 DECK

CHIEF SCIENTIST'S STATEROOM - The chief scientist's room has one bunk plus ample bookshelf, file, and desk space to serve as an office. The room has computer network connections and a shipboard telephone.

CAPTAIN'S STATEROOM - Adjacent to the chief scientist's room is the captain's room, which also serves as the captain's office.

SCIENTIFIC STATEROOMS - There are four scientific staterooms on this level, each with two bunks. Rooms are small with no desks, but are the quietest aboard.

02 DECK

CRANE - Two North Pacific cranes are permanently mounted on the ship, one on the port side 02 level and one on the main deck starboard quarter.

DECK - The 02 deck has space available on the forward deck for four standard vans, and for additional items forward of these vans, provided the items are not tall enough to block the line of sight from the pilot house to the bow.

HOSPITAL - There are 5 bunks and various medical supplies. (See Section VII for more on medical matters.)

HYDROBOOM - The hydroboom is used for launching and recovering oceanographic equipment and fairleading wire from the hydrographic winches.

Controlled from the forward Winch Control Station. Various block/sheave combinations are available.

HYDROGRAPHIC WINCHES - One Markey DESH 5 winch equipped with either hydrographic wire or 0.322" CTD cable, is located on the 02 level forward of the staging bay. Wire is led over the starboard side via blocks on the end of a retractable boom at the level of the top of the staging bay. Check your wire requirements.

One CAST-6/ Allied Crane CTD Handling System equipped with 0.322” CTD cable Is located just above the hangar, with boom head directly over the starboard hangar door when stowed.

INSTRUMENT WELL HATCH - This is a hatch aligned with the 24-inch diameter through-hull instrument well that opens in the deck of the staging bay 20 ft below. (See INSTRUMENT WELL in Section 4.)

LIFE RAFTS - All eight of the ship's life rafts are located on the 02 level forward.

STATEROOMS - There are four staterooms for ship's officers and one scientific stateroom on this level. This latter stateroom has one bunk plus a pullman berth and has a private head. (See Section IX for specifics.)

WINCH CONTROL - Primary site for control of CTD and hydro winches is on the 03 level, with good view of both winches and the starboard-side water entry point.

01 DECK

INCINERATOR ROOM - The ship normally burns plastic trash once a day, to keep ahead of the accumulation. If your science operations will be compromised by trash burning, please consult with the resident technicians well in advance of your cruise. Depending on the amount of interference and the amounts of trash generated it may prove necessary to carry an extra van to hold trash until it can be burned or otherwise disposed. No trash is thrown overboard in accordance with international regulations.

CONFERENCE ROOM/LIBRARY - This area is designated as a quiet space on the ship for reading or studying. It is separated from the mess deck by a folding door. Good place for meetings. It contains one of the ship's copy machines (another is in the main lab, main deck). Food and drink are not allowed in this space, to keep carpeting and upholstery clean.

CRANE - DMG 1200 extension crane located aft of rescue boat on 01 level stbd side.

(D)AMAGE (C)ONTROL LOCKERS - DC lockers are located amidships, starboard, aft of the galley and main deck forward in port side of scientific cargo hold. (See also DC LOCKER under MAIN DECK, this section.)

GALLEY & CAFETERIA - The mess hall is located amidships. For safety and public health reasons only the cooks and other authorized crew members are permitted in the galley food preparation area. Food is served cafeteria style. (See Section 8 for more details on mess hall hours and practices.)

SHIP'S LOUNGE - Located forward of the galley on the starboard side is the lounge. This space contains a TV with various media consumption options.

Gym – There is a free weight gym space located on the 01 level, port side, just forward of the Winch Control station.

STATEROOMS - Eight crew staterooms are on the 01 level.

RESCUE BOAT - The ship's rescue boat, a semi-rigid type, is located on the 01 level, starboard.

WORK BOAT - Depending on how many vans are carried, and in what locations, the ship's Hurricane work boat in its relocatable cradle may be situated on the 01-level aft, port side. The cradle is difficult to relocate at sea. Please pre-plan. (See BOATS in Section 4.)

MAIN DECK

A-FRAME - Located at the stern. A principal means of overboard handling or towing of instruments. Capacity 18,000 lbs dynamic.

ANALYTICAL/BIOCHEMICAL LAB - On the port side forward of the electronics/computer lab, it has its own air conditioning and ventilation system to maintain more constant climate conditions for sensitive instrumentation.

BOATSWAIN LOCKER - The ship's boatswain locker is located all the way forward on the main deck.

CAPSTAN - The ship normally carries a portable capstan on the main deck, principally used for mooring lines, available for other line-hauling tasks. Specifics available upon request. It can be situated to mesh with other space constraints and operational requirements.

CLIMATE CONTROL CHAMBER - There are two walk-in temperature-controlled chambers.

CRANE - A North American telescoping boom crane is permanently on the starboard quarter. A Morgan Marine 18,000 folding boom crane is normally carried on the port quarter deck. It can be relocated in port. (See CRANES in Section 4.)

Ship's Office - The Ship's Office is located on the port side forward of the analytical/biochemical lab.

Gym – There is a cardio gym space located just forward of the Main Lab.

(D)AMAGE (C)ONTROL LOCKERS - Two DC lockers, one in the forward port corner of the forward scientific storeroom, the second midships on 01 level, contain emergency and fire fighting equipment. This equipment is for emergency use only and should never be removed.

DECK - There is approximately 3,500 sq ft of open deck space. This includes a clear lay-down area of 11 ft x 60 ft on the starboard side. The open starboard rail extends for 104 ft. Space between the rail and the permanent crane on the starboard quarter is narrow but usable, see deck plan.

All weather deck areas are fitted with a standard 2' x 2', 1" NC thread bolt-down pattern.

ELECTRICAL/ELECTRONICS SHOP - Opposite the electronics/computer lab is a shop and tool/parts storage area for the ship's electrician.

ELECTRONICS/COMPUTER LAB - On the port side, opposite the main lab, is the site of the deck electronics, ship servers, satellite control, acquisition computers, and display array for the ship scientific data, nav, and satellite info.

Generally, where science parties set up their watch station spaces.

Climate Controlled Spaces (x2) – There are two walk-in climate controlled spaces for scientific samples.

SCIENTIFIC STOREROOM (FORWARD) - The forward scientific storeroom is at the forward end of the main deck passageway. It is served by a hatch that opens on the 01 deck forward and accessible internally via double doors and widened passageway. All labs are accessible to this storeroom at sea or in port.

STAGING BAY - A high-overhead sheltered (not weatherproof) workspace with roll-down doors starboard and aft, and deck hatches to the lower scientific storeroom and the instrument well.

1ST PLATFORM

ENGINEERING SPACES AND SERVICES - These are off-limits to scientific party members except by permission of the chief engineer or the duty engineer, especially when cruising. They can be dangerous at any time, due to the possible hazard of noise, oil, grease, or lubricants underfoot.

All questions of an engineering nature and requests for services or help should go to the chief engineer or engineer on watch in port; at sea requests for assistance should go via the bridge. Engineers are helpful and knowledgeable, but they can assist scientists only after completion of their regular duties.

MACHINERY CONTROL ROOM - Propulsion machinery and electrical plant controls.

MACHINE SHOP - Forward of the machinery control room, and on the port side. The shop has a lathe, drill press, etc. By permission of the chief engineer, science party members who demonstrate the requisite experience and ability may use these tools.

PROPULSION MOTOR ROOM - Propulsion machinery. This area is in the aftermost part of the ship. It is an unmanned space. Access by nonessential personnel is restricted, due to the hazards of the high-power electrical equipment here.

SCIENCE STOREROOM (LOWER) - Located aft of the upper engine room and switchboard room, and forward of the winch room, this is a second scientific storage area. A portion of the port side of this room is devoted to engineering stores. Access at sea is limited to what can be hand carried up the ladder. In port, flush deck hatches can be opened.

STATEROOMS - There are berths for 30 persons, 24 scientists and 6 crew, on the first platform. (See Section 9: Scientific Berthing Plan for specifics.)

TRAWL WINCH ROOM - This room contains the Markey two-drum main traction winch system, and fairleads by which wires can be led to the A-frame or the heavy crane on the starboard quarter.

SECTION 4: SHIP'S AND SCIENTIFIC EQUIPMENT DESCRIPTION

ACOUSTIC DOPPLER CURRENT PROFILER (ADCP) - *Roger Revelle* has a 75kHz and 150kHz RDI Ocean Surveyors installed that are capable of either

narrowband, broadband, or interleaved operation. These provide vertical profiles of ocean current speed and direction. The system utilizes the doppler effect to measure currents in the water column. Current profiles can be produced in as many as 128 depth cells, each cell being variable from 1 to 32 meters to a maximum depth of 700 meters. When the bottom is within range, an earth-referenced vessel velocity can be obtained which allows for the measurement of absolute currents. Data are processed and current profiles are displayed in real-time on a color monitor. Data processing and recording are done on a Linux (Ubuntu) system using UHDAS software. The system takes inputs from the ship's motion reference systems and GPSes. Heading corrections are derived from the ship's motion reference systems and the Trimble ABXTWO differential GPS array -- these corrections are applied to the data in real-time.

A-FRAME - The A-frame is located at the stern. It is rated above the breaking strength of 9/16" wire (32,500 lbs) in its braced position and has a safe working load of 21,667 lbs when in motion (hydraulically driven). It is one of two means (the other is the starboard quarter crane) to lead trawl wire or 0.680" EM wire overboard and is the only route for fiber optic cable.

AIR, COMPRESSED - (See COMPRESSED AIR in this section.)

AIR CONDITIONING AND HEATING - The ship's air conditioning system is extensive and complex, with zone-by-zone and even room-by-room control. If the ventilation or air conditioning in your room or working space seems not to be operating correctly or not to be controlled properly by the pertinent thermostat, please ask the engineer on watch for help. Do not resort to system-defeating measures like blocking vents, etc.

BOATS - A 23-ft Hurricane semi-rigid inflatable boat (SRIB) is normally carried by *Roger Revelle* as a work boat. Specific requests should be made to the marine superintendent prior to departure of the ship from San Diego to ensure that a boat meeting your requirements is available. At sea the crew controls launching, operation and recovery of boats.

BOATSWAIN LOCKER - The primary boatswain's locker for rigging and deck supplies used by the crew is located at the extreme forward end of the main deck. Auxiliary lockers are located at other places on the weather decks. They also contain rigging/securing items, such as cleats and eyebolts, for use with the 2' deck bolt-down pattern. The resident technician or a crew member will assist you in their use if necessary.

BULWARKS - Bulwarks on the main deck aft are capable of being removed in sections, to permit loading and handling of large and/or heavy objects.

Requirements for the removal of bulwark sections should be discussed in advance with the marine superintendent or the captain. Bulwarks are personnel safety devices their removal is not treated lightly. They are not normally removed or installed at sea.

CABLE RACEWAYS - Raceways and cable pass-throughs run between labs, from labs to bow, from the labs to the fantail and staging bay, and up to the pilot house and mast. The unistrut network throughout the labs affords additional ways to route and secure scientific cables. Consequently, it should almost never be necessary to route scientific cables in the overheads, and use of the overheads for this purpose is discouraged. If you do not see immediately how to route your cable outside the overheads where you want it to go, consult any STS technician. Do not disturb existing wiring and remember to remove yours at the end of your cruise.

CAPSTANS - There is normally a large capstan on the fantail. (See MAIN DECK in Section 3.)

CHEMICALS - Use care in storage, handling, and disposal of toxic chemicals, particularly inside laboratories. All chemicals brought on board should be accompanied by a Material Safety Data Sheet (MSDS) provided by the chemical manufacturer. Plastic bottles are safer at sea and should be used unless specific chemicals must be stored in glass. Disposal of chemicals is regulated by University policy and international laws. The ship's captain must know what chemicals you are carrying. A chemical storage locker is available and is the only safe way to carry most chemicals aboard ship. Please make arrangements with the research technicians in advance for proper stowage and for appropriate disposal at the end of your cruise.

Working supplies of hazardous chemicals may be kept beneath fume hoods. Stocks/reserve supplies are to be kept in the appropriate storage.

CLEAN POWER - (See ELECTRICAL SYSTEM in this section.)

COMPUTER SYSTEMS, ACQUISITION, IT, PRINTERS - Shipboard computer systems are run on a redundant cluster for high availability of scientific systems. All scientific systems are run as virtual machines which are distributed via the ship’s network and displayed/controlled via a multicast KVM system.

The various Windows, Linux, and Mac acquisition machines perform a standard set of data acquisition, archiving and processing functions on many of the permanently installed data collection systems. All data is archived in

regular intervals to our shipboard file server. All systems in the electronics/computer lab are powered through a data center grade UPS. Some of the permanently installed data acquisition systems include (see also separate entries for these items):

- 75kHz and 150kHz RDI Ocean Surveyors ADCP, running University of Hawaii's UHDAS software.
- UCSD Ocean Physics Group 50 and 140 kHz High-resolution Hydrographic Doppler Sonar System (HDSS), using OPG's HDSS software.
- Turo Quoll XBT system, used with Sippican Fast Deep probes
- Kongsberg EM124 bathymetric mapping system
- Kongsberg EM712 bathymetric mapping system
- Knudsen Engineering 3260 and 320B/R 3.5 & 12 kHz singlebeam echosounder sub-bottom survey system
- Simrad EK80 Fisheries Sonar – (18 kHz, 38 kHz, 70 kHz, 120 kHz, 200 kHz)
- Seapath 330+, and Phins-III are the main MRU's for our acquisition systems.
- Kongsberg Seapath 330+, Trimble ABXTWO, and Furuno GP-170 GPS systems provide time, position, heading, and attitude information at various frequencies for the science equipment. Feeds from these instruments can be accessed through the science repeater boxes in the labs, and through the SIS boxes throughout the vessel.
- Seapath 330+, Trimble GPS and End Run time servers that provides NTP GPS-derived time, and 1 PPS synchronization along with other time measurements
- MET meteorological system that provides wind speed/direction, relative humidity, barometric pressure, long and shortwave radiation, air temperature, sea surface temperature, and precipitation.

Scanners, copy machines, printers, and a large-format plotter are available to use. There is Wi-Fi access in the public areas of the ship where anyone can connect to view the ship's intranet. Cruise data will be accessible and updated at regular intervals from a central NAS server, from any computer aboard. Serial feeds (DB9) or UDP feeds of navigation, MET, and MRU data are available in all labs, and can be configured by the shipboard technicians.

The shipboard instrumentation technician operates and maintains the oceanographic instrumentation and data acquisition equipment. They will be able to assist in ship account creation, general IT services, science equipment repair, interfacing with the acquisition machine and data downloading. At the end of a cruise, the instrumentation technician will provide the entire cruise data set that was collected from all shipboard systems to the chief scientist.

It is recommended that necessary printer drivers are loaded on all computers being brought aboard ahead of time -- trying to download the large files over the Internet during the cruise will not be possible:

- HP Pagewide Pro 577 (main lab)
- HP Color LaserJet M751 (electronics/computer lab)
- HP DesignJet T1600 (main lab) -- this is a large-format plotter

COMPRESSED AIR - Ship's service air is 100 psi at 12 cfm. The upper limit cannot be used continuously. It is suitable for running pneumatic tools but may not be dry or clean enough for laboratory use. Users should plan to supply their own filters if the air is intended for any lab use. There are numerous outlets in the labs.

CRANES - Permission to operate cranes is strictly limited to authorized personnel. These cranes are operated at sea only by permission of the captain.

Two large North Pacific cranes are permanently mounted on the ship, one on the port side 02 level and one on the main deck starboard quarter. These cranes have a dynamic range capability of 10 to 65 ft and a dynamic load capability of 21,000 to 1,700 lbs. These dynamic load conditions are good up to sea state 5. In port, at sea state 0, these cranes can lift 42,000 to 3,400 lbs. with a 10 to 65 ft reach. These cranes can only be operated by qualified crew members or the research technician.

The ship carries a Morgan Marine 18,000 portable deck crane. Crane capacity is 14,000 lbs at 6 ft to 3,000 lbs at 46 ft. Crane winch is rated at 4,000 lbs pulling strength. The crane base is designed to interface with the working deck bolt-down system to provide flexibility. The crane serves the forward scientific storeroom via a hatch that opens in the foredeck when carried on the forward 02 deck. The hatch may not be opened at sea. The crane can also be located on the main deck as needed. This crane is operated by the resident technician or qualified crew members only.

DMG 12000ET2 extension crane is carried stbd side 01 level aft of the rescue boat. This crane services the stbd side midships. Boom 2'to 27' capacity 0-2900 lbs. Operated by ship's crew and restech.

CUSTOMS - Shipping equipment to and from foreign ports requires long lead times and planning. Science parties are responsible for getting their equipment alongside the vessel in port in time for their schedule mobilization, and picked up from port during their scheduled demobilization.

DECK LOADING - In addition to the main deck, equipment may be loaded on the 02 level forward, the 01 level aft on the port side, and (limited) on the foredeck. The approximate loading limit is 0.5 ton/sq ft.

Ship stability is ultimately the responsibility of the captain. The responsibility of scientists is to consult the Nimitz Marine Facility or the researcy technician early to describe loading plans and requirements so that any necessary adjustments can be made. The more complex and heavier your equipment the more advance notice is needed. Our goal is to resolve loading problems and incompatibilities well before sailing day, so that it will not be necessary to leave scientific gear on the dock to assure a safe ship.

DECK TIE-DOWNS - No welding is permitted directly to any deck. All installations must use the 2 ft x 2 ft grid of tie-downs (welding may be done to "ears" or plates, which in turn are bolted to the deck). Bolt holes are 1" NC thread on weather decks, 1/2" NC thread in labs and storerooms. Bolt holes in equipment should be made oversize, to allow for deck grid irregularities.

DEPTH RECORDING - (See ECHOSOUNDING in this section.)

DISTILLED WATER - (See FRESH WATER in this section.)

DOPPLER LOG - An Furuno doppler speed log is installed in the chart room for ship speed measurements; its output is available on a repeater in the lab. (Also see ACOUSTIC DOPPLER CURRENT PROFILER in this section.)

DRAINS - (See also CHEMICALS in this section.) All lab sinks drain directly overboard, or into the sewage holding tanks. Ship's engineers control the drain routing and should be consulted about specific drainage requirements.

The under-sink areas in the lab should (1) be carefully inspected before using the sinks to ensure that connections are in fact connected and open, (2) be kept clear of stored items capable of damaging PVC pipes or blocking drains, and (3) be kept clear of lab trash and debris.

ECHOSOUNDING - There is a 16-element array of transducers which operate at 3.5 kHz, and two MASSA 12 kHz transducers which are operated individually. These can be accessible by portable deck units behind the forward server racks in the electronics/computer lab. These are normally used by the Knudsen 3260 deck unit for sub-bottom profiling and/or singlebeam depth sounding. The data is digitized and may be stored in SEG-Y format. Data is graphically displayed on the display array.

There is also a Kongsberg EM124 12 kHz multibeam for bathymetry data. The main power and transceiver units are in the Transceiver room, two decks down from the main deck.

ELECTRICAL SYSTEM - The permanently installed lab power systems include 120-, 208-, and 240-volt receptacles. 120-volt vital systems utilize the 15 kVA uninterrupted power source. The UPS provides 15 minutes of power at its rated load should a power failure occur. The ship has the following power plant elements:

- 2 ship service diesel generators (SSDG), 690VAC @ 2,100 kW
- 2 ship service diesel generators (SSDG), 690VAC @ 940 kW
- 2 1,500 kVA transformers 600vac to 480vac
- 2 150 kW m.g. sets for clean power, providing 90 kVA of 120VAC power to the various labs on the main deck
- 10 kVA @ 240VAC single phase clean power in labs
- 9 kVA@ 220VAC single phase clean power in labs
- 3 100 amp 480VAC deck receptacles, two at the aft end of the staging bay, one at the bow, 01 deck
- 1 30 amp 480VAC deck receptacle in the staging bay
- 2 30 amp 480VAC deck receptacles on weather deck aft end of staging bay
- 4 30 amp 208VAC deck receptacles and 4-30 amp 120vac 3-phase clean power deck receptacles, two of each kind aft of the hydro lab for main deck vans, and aft on the 02 deck for 01-level vans

ELECTRO-OPTICAL TOW CABLES - See the cable specifications.

INTERNET - (See also COMPUTER SYSTEMS, and SATELLITE COMMUNICATIONS) Internet access is available to all users but can be slower than typical land based, broadband systems.

FLOOD LIGHTS - Working lights on deck are controlled by the bridge. Consider the night vision of the crew and use only the lights you need, turning them off when finished.

FREEZER - (See REFRIGERATION AND FREEZING in this section.)

FRESH WATER - Fresh water generation capacity is about 4,000 gals/day. The ship also has 2 evaporation distillers which put out very pure water that can be used to fill carboys. Potable water tank capacity is about 12,000 gals. A MilliPore Milli-Q IQ7000 Water Purification System is located in the Hydro Lab and a MilliPore Milli-Q Advantage A-10 Water Purification System is installed in the Analytical Lab to provide pure water for science use.

Fresh water should not be used for wash down purposes, except if necessary and then by consultation with the resident technicians. In personal use, conserve. Take short showers; do only full laundry loads. (See Section 8: SHIP ORGANIZATION.)

GASES - (See STORAGE in this section.) These are the responsibility of the individual requiring gases for shipboard use. Any gas under pressure is dangerous; consult the captain or the resident technician for safe stowage methods and locations.

GASOLINE - Inspected vessels are severely limited by law in the amount of gasoline they can carry, unless they have approved built-in tanks, which R/V *Roger Revelle* does not. Small amounts of gasoline for outboard motor use at sea are carried in USCG-approved containers.

GENERATORS - (See ELECTRICAL SYSTEM in this section.)

GYRO – Kongsberg Seapath 330+, and a Phins Gen. III are the two main MRU's used for the various scientific sensors aboard the vessel. The ship's gyro has a repeater in the electronics/computer lab. MRU and gyro data are available in the lab.

HATCHES - Hatches and watertight doors are heavy and dangerous if not secured correctly. Careful use of all doors and hatches, especially at sea, is very important. Carelessness could easily lead to severe injury. All doors and hatches should be positively latched either open or closed at all times, never left to swing free.

HIGH-RESOLUTION HYDROGRAPHIC DOPPLER SONAR SYSTEM (HDSS) - The High-resolution Hydrographic Doppler Sonar System, developed by UCSD's Ocean Physics Group, have two sets of sonars installed on the R/V *Roger Revelle*. One set is a 50 kHz unit and the second set is 140 kHz, each consisting of 4 beams. The sonars measure ocean velocities and shears with very high precision.

HOLD - (See description of forward and lower scientific storerooms under LABORATORY SPACES in this section.)

HOODS - There are four fume hoods, one each in the analytical lab, the hydro lab, the main lab and the wet lab.

HYDRAULIC SYSTEM - (See also A-FRAME, CRANES, and HYDROBOOM in this section.) The A-frame and hydroboom are hydraulically operated, as are all cranes. Operating controls for the frame are located on the starboard side of the frame. The hydroboom control is located in the hydro winch control booth.

Questions regarding user applications of excess hydraulic capacity should be directed to Nimitz Marine Facility (the marine superintendent, the port engineer, or the chief engineer of *Roger Revelle*) well in advance.

HYDROBOOM - The hydroboom located on the 02 level starboard side is a McElroy model 15000. The hydroboom is used for launching and recovering oceanographic equipment and fairleading wire from the DESH-5 hydrographic winch. It is designed for a safe working load of 15,000 lbs perpendicular to the ship's deck. The total length of the hydroboom fully extended is 43 ft. The extension boom is 18 ft long and reaches over the starboard side by 10 ft when fully extended. The distance from the bottom of the sheave, on the end of the boom, to the deck is 20 ft. The hydraulic control for the boom is located in the forward Winch Control Station. This boom is operated by the winch operator.

HYDROWINCH - (See WINCHES in this section.)

INSTRUMENT WELL – Located in the Main Deck Hangar, a 23” diameter well is available for installation of a variety of instruments. The ship carries a “Pipe String” designed for full ship speed deployment of instrumentation in the instrument well. A Portable HIPAP USBL system is available for use on the Pipe String. Any planned use of the instrument well, pipe string, or HIPAP should be coordinated with the Research Technician Group well in advance of a cruise.

ISOTOPES - (See RADIOACTIVE MATERIAL in this section.)

INTERCOM - (See INTERNAL COMMUNICATIONS, Section 6.)

LABORATORY SPACES - Please refer to the deck plans for dimensions and layout of the laboratories and other science spaces. Virtually all scientific spaces are on the main deck. The approximate sizes of the labs and other science spaces are as follows. These are the areas that are clear and unencumbered by such uses as passageways through the space, ship equipment, etc. They therefore may not correspond to areas of the spaces shown on general arrangement drawings.

All labs and storerooms are fitted with the standard 2' x 2' 1/2" NC bolt-down pattern on deck, accepting bolts which are 1/2" deep. Unistrut mounting channels are on the bulkheads and overheads. An inventory of Unistrut hardware and fasteners is maintained on board by the research technician.

In sequence from bow to stern and main deck to 1st platform, these spaces are:

- **Forward science storeroom 358 sq. ft.**
  This storeroom is at the forward end of the main deck passageway. It is served by a hatch that opens on the 01 deck forward. A network of deck tiedowns and Unistrut fixtures permits flexible securing arrangements. Standard pallet-sized loads can be craned into this storeroom through the hatch. All labs served via pallet jack down passageway.
- **Cardio Gym 76 sq. ft.**
  An assortment of cardio gym equipment is available for science and crew use.
- **Ship’s Office 65 sq. ft.**
  This space is used by the ship’s crew for general ship diagrams and supplies.
- **Main Lab 1,745 sq. ft.**
  This is largely flexible general lab space, with extensive utility connections and Unistrut capability, configurable to suit the onboard project(s). It has a fume hood, small -80 freezer, and a convertible chest freezer/refrigerator.
- **Analytical/Biochemical Lab 330 sq. ft.**
  This lab has its own air conditioning and ventilation system, for fine control of ambient conditions needed by some analytical work. There is a fume hood and a refrigerator.

- **Climate control chamber (1) 63 sq. ft.**
  A walk-in chamber; the temperature may be controlled from 4 to 40 C, with sensitivity of 0.1 C and uniformity within the chamber of 0.5 C.
- **Climate control chamber (2) 63 sq. ft.**
  A walk-in chamber; the temperature may be controlled from 4 to 40 C, with sensitivity of 0.1 C and uniformity within the chamber of 0.5 C.
- **Computer Lab/Data Center 610 sq. ft.**
  This location is divided between the Data Center, which houses the ship's main servers and compute infrastructure, and the Computer Lab where the ship's main display array is located for viewing and controlling the ship's oceanographic instrumentation. There is desk space available for science watch standers as well. The primary work site for the Shipboard Instrumentation Technician and Research Technician is here, as are the hubs of the data and video networks and science information system. The lab has a secondary control station for lab control of winches.
- **Hydro Lab 693 sq. ft.**
  Has access aft to two vans, plus general lab outfitting. Van access can be fully enclosed if van door arrangements are suitable.
- **Wet Lab 230 sq. ft.**
  With direct access to the staging bay aft, this lab is the site for wet work, wet sample preservation, etc. The lab has a fume hood.
- **Staging bay 330 sq. ft.**
  A sheltered workspace. Clearance from overhead to deck is 18 ft. It has a telephone and outlets for compressed air and electricity. Roll down doors, starboard and aft, offer limited protection against weather. Padeye lifting points in the overhead exist. Overhead hoists are installed; 5,000 lb capacity each.
- **Aft science storeroom 635 sq. ft.**
  This is the other major science storeroom, forward of the winch room on the 1st platform. Some of this space (port side) is used for ship's engineering spares storage. A pallet-sized hatch to the storeroom opens to the main deck just outboard of the starboard rollup door of the staging bay.

MAGNETOMETER – *Roger Revelle* has the capability to support magnetometer operations if requested early, and equipment is available. Not kept standard aboard vessel.

MASTS - *Roger Revelle* has a mainmast, and a jackstaff. The main mast, above the pilot house, carries radar antennas, navigation lights, various antennas, the ship's anemometers, and flag halyards.

A suite of scientific meteorological sensors (see MET in this section) is on the bow of the ship, on a science mast.

MET - The Shipboard Meteorological Acquisition System (MetAcq) acquires, filters, averages, corrects, displays, and distributes meteorological sensor data from a wide variety of sensor types and data input devices.

Meteorological sensors such as ones made by RM Young, Vaisala, Alden, Coastal Environmental Systems, Seabird, FSI, Omega and most sensors that have an RS485, RS422, RS232 digital interface or any analog sensor that can output a voltage, frequency or 4-20ma current can be accommodated.

A typical system measures air temperature, barometric pressure, wind speed/direction, relative humidity, shortwave radiation, longwave radiation, seawater temperature, and seawater conductivity. Sensor information is combined with time and GPS position information and displayed on the local video display or web server and written to data files. Acquired data that has been collected from the sensors (uncalibrated) is stored in an uncorrected data file. Data that has been corrected by applying the most recent pre-cruise calibration data is stored in a corrected data file.

Atmospheric meteorological sensors are generally located on either the forward part of the ship on the MET mast and/or above the ship's upper bridge deck. Sensors that measure seawater properties are generally located near the uncontaminated seawater intake area or in one of the ship's laboratories that has a connection to the uncontaminated seawater line.

At least once a year all sensors are removed from the vessel, refurbished, and calibrated at an appropriate shore-based maintenance/calibration facility. Calibration data for each sensor is kept onboard each vessel and entered into the shipboard acquisition/setup file that is used by the acquisition program to correct sensor data for display and storage.

MULTIBEAM -

- Kongsberg EM124 12 kHz Multibeam Echosounder mapping system for deep water bathymetery.
- Beams map 6-7 times the water depth (25 km swaths in deep water)
- Kongsberg EM712 40 – 100 kHz Multibeam Echosounder mapping system for shallow to midwater bathymetery.
- Turo Devil Expendable Bathythermograph System (XBT) (one probe per day for calibrating Multibeam systems if additional probes are required advanced planning and additional funding is necessary.
- Software: Kongsberg SIS acquisition system.

PROPULSION - *Roger Revelle* is equipped with twin "Z" drive propellers aft, trainable 360 degrees. Propeller speed is variable from 0 rpm to full. A White-Gill azimuthing water-pump bow thruster is used for precision maneuvering, dynamic positioning, station-keeping, etc. Thrusters can be controlled independently or integrated through a Kongsberg dynamic positioning/maneuvering system. Dynamic positioning is driven by inputs from GPS. *Roger Revelle* is capable of accurate station holding, positioning and track line following in most wind and sea conditions. For fuller details of handling and maneuvering characteristics, consult the captain.

RADIOACTIVE MATERIAL - The use of radioisotopes, or other isotopes in concentrations not found in nature, is strictly controlled aboard *Roger Revelle*. Permission to use radioisotopes must be obtained from the SIO Radioisotope Use Committee in writing, following written application (which is reviewed by the Radioisotope Committee) describing aims of the work and the isotopes, quantities, and procedures to be employed. Such usage must be consistent with strict precautions for safety and to prevent contamination of the ship. All handling of isotopes must be done within a designated portable isolation van. Vans are available upon request from the UNOLS Van Pool (the Research Technician group can assist with these requests). Cleanup costs of any isotope spills will be charged to the persons responsible.

REFRIGERATION AND FREEZING - (See also "Science Freezer" and "Climate Control Chamber" under LABORATORY SPACES in this section.) Revelle has several lab refrigerators and freezers available, please consult the Research Technician Group early on in cruise planning with specific cold storage requirements.

SCIENCE INFORMATION SYSTEM (SIS) – There is a system of twisted pair copper wiring to support the distribution of data from/to the Data Center and laboratories and other key locations around the ship.

SCUBA DIVING - All diving from SIO vessels is controlled by the diving officer. Please contact the Research Technician group early in your cruise planning process if your research requires SCUBA diving support.

There is no decompression chamber on R/V *Roger Revelle*.

SEAWATER - There are multiple bibs for seawater wash down on the weather decks. Checking with the deck watch officer is appropriate before hooking up and using any hoses. Sea water for incubation purposes is available. For quantity, flow rate, etc., check with the engineer.

SHEAVES & BLOCKS - Use of various winches and wires implies use of certain combinations of sheaves and blocks. In addition, your scientific operation may have requirements for fair-leading wires to certain locations. Be sure to check with the Research technician well in advance to explain all your wire rigging ideas and needs. Technicians will know how to best accomplish your task. Never use a sheave that is too small in diameter for the wire.

SHIPPING - Limited stowage on board R/V *Roger Revelle* often necessitates shipping equipment and samples. Shipments can be made to the ship's agent in ports other than San Diego; contact the Nimitz Marine Facility for the agent's addresses. Agents charge for every service they provide; science users should arrange in advance to cover any costs associated with shipping or receiving their equipment or samples. Please include the Port Captain, Ship's Captain, and Research Captain in any dealings with the ship's agent. (See also CUSTOMS in this section.)

STORAGE - (See entries under LABORATORY SPACES in this section for forward and lower scientific storerooms, GASES for storage of gas cylinders, and CHEMICALS for storage and use of lab chemicals and hazardous materials.)

SUPPLIES AND EQUIPMENT -

While not possible to stock everything anyone might conceivably wish to have at sea, the ship maintains an inventory of tools and supplies to supplement needs where possible. The ship does not carry a standard suite of analytical or special-use equipment. (See also Section 5.)

UNCONTAMINATED SEAWATER - Uncontaminated seawater is provided via a pump in the bow thruster room at 50 gal/minute, and from a pump from the engine room and or a pump forward near the bow thruster, the pumps are connected to the hydro lab. Distribution to various labs via plastic piping. Please check with duty engineer for hookups of supply and drainage.

VANS - *Roger Revelle* can carry multiple laboratory, refrigeration, and storage vans. Two vans can be sited aft of the hydro lab and can have enclosed access to that lab if the van door arrangements are suitable. Two more van sites are on the 01 level, port side. The 02 deck forward of the house has space for 4 full vans. (Decks have special cam-loc fittings in these locations.) Other deck space is available for vans as necessary.

Plans to use any vans should be indicated on the Marine Facilities Planning tool and details should be discussed with the research technician well in advance of departure.

WINCHES - The Markey DUTW-9-11 traction winch is in the winch room on the 1st platform level. Two stowage drums can carry up to 15,000 m of 9/16" wire on one drum and either 10,000 m of 0.680" electromechanical wire or 10,000 m of fiber optic cable. The unit is driven by a 150 hp electro-hydraulic power pack. Wire is led over the side through the A-frame aft or through the trawl crane on the starboard side aft. Fiber optic cable can also be used, led to the stern A-frame. Trawl crane may require use of boom crutch. Check with research technicians.

The primary Hydro winch is a Markey DESH 5 (75 hp AC-SCR/DC drive). It is located on the 02-level aft of the house, and holds up to 10,000 meters of 0.322" conducting wire or 0.250" mechanical wire. Wires can be led over the side via the hydroboom boom. This winch can be configured for either CTD or hydroboom operations.

The primary CTD winch is a Markey CAST 6 (75 hp AC-SCR/DC drive) integrated with an Allied articulating load-handling system. The winch holds up to 10,000 meters of 0.322" conducting wire, which can be led overboard using either the Allied load handling boom or the hydroboom.

WIND & SPEED DIRECTION INDICATORS - (See MASTS in this section.)

WIRE - A log is maintained by the chief engineer documenting the actual wire on each winch at any given time. The working end of every wire is occasionally cut off and the termination replaced, and this can sometimes amount to 100 meters or more if damage has been sustained by the wire.

It is important that expected water depths of planned operations be made known to the research technicians and the marine superintendent as far in advance of these operations as possible, to ensure that adequate wire is available. Lead times on the purchase of new wires can amount to a year.

XBT - A Turo Quoll XBT system used with Sippican Fast Deep probes is permanently installed. It is available for general use, but stocks of XBT probes

beyond the one per day budgeted for calibration of the multibeam system must be user-supplied.

SECTION 5: TECHNICAL SERVICES AND SPECIAL EQUIPMENT

Shipboard Technical Support (STS)

STS provides science support services and general use equipment for the Scripps research vessels. Levels of services and facilities depend on the mission, capabilities and requirements of each cruise and are negotiated with the manager of STS in advance. The specific capabilities and services of the 5 groups within STS are as follows:

Research Marine Technicians Group (ResTechs)

The primary job of the RMTG is liaison between research vessels of Scripps and the scientists and research groups using those vessels. The research technician who is assigned to R/V *Roger Revelle* for a particular cruise works with the chief scientist during the planning stage of the cruise to provide ship-specific information and to determine the needs of the scientific party. At sea, the ResTech will be the primary contact for the science party with regards to over the side operations, laboratory safety, and can act as a liaison between the science party and the ship's crew. The ResTech typically acts as the deck boss for any over the side operation. If a science expedition requires 24 hour deck operations, a second ResTech may be required (this should identified early in the cruise planning process to ensure availability).

The RMTG is the point-of-contact for scientific logistics. They plan with the scientists and research groups for the shipping and receiving of equipment and supplies. These technicians plan the deck load and laboratory setup. They operate forklifts on docks and the cranes on all ships, and supervise loading and unloading of scientific equipment and supplies. They report the load plan with weights of large items to the ship's captain for stability calculations.

Shipboard Instrumentation Technician Group (SITG)

During normal operations at sea, members of the Shipboard Instrumentation Group on R/V *Roger Revelle* perform maintenance, repair, and calibration on the installed shipboard oceanographic instrumentation.

The Instrumentation Technician will monitor data acquisition systems during a cruise to ensure all data is synced to the ship's file server and will provide a consolidated data set to the Chief Scientist at the end of the cruise. After the cruise, the instrumentation technician will make the data set available to R2R for data quality assessment and archiving.

(See also COMPUTER S, Section 4.)

SECTION 6: NAVIGATION AND COMMUNICATIONS CAPABILITY

Roger Revelle is equipped with an extensive suite of navigation and communications instruments and devices. This equipment allows precise navigation and control of the ship and worldwide communications in voice, data and facsimile. A number of the more prominent systems and devices are listed below and described.

CELLULAR TELEPHONE - The captain is equipped with a cellular telephone, but R/V *Roger Revelle* normally operates beyond the range of cellular networks.

DATA COMMUNICATIONS - (See SATELLITE COMMUNICATIONS.)

DEPTH RECORDING - There is a fathometer on the bridge. Maximum reliable soundings are ~300 meters.

Deep sea soundings are accomplished with the EM124 Multibeam, or the 3.5/12 kHz echosounder system. (See ECHOSOUNDING in Section 4.)

DIRECTION FINDING EQUIPMENT - A Simrad Taiyo medium frequency RDF is installed in the chartroom for navigational purposes. A VHF direction finder is scheduled for installation in the pilot house. This RDF will operate in the 110-170 MHz range. It is primarily used for locating autonomous vehicles at sea. Transmitters for use with this system are provided by the scientific group or arrangements for the appropriate equipment can be made with the Research Marine Technicians Group.

GYRO COMPASS - *Roger Revelle* carries two Sperry gyro compasses. In addition to these, the science acquisition primarily uses Kongsberg Seapath 330+ and a Phins Gen. III MRUs. Several electronic devices, including navigation systems and the shipboard computer system, have inputs from the gyro compass.

INTERNAL COMMUNICATIONS - Three installed systems facilitate internal communications around the ship - a household-type dial telephone, a sound-powered phone system and a mission announcement system. The directory for the dial phone system is posted next to each phone. The sound-powered phone has no external power supply. A list of stations is posted on each phone. To call using the sound-powered phone select the desired station. Crank the handle two or three times to ring the phone, press the button on the handset and talk. The button on the handset must be pressed both to talk and to listen. A public address system is operated from the bridge. It is used to make urgent pages and for emergencies. Instructions are posted by the various units.

NAVIGATION EQUIPMENT - *Roger Revelle* navigates primarily by Furuno GP-170 GPS. A doppler log is utilized for speeds. A full set of traditional navigation equipment is maintained onboard.

RADAR - Two Furuno marine radar are carried; an S band (10 cm) and an X band (3 cm). Radar consoles are located on the bridge. Do not touch this equipment without permission of the mate on watch. One Furuno X-band science radar is in the electronics/computer lab for ocean waves data collection.

HAND-HELD RADIOS - The ship normally carries portable VHF and UHF marine radios. They are used for internal communications and small boat operations.

HF/SSB COMMUNICATIONS - GMDSS radio suite carried aboard.

SATELLITE COMMUNICATIONS - Sealink C/Ku-Band is the primary satellite communications system on board. Inmarsat FleetXpress service is the secondary system. Sealink coverage is global, per cruise coverage will vary for FleetXpress. Current baseline bandwidth for Sealink is 4Mbps shore to ship and 2Mbps ship to shore. Current baseline bandwidth for FleetXpress is 2Mbps.

SEARCH LIGHTS - There are two installed search lights to facilitate certain operations at night.

SPEED LOG - (See DOPPLER LOG in Section IV.)

VHF COMMUNICATIONS - (See HAND-HELD RADIOS in this section.)

SECTION 7: SAFETY

BOATS AND LIFERAFTS - The ship carries eight automatic-release, self-inflating liferafts. They are in cradles on the 02 deck forward, four on each side. The forward-most carries 16 people while the after three carry 25 persons each. The rafts are numbered 1-8 with the even numbers on the port side and the odd on the starboard. All personnel aboard are assigned to one of the liferafts (see station card attached to your bunk for raft assignment).

There is a rescue boat located on the starboard side. This boat can be quickly deployed and would be used by the Rescue Squad in an emergency, such as "man overboard". Please do not tamper with this or any other safety equipment. If you have questions about any of the equipment ask a crew member.

EMERGENCY DRILLS - A fire and abandon ship drill must be held within 24 hours of leaving port and once every seven days thereafter, by Coast Guard regulation. Fire and abandon ship station bills are posted throughout the ship. Individual billet numbers and responsibilities are posted on small cards near each bunk. For convenience individual billet numbers also correspond to cup and glass numbers. There are two U.S. Coast Guard-approved "personal flotation devices" (lifejackets) in each stateroom for the occupants. Additional lifejackets are stored in the labs. Upon room assignment, all scientists should familiarize themselves with their fire and boat stations, memorize their billet numbers, and learn where their lifejackets are stored and how to wear them properly. Lifejackets are to be worn during all drills.

With the captain's permission, the chief scientist may assign a "skeleton watch" to remain in the lab during fire and boat drills. Proper dress (i.e., long pants, hats, shoes, shirt, etc.) is required at all drills. Bare feet, flip-flops, and shower shoes are unsafe on deck.

Life rafts are for emergency use only. *Roger Revelle* carries 64 cold water survival suits, which are in the staterooms.

MEDICAL MATTERS - The ability of the ship to handle medical emergencies is limited. There are first aid kits, a stocked sick bay, officers have limited first aid training and help can be summoned by Internet. The best course of action is to prevent emergencies.

To this end:

- Do not try to disguise or pass over any abnormal conditions you may have, especially any which might erupt suddenly and require treatment.
- Prevent injuries by thinking safety all the time. Watch for dangerous situations - fix them or bring them to the attention of someone who can.

Roger Revelle currently participates in the UNOLS contracted medical advisory service to provide medical assistance via Internet.

PERSONAL FLOTATION DEVICES - You will find your lifejacket in your assigned room. It should be equipped with a whistle on a lanyard and a waterproof light. All lifejackets also have reflective patches attached front and back near the shoulders. Lifejackets are important safety devices; they should not be left about the ship, used as cushions or pillows, etc. If there is a problem with your lifejacket or it is missing notify the mate on watch who will plan to take care of the problem. Work vests and hard hats are provided by the ship and are in the aft section of the main lab. These vests must be worn when the safety lines are down or if you are involved in over-the-side handling of equipment. Hard hats are required by anyone involved in any operation with loads lifted overhead or wires/cables under tension.

A limited number of "mustang" cold-weather work suits/PFDs is available, as is a limited supply of foul weather gear.

SHIPBOARD SAFETY - Seagoing operations are by nature hazardous. Strict compliance with safety at-sea precautions is necessary to prevent injury to personnel and damage to the ship.

There should be someone in the lab whenever deck evolutions are being conducted to maintain the communications link between the lab, work site on deck, and bridge. Deck evolutions should be discussed well in advance whenever possible with safety and efficiency foremost. The bridge should be informed of all deployments before anything is put over the side and then deployed only from the designated place. At night or during heavy weather no one should go out on the working deck without informing the bridge. Permission must be obtained from the bridge prior to turning on any deck lights or operating any equipment on deck. Work vests shall be worn by everyone on the working deck whenever the lifelines are down. Safety is everyone's business.

Hard hats are required for any over head operations (e.g., crane lifts, over-the-side deployments, etc.).

Due to vessel motion in heavy seas, the scientific party members should ensure that all of their equipment is securely lashed down and properly stowed. It is the chief scientist's responsibility to ensure that this task has been accomplished. If you see any items not secured properly and are in doubt as to how to stow or lash it down, ask the research technician or any crew member for assistance.

A shipboard fire is the most dangerous and most prevalent hazard encountered at sea. It is also a hazard that can be easily prevented by common sense and simple precautions. Remember: while at sea, you can't run away from a burning ship.

Keep all doors and hatches secure at all times. Either latch it open with the hook supplied or close it tight. Never allow doors or hatches to swing freely with the roll of the ship. Be aware of air conditioning boundaries and leave these doors shut at all times. When opening and closing doors, be courteous to sleeping shipmates and do not let the door slam shut.

Stand clear of all wires, ropes and blocks which are under stress. Do not handle any moving wire or rope.

Pick up, clean up, and securely stow all loose gear after each use. Do not walk away from any piece of loose equipment-- even if it is not yours, tie it down.

Wear proper shoes when working on deck. Sandals or other flip-flop type of footwear are unsafe and will not be tolerated for deck work. Closed toed shoes are required at all times while working on deck and in the labs.

MAN OVERBOARD - If someone has the misfortune to fall overboard, first pass the word to the bridge, "MAN OVERBOARD," designating which side if possible. Next throw one of the strategically located life rings over the side to mark the spot and provide flotation. At all times, you should keep your eyes on the person; it helps if you point to the victim. This assists the bridge and other watchers in keeping the person in sight. If underway, the bridge watch will maneuver to keep the props clear and recover the person, or if circumstances permit, launch the rescue boat. The sound signals for MAN OVERBOARD are 3 long blasts on the general alarm and ship's whistle.

SECTION 8: SHIP ORGANIZATION

HOUSEKEEPING - Clean towels and linen are available at the beginning of the voyage. At the end of the cruise, bunks should be stripped and soiled linen taken to the place designated.

Bunks should be made up daily. Public heads and passageways are cleaned by the crew. The scientific party is responsible for cleaning science staterooms and heads and the laboratories. The responsibility of regularly sweeping out the laboratories is assigned by the chief scientist. All laboratories and scientific party rooms should be thoroughly cleaned before departing the vessel at cruise end. Cleaning gear is available throughout the

vessel in cleaning gear lockers; if you can't find it, ask. Common courtesy calls for the scientific party members to pick up after themselves. Good shipmates leave their quarters or work areas cleaner than they found them.

Fresh water is a precious commodity at sea and must not be wasted. In ports, foul harbor water may prevent operation of desalinators, and the local fresh water may be unsafe to take aboard. Conservation of freshwater is therefore a must. Salt water should be used on deck when possible. "Navy" showers (i.e., rinse-soap-rinse, turning off water between times) should be practiced. Full washer loads make best use of water.

Washing machines, laundry soap, bleach, and dryers are available. They are used on a first-come-first-served basis. The only request is for users to do full loads of laundry to conserve fresh water. Laundry detergent is provided. A laundry sack is stationed in this area to collect soiled sheets and towels from the ship's supply. An iron is available.

The ship's sanitary system cannot handle cigar and cigarette butts, sanitary napkins, etc. Please dispose of such items properly.

Although there is no standard for dress aboard, mature judgement and decorum are expected.

MESS HALL - The mess deck has seating for 30. This is only half of the full ship's complement, so personnel should not loiter during or immediately after meals. Watchstanders are customarily served first. Meal hours must be respected. Shirts and foot coverings are required at all times in the mess hall.

Meal hours at sea are:

- Breakfast: 0730-0815
- Lunch: 1130-1215
- Dinner: 1700-1800

The mess hall is cleared 45 minutes prior to and after meal hours to allow for setup and cleanup. Messing is cafeteria style. It is most important that all persons bus their own dishes and clean up after themselves. When stores arrive at the ship, all hands help load.

Except in extraordinary circumstances, meals are to be eaten in the mess, not in labs. If it is necessary to bring food into labs for important science operational reasons, bus the dirty dishes and scraps back to the mess area afterward; do not use the lab trash containers.

Cups and glasses disappear at sea. Therefore, everyone is assigned a coffee cup and a drinking glass, marked with their berth number. Use your own, only. If yours disappears, please look for it before asking for a replacement; there may not be one. The chief scientist should work out with the captain any special eating schedules for scientific watchstanders and station times.

SHIP'S CREW - The complement of 21 is the captain, 3 mates, the boatswain, 3 able seamen, 1 ordinary seaman, the chief engineer, 3 assistant engineers, 1 electrician, 4 oilers, 1 wipers, and 2 cooks.

The mates are the officers of the watch. The duty station for all operations, including station work, is the bridge, since fantail and other weather decks may be monitored from the bridge wings.

The assistant engineers and the electrician, if necessary, man the watch in the engine room. When winches are required for station work, call the bridge to arrange for a winch operator.

The electrician is primarily a "dayworker," unless included in the engine room watch rotation.

The boatswain also is a "dayworker," responsible for general ship upkeep. The able seaman on watch assists him or the officer of the watch, as required, and the A.B.'s and ordinary seaman are primarily responsible for daily cleaning of the ship.

The boatswain will operate the ship's heavy cranes if requested. Otherwise, the resident technician performs this task. Smaller cranes (Morgan) are normally operated by members of the scientific party, but only after training by the resident technician.

If assistance from any crew member is needed by the scientific party, it is recommended that such requests be routed through the officer of the watch. Requests for a winch operator should always go to the bridge.

It should be kept in mind that requests for after-hours work by any of the crew are treated as overtime, and should not be placed unless urgently needed, and then through the captain or chief engineer as appropriate.

SECTION 9: SCIENTIFIC BERTHING PLAN

BERTHING - The scientific berthing is 37. This assumes 1 person in the chief scientist room, and 2 people in each of the remaining 18 rooms. One of the

bunks in room 02-42-6 has a fold down pullman berth. Rooms 2-40-2 and 2-40-1 are permanently assigned to the Instrumentation Technician and Resident Technician, the second bunk in each of these rooms should be the last to be assigned and left vacant unless a full ship. Except where indicated below, all rooms share an adjoining head.