



DEPARTMENT OF THE NAVY  
OFFICE OF THE CHIEF OF NAVAL OPERATIONS  
2000 NAVY PENTAGON  
WASHINGTON, D.C. 20350-2000

IN REPLY REFER TO

OPNAVINST 9010.345A

N096

27 September 1996

OPNAV INSTRUCTION 9010.345A

Subj: APPROVED TOP LEVEL REQUIREMENTS (TLR) FOR OCEANOGRAPHIC RESEARCH SHIPS (AGOR 24/25)

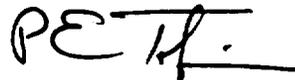
Encl: (1) Oceanographic Research Ships, AGOR 24/25 Top Level Requirements

1. Purpose. To issue the approved Top Level Requirements (TLR) for the university-operated Oceanographic Research Ships (AGOR 24/25). This instruction is a substantial revision and should be reviewed in its entirety.

2. Cancellation. OPNAVINST 9010.345.

3. Applicability. These Top Level Requirements are applicable to AGOR 24/25 currently under construction.

4. Discussion. This TLR is modified to include unique requirements for AGOR 25 which will serve as a support ship for the university-operated Deep Submergence Vehicle (DSV) ALVIN.

  
P. E. TOBIN

Oceanographer of the Navy

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OCEANOGRAPHIC RESEARCH SHIPS, AGOR 24/25

TOP LEVEL REQUIREMENTS

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## 1. OVERVIEW

### 1.1 Objectives and Scope

a. This document specifies the Top Level Requirements (TLR) for the university-operated Oceanographic Research Ships (AGOR 24/25). Included are the ships' missions, operational requirements, major configuration constraints, the plan for use, the maintenance concepts, the supply support concepts, and minimum operational standards.

b. The objective of the AGOR 24/25 Ship Acquisition Program is to acquire oceanographic ships to meet worldwide oceanographic and data collection requirements.

c. The format of this TLR has been developed in accordance with the requirements of OPNAVINST 9010.300A. After this TLR is issued, serialized changes will be made to issue any changes to these requirements.

1.2 Constraints. If the provisions of this TLR cannot be met, the Commander, Naval Sea Systems Command will so advise the Chief of Naval Operations (N096).

### 1.3 Design Guidance

a. AGOR 24/25 are to be built to commercial standards and shall comply with all the applicable laws of the United States and the requirements of the regulatory bodies, American Bureau of Shipping (ABS), United States Coast Guard (USCG), SOLAS '74 (as amended), 46 CFR Subchapter U (Oceanographic Ships), U.S. Public Health Service and Federal Communications Commission. The ships shall be classified by ABS to (MALTESE CROSS) A1 CIRCLE E (UNRESTRICTED OCEAN SERVICE), (MALTESE CROSS) AMS, (MALTESE CROSS) ACCU, and Class C ice strengthening.

b. The ships will satisfy all the requirements to obtain certifications for transit of the Suez Canal and Panama Canal.

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c. Design shall include emphasis on economy of operation. The maximum draft requirement is 17 feet without sonar dome; the maximum length requirement is 275 feet. Compliance with the General Specifications for Ships of the U.S Navy, NAVSEA Technical Manuals, or other military requirements, is not required except as noted here. For AGOR 25 only, the ALVIN handling system shall be certified by NAVSEA 92Q.

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## 2. MISSION STATEMENT

2.1 Mission. The missions of the Oceanographic Research Ships (AGOR 24/25) are to provide general purpose oceanographic capabilities in coastal and deep ocean areas. Typical missions will include:

- a. Physical, Chemical and Biological Oceanography
- b. Multi-discipline Environmental Investigations
- c. Ocean Engineering and Marine Acoustics
- d. Marine Geology and Geophysics
- e. Surveys (bathymetry, gravimetry, and magnetometry)

2.2 Primary Tasks. To carry out the missions, AGOR 24/25 shall be capable of performing the following tasks:

- a. Oceanographic sampling and data collection of surface, midwater and sea floor parameters using state-of-the-art scientific instrumentation.
- b. Launch, recovery and towing of scientific packages, both tethered and autonomous, including the handling, monitoring and servicing of remotely operated vehicles.
- c. Shipboard oceanographic data processing and sample analyses in modern well-equipped scientific laboratories.
- d. Precise navigation and station keeping and track-line maneuvering to support deep sea and coastal surveys.
- e. For AGOR 25 only, provide support services including launch, recovery, and maintenance for DSV ALVIN.

2.3 Secondary Tasks. These ships have no wartime mission.

### 3. TOTAL SHIP REQUIREMENTS AND CHARACTERISTICS

3.1 Command, Control and Communications. Facilities shall be adequate for scientific and survey operations and shall include:

a. Ship handling and maneuverability to permit dynamic positioning, station keeping and the launch and recovery of large scientific packages and vehicles.

b. Manual and automatic steering control, precision trackline and position-keeping.

c. A pilot house location at or near amidships, including an aft-facing secondary ship control station with the best possible view of the working deck areas aft. For AGOR 25 only, the secondary ship control station is not required and shall be replaced by an ALVIN surface controller's station. Bridge wings shall include gyro repeaters, rudder angle indicators and shaft RPM indicators. Satisfactory visibility from pilot house forward, from bridge wings forward and aft, and from the aft control station to the working deck areas aft-starboard, is required. Bridge wings shall be enclosed from beam to beam, as integral parts of the pilot house. The functions, communications, and layout of ship control must allow the close interaction of ship and science operations. For AGOR 25 only, an aft-located winch control house is required with good visibility of the working deck and the water aft of the ship.

d. Navigation, communication, and IC systems are listed in Appendix B.

### 3.2 Acoustic Characteristics

a. The shipboard acoustic systems are identified in the appendices. It is required that the mounting, configuration and location of the sonar systems listed in the appendices to this TLR shall reduce hull induced flow noise and bubble-sweepdown interference within the current state-of-the-art for this type of

acquisition. All installed sonars will operate at ships speeds up to 12 knots in sea state 4.

b. The choice of shipboard hull and machinery systems, their locations and their installation shall be to reduce impact on the operation of shipboard acoustic systems within the current state of the art for this type of acquisition.

c. Airborne noise levels shall meet Occupational Safety and Health Administration (OSHA) and USCG requirements. In addition, for the main weatherdeck (except when deck machinery is operating), speech communications must be possible over moderate distances. Laboratories and interior scientific working spaces shall be sound insulated to maximize communication within these spaces.

### 3.3 Survivability, Including Passive Protection

a. Survivability provisions shall be under regulatory body requirements for oceanographic ships.

b. All radiators and receptors of electromagnetic energy and related electronics on AGOR 24/25 shall be designed and installed to ensure electromagnetic compatibility (EMC) and to avoid hazards of electromagnetic radiation to personnel (HERP) and fuels (HERF). Automated control systems shall not respond spuriously to electromagnetic interference (EMI) from radiating sources or to transients on power lines.

c. The ships shall meet all applicable safety requirements of the regulatory bodies.

3.4 Mobility. A sustained speed of 15 knots is required. The ship shall be capable of 11,300 nautical miles at 12 knots plus 29 days at 3 knots. A 10 percent fuel reserve shall be provided based on total fuel required.

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3.5 Operating Environment. AGOR 24/25 shall operate as required in worldwide service, and perform missions under a range of weather conditions from tropic to subarctic.

3.5.1 Temperature and Humidity. Habitability areas and mission essential spaces shall be air-conditioned and shall be designed for a maximum external air temperature of 95 degrees Fahrenheit dry bulb (82 degrees Fahrenheit wet bulb), with a maximum sea water temperature of 95 degrees Fahrenheit, and a minimum external air temperature of 0 degrees Fahrenheit with a minimum seawater temperature of 28 degrees Fahrenheit. Air-conditioning for all laboratory spaces and interior scientific operations spaces shall be designed to provide maximum of 75 degrees Fahrenheit with maximum humidity of 55 percent. Heating for these spaces shall be designed to provide minimum of 70 degrees Fahrenheit. Other payload compartments, including scientific storage compartments, shall be designed to maintain 70-80 degree Fahrenheit dry bulb with maximum humidity of 55 percent.

3.5.2 Wind and Sea Conditions

a. Safe transit is required at all speeds up to approximately 15 knots on all headings in seas up to 8.2 feet (ft) significant wave height, and at 10 knots on a best heading in seas up to 12.2 ft significant wave height.

b. The ability to launch, operate, and recover scientific equipment while holding position, at best heading, in seas up to 11.0 ft significant wave height is required.

3.6 Ship Utilization. AGOR 24/25 have irregular deployment cycles. These ships are expected to average 250 days per year at sea.

3.7 Maintenance, Overhaul and Supply Support Concepts

3.7.1 Logistics Support

a. AGOR 24/25 shall be capable of self-sufficiency for regular preventive maintenance. Onboard maintenance and repair capability shall meet USCG and ABS requirements.

b. AGOR 24/25 shall be capable of limited emergency repair of hull structure and engineering casualties. Repair tasks areas include:

- (1) Limited repair of above-water hull structure.
- (2) Minor steering system and/or shafting repair.
- (3) Minor propulsion, auxiliaries and electrical repairs.
- (4) Substantial repair of scientific deck machinery and electronics.

c. The maintenance and overhaul concept shall be consistent with post-delivery logistic support by an academic institution using U.S. commercial sources of supply.

d. Regular drydocking and ship overhaul will be scheduled to maintain a valid USCG certificate of inspection and to maintain the ships in class with ABS.

3.7.2 Supply Support

a. AGOR 24/25 shall carry consumables for accommodation of 60 as follows:

Dry Stores	90 days
Frozen	90 days
Chilled	30 days
Medical	120 days
Using ONR stowage factors	

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b. Adequate stowage spaces shall be separately provided for deck, engine, medical and steward stores.

### 3.8 Manning and Habitability

3.8.1 Manning. Manning shall be constrained to the accommodations stated here. Ship manning levels shall be established in order to comply with USCG regulations regarding minimum manpower requirements.

#### 3.8.2 Accommodations

a. AGOR 24/25 shall conform to USCG habitability standards.

b. Minimum capability. Fifty permanent accommodations; 10 single staterooms (including 2 rooms for scientists) and 20 double staterooms (14 rooms for scientists). The ship shall be capable of accommodating 10 additional scientists in two deck vans. A public toilet and shower shall be suitably located in the van area.

c. Desired capability. Permanent accommodations for 59 personnel; 9 single staterooms (including 1 scientist room) and 25 double staterooms (19 rooms for scientists). If this arrangement is used, the additional deck vans are not required.

#### 3.8.3 Habitability Standards

a. Quarters for scientific personnel shall be comparable to those provided for ship's personnel. A hospital space, exercise room and self-service laundry facilities are required. A common galley for cafeteria style feeding shall be utilized.

b. AGOR 24/25 shall have a common messing facility (minimum 50 percent seating) for all officers, crew and scientists as well as a lounge area for recreation and training purposes.

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3.9 Flexibility for Change, Including Space and Weight Reservations

a. Design and outfitting shall provide for rapid scientific payload changes and for ship turnarounds and redeployments. This includes optimum access to work and storage areas, and laboratory facilities to permit changeout of electronics and other laboratory internal equipment.

b. Service life allowance of 5 percent of full load displacement and 0.5 foot of KG shall be provided. For AGOR 25 only, the service life allowance shall exclude the weight and moment impact of the ALVIN conversion.

4. SUBSYSTEM REQUIREMENTS AND CHARACTERISTICS

4.1 Hull Form and Structure. The following specific capabilities and characteristics are required:

a. The ships shall satisfy the requirement of the 1989 ABS Rules for Building and Classing Steel Ships with the Class C ice strengthening.

b. The ships shall have a hull shape, appendages and hull openings so as to reduce hull induced flow noise and bubble sweep down interference within the current state-of-the-art for this type of acquisition.

4.2 Propulsion System. The following specific capabilities and characteristics are required:

a. The prime movers shall be diesel engines, using marine diesel fuel.

b. An integrated electric propulsion and auxiliary service system is required.

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c. The machinery plant shall be capable of continuously variable ship speed control (0-15 knots) without switching systems.

d. Economy of operation shall be considered during the design.

e. The machinery plant shall be designed for unattended operation. An air-conditioned central machinery control space shall be provided for operation and monitoring of propulsion and auxiliary machinery and systems. The centralized control room shall be located within or adjacent to the machinery space boundary with suitable access provided.

f. Bow thrusters shall be steerable jet or retractable propeller (faired) type to ensure minimum acoustic interference.

4.3 Electric Plant (Scientific Purposes). Provision shall be made for clean power to support a scientific load of approximately 100 kw including a 12 kw Uninterrupted Power Supply (UPS).

4.4 Command, Surveillance, and Scientific Mission Requirements

a. Appendix A provides a list of Mission Sponsor Equipment.

b. The following scientific facilities shall be provided and, where practical, are to be located contiguous to one another in the area of the ship which experiences the least motion in a seaway.

(1) Deck-Working Area. Approximately 3,500 square feet (sq ft) total fantail working deck area is required. Working deck unit loading shall be 1,500 lb/sq ft. Working deck shall be 6 ft to 10 ft above the water line. All hatches on the working deck shall be flush-type hatches. A disposable load of 100 tons shall be accommodated at the working deck level. For the AGOR 25 only, the disposable load is not required.

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(2) Vans. Additional deck area (working deck or 01 deck) for four 8 ft X 8 ft X 20 ft standard vans shall be provided near the lab complex and working deck with direct access to the ship's interior. For AGOR 25 only, deck area is required for two vans located on the 01 Level. The deck area for vans on the working deck shall have a 1,500 lbs/sq ft unit loading. Ship cranes shall be capable of onloading and offloading the vans up to a weight of 20,000 lbs.

(3) Laboratories. Approximately 4,300 sq ft of laboratory space shall be provided. 2,400 sq ft of laboratory space for the main laboratory and hydrographic labs shall be located near the working deck. Five hundred sq ft of space for the wet lab and staging bay shall be located adjacent to each other and adjacent to the working deck. The staging bay shall be enclosed with 10 ft wide access and 15 ft clear headroom. Three hundred sq ft for the biochemical clean lab, 700 sq ft for the computer lab, and a darkroom, a scientific freezer (8 ft X 8 ft X 10 ft), and a climate-controlled chamber (8 ft X 8 ft X 10 ft) shall be provided. Provisions for handling and storage of chemical material shall be included adjacent to laboratory areas. Chemical laboratory hoods will be provided in the wet laboratory and biochemical laboratory.

Rapid rearrangement and flexibility will be maximized by selective spaces being equipped with flush-deck boltdown fittings on two foot centers and through the use of unistruts on overheads and bulkheads. Laboratory cleanliness is a major objective. Materials which permit achievement of this objective will be used in the construction of these spaces. Furnishings, Heating Ventilation Air Conditioning, doors (HVAC), hatches, cable runs, and fitting will also be planned for maximum lab cleanliness. These spaces should have 9 to 11 air changes per hour. One hundred percent filtered fresh air supply provided to the Analytical Laboratory. Laboratories will be furnished with 110 and 208 volt AC power. Uncontaminated sea water and fresh water, and clean oil-free compressed air supplies with appropriate drains will be provided in selective spaces.

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(4) Scientific Storage. Two to four storage compartments with a combined total of approximately 15,000 cubic ft (75 tons) accessible from both the weatherdeck and the ship's interior shall be provided. High density storage spaces should be located aft with access to working areas by hatches using ship cranes. Maximum total weight in high density spaces is 100 tons. For AGOR 25 only, the weight of ALVIN support machinery, equipment, and consumables may be considered part of the loading in these spaces.

(5) Other Scientific Spaces. In addition to the laboratories, the following scientific spaces are required: a library/conference room (350 sq ft minimum) and a separate science office (150 sq ft minimum).

(6) Overside Handling. Handling gear to accommodate overside operations shall include the capability to carry, launch, and recover equipment on starboard side from midships to stern, including a 100-ft core sampler.

(7) Mission-Related Deck Equipment. A suite of modern cranes, winches, stern A-frame and other deck gear shall be provided to permit loading and unloading the ship without assistance to support a variety of oceanographic operations at sea, such as: coring, water sampling, equipment implantation, and array and trawl towing. These equipments will be located throughout the working deck areas during the life of the ships. Electric power shall be provided to the deck machinery alternative locations. AGOR 24/25 will have both a large trawl/coring winch and a large towing winch which are to be located below the working deck. Provisions shall be made for the remote control of permanently installed mission-related winches from weather protected enclosure(s) with maximum practicable visibility of the cable to the last overside block or sheave. For the AGOR 25 only, additional deck equipment to support ALVIN operations shall include a cross decked A-frame, a DSV transporter with deck rails, and a stern-mounted towing winch.

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c. A dynamic positioning system (DPS) will be installed. This system shall provide control information to the propulsors, bow thruster, or other devices used for speed and direction control, to achieve the following:

(1) Maintain maneuverability and keep station within a 300 foot circle radius in seas up to 11-foot significant wave height, a wind speed of 27 knots, and a 2-knot current at best heading.

(2) Maintain a trackline over the bottom in any direction at 2.5 knots with a constant towing force of 10,000 pounds within a lateral error of plus or minus 300 feet and a ship heading of plus or minus 45 degrees in seas up to 11-foot significant wave height, a wind speed of 27 knots and a 2-knot current.

The DPS shall be capable of accepting input from a Global Positioning System (GPS). The DPS will also be capable of accepting input data from an acoustic positioning indicator system.

d. Ship shall be capable of continuous tow of large scientific packages up to 10,000 pound (lb) tension at 5 knots, and 20,000 lb at 2.5 knots.

e. Flush deck boltdown fittings shall be provided in a uniform grid pattern on 2-foot centers over the entire area of the working deck, staging bay, and van tie-down area.

f. A Scientific Information System shall be provided. This system shall consist of a computer network and cables and junction boxes for a video network.

#### 4.5 Auxiliary Systems

a. The following specific capabilities and characteristics are required:

(1) Fresh water making capacity shall be provided

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consisting of a minimum of two units, each capable of providing in excess of 60 gallons per day per accommodation (60 people). Stowage for not less than 120 gallons of potable water per person shall be provided. An additional 10 percent watermaking and storage capacity shall be provided for lab use. A minimum of two potable water stowage tanks shall be provided.

(2) A clean ballast system shall be provided. Dirty ballast shall not be permitted in any loading condition. Liquid ballast operations shall avoid partially full tanks in any hydrophone area.

(3) All overboard discharges shall be configured to restrict discharge to the port side.

(4) An uncontaminated seawater system shall be provided with bow inlet and distribution to selected laboratories. Materials for this system shall not contribute to biological or chemical contamination.

b. The pollution emanating from the ships shall be controlled. A shipboard sewage system, including transfer system, marine sanitation devices, and holding tanks with 24-hour capacity shall be installed and shall meet USCG and Environmental Protection Agency (EPA) regulations. Oily waste separation equipment shall be provided.

c. A combined workshop shall be provided for ship crews and scientific use equipped with industrial-sized equipment including lathe, drill press, grinder, milling capability, and welding machines (electric and gas). The workshop shall be located adjacent to or within the engine room boundaries and be provided with suitable access for handling both ship and scientific equipment and material.

d. The stack exhaust shall be arranged to minimize airborne pollution of the shipboard environment and airborne noise on main and/or working decks.

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e. Laboratories, working deck stations, and van installation sites shall be provided with appropriate services.

f. Thrusters shall be sized to meet positioning and trackline requirements. Control of thrusters shall be in the pilothouse.

4.6 Outfit and Furnishings. Shall follow USCG requirements and commercial standards.

4.7 Armament. Not applicable.

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## APPENDIX A

AGOR 24/25 MISSION SPONSOR EQUIPMENTItem

1. Two Large Deck Cranes
2. Two HIAB Articulated Cranes or Equivalent
3. Stern A-frame (large)
4. Side A-frame, J-frame or Boom
5. Two hydro winches
6. One Trawl/Coring winch
7. One Deep Tow winch
8. Multibeam Deep water Sonar System
9. One 12 KHz Bottom Profiler
10. Doppler Current Profiler System
11. Doppler Speed Log
12. Dynamic Positioning System
13. Vans, Two
14. Cabinetry for labs, 200 ft.
15. Lab hoods, Two
16. Uncontaminated Sea Water system
17. Refrigerated and Climate chambers
18. SATNAV and GPS Systems
19. Dial Telephone
20. VAX 11/750 Computer System, or equivalent
21. SAIL Systems, or equivalent
22. Wire and Cable (one each, 2 sizes)
23. Diving Locker Outfit
24. Workboat
25. Clean Power system, (100kw)
26. Photo Lab Outfit
27. Scientific Information System
28. One 3.5 kHz Sub-bottom Profiler
29. Seismic Air System

APPENDIX B

AGOR 24/25 COMMUNICATION, NAVIGATION, AND IC SYSTEMS

1. Infrared Facilities

None

2. Transmitting/Transceiver Facilities

- a. (1) Global Maritime Distress & Safety System (GMDSS)
- b. (1) 1.5-1.6 GHz INMARSAT (MCS 9100)

3. Receiving Facilities

- a. (1) Global Maritime Distress & Safety System (GMDSS)

4. Terminal Facilities

None

5. Radar Facilities

- a. (1) 10 cm Surface Search Radar
- b. (1) 3 cm Surface Search Radar
- c. (1) Collision Avoidance System

6. Sonar Facilities

- a. (1) Deep Echo Sounder with Record Capability  
(Navigation)
- b. (1) Shallow Depth Echo Sounder with Flasher (Navigation)
- c. (1) Doppler speed Log (Dual Axis)

7. Countermeasure Facilities

None

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8. Navigational Facilities

- a. (1) Gyrocompass (MK 37)
- b. (1) SATNAV (GPS Capability with Remote) 4 Channel
- c. (1) Loran C (with Remote and Plot)
- d. (1) Automatic Radio Direction Finder
- e. (1) Dynamic Positioning system

9. Radiac Facilities

None

10. Remote Station Facilities

a. Wheel House

- (1) Radar Display/Control of 10 CM Radar (16 inch)
- (1) Radar Display/Control of 3 CM Radar (16 inch)
- (1) Control of Collision Avoidance System
- (1) Echo Depth Sounder Display
- (1) Control of Dynamic Positioning System
- (1) Anemometer

b. Chart Room

- (1) Display/Control of Echo Depth Sounder
- (1) Display/Control of Doppler Speed Log
- (1) Display/Control of Automatic Radio Direction Finder
- (1) Control/Display of Weather Facsimile
- (1) Control/Display of Loran C
- (1) Control/Display of SATNAV
- (1) Control of Radio Facilities
- (1) INMARSAT Terminal
- (1) Anemometer Readout

c. Scientific Laboratory (Electronics Lab)

- (1) Remote Display from Ship's Echo Depth Sounder
- (1) Remote Display from Ship's Doppler Speed Log
- (1) Remote Display from Ship's Loran C

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- (1) Remote Display from Ship's SATNAV
- (1) Gyro Repeater
- (1) Remote Control System Dynamic Positioning System
- (1) Anemometer Readout
- (1) Remote from INMARSAT

11. Meteorological Facilities

- a. (1) Weather Facsimile Converter/Recorder
- b. (2) Wind Direction Equipment (Anemometers) with Readouts  
(Wheel House, Chart Room, Electronics Laboratory)

12. Supplementary Facilities

Not Applicable

13. Special Facilities

- a. (1) Lifeboat Radio
- b. (2) EPIRB
- c. (1) SOLAS Emergency Watch Receiver (2182 kHz)

14. IC Facilities. Electronic IC System serving all operating spaces, labs, public spaces and working deck stations, and four van stations.